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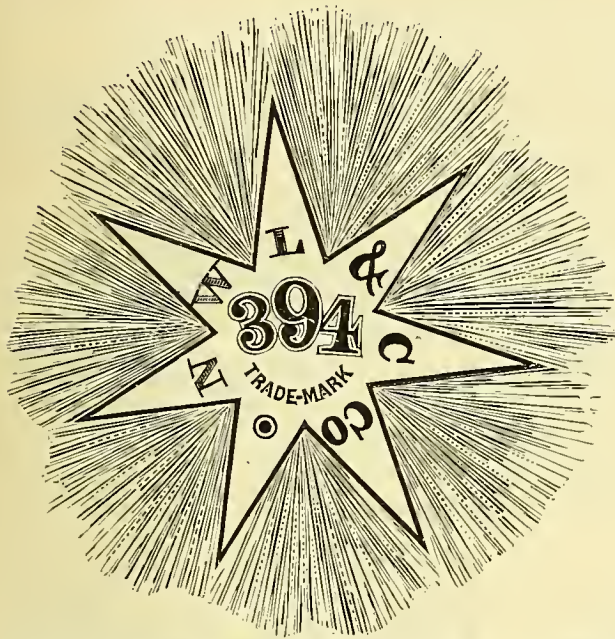
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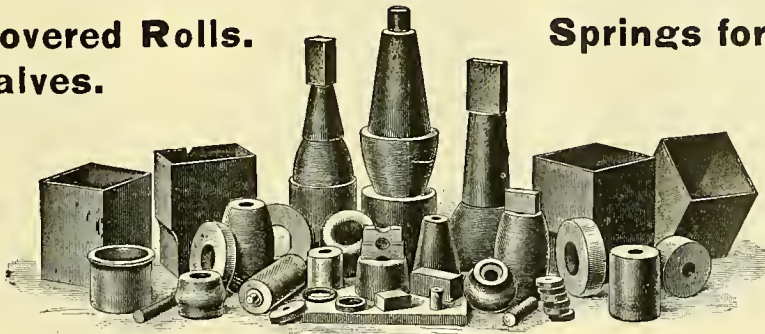
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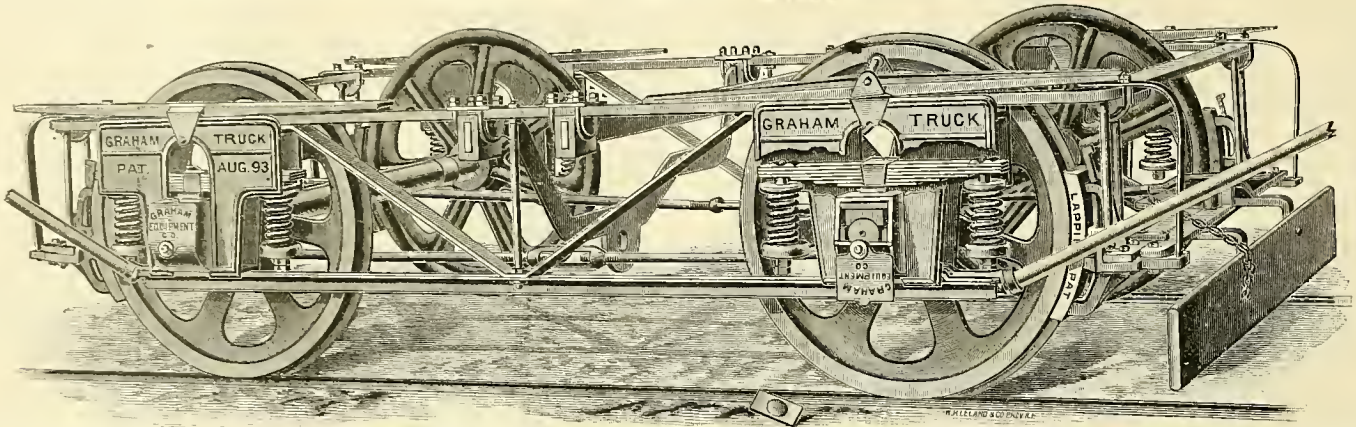
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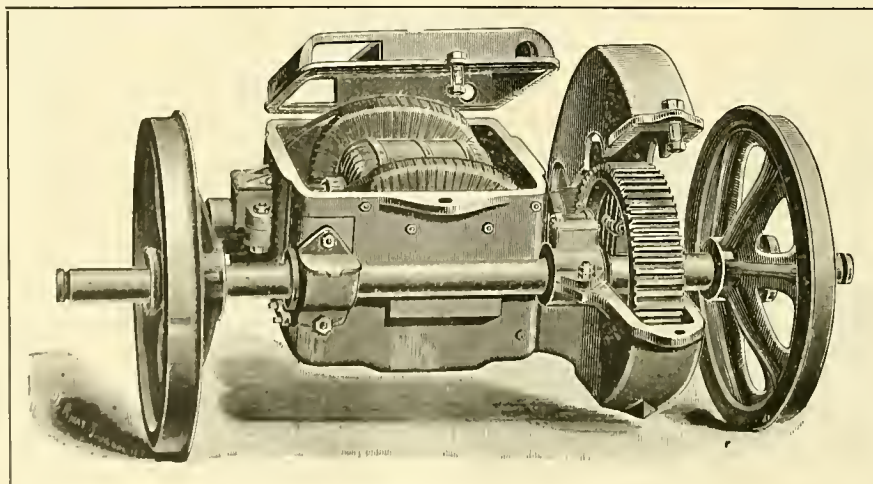
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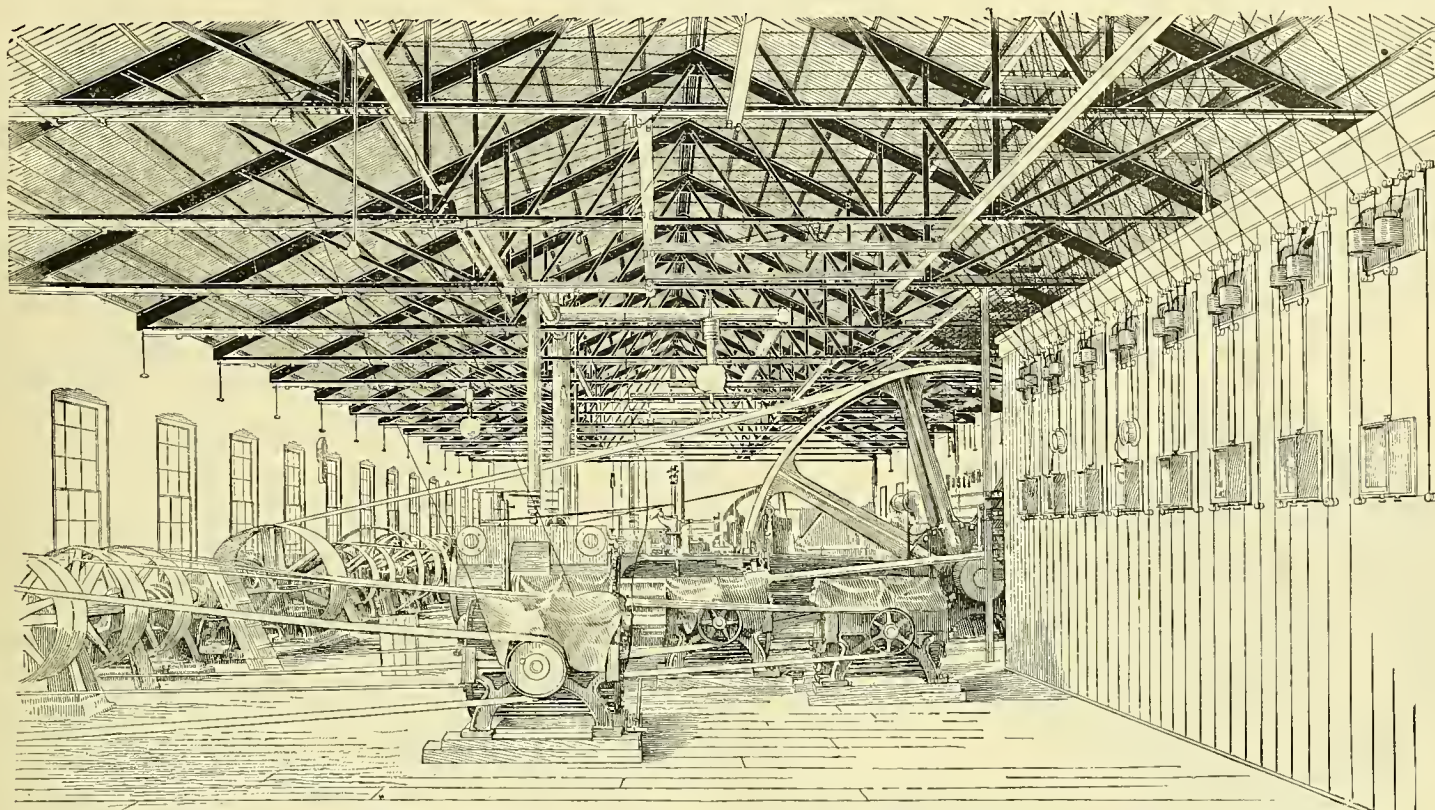
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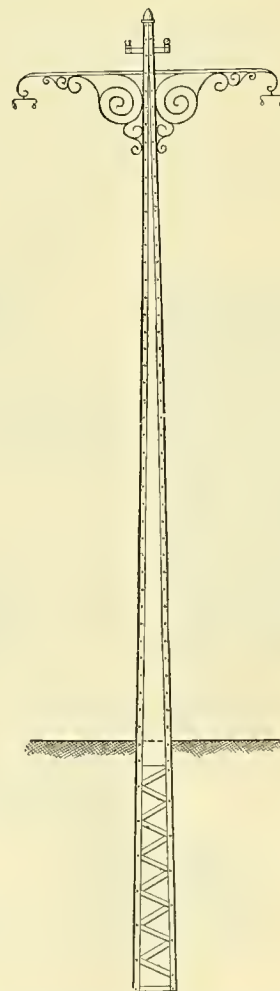
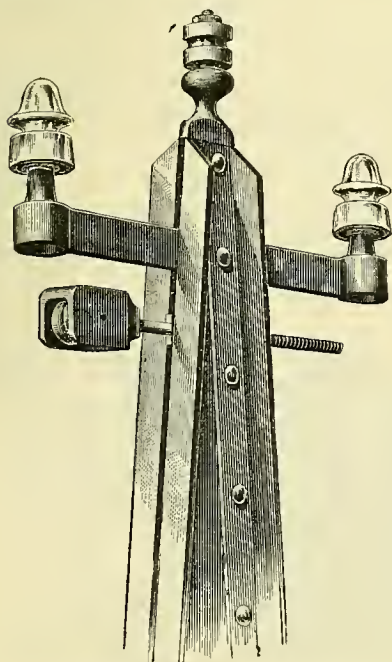


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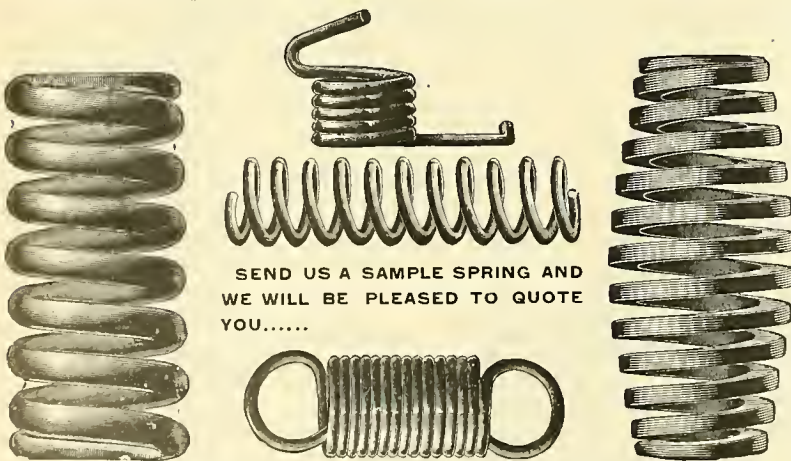
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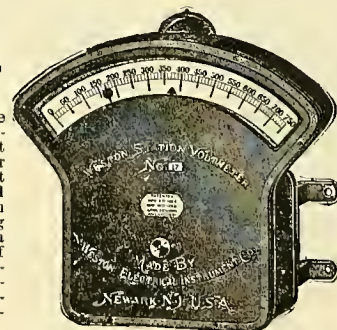
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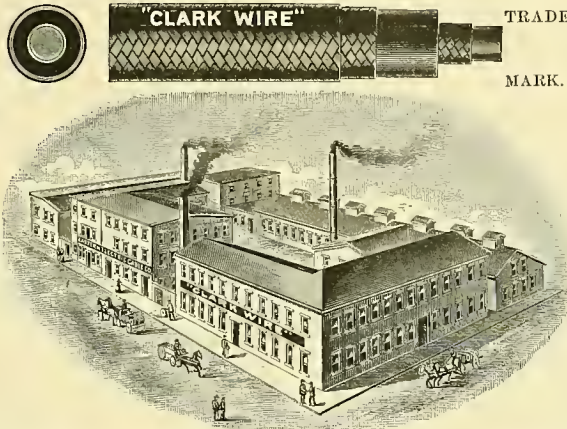
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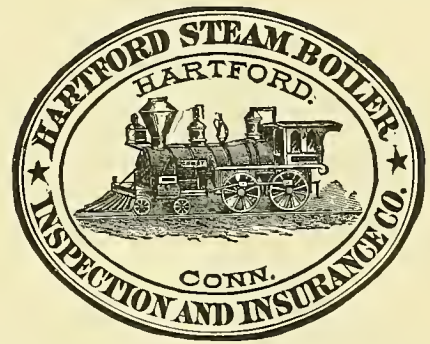
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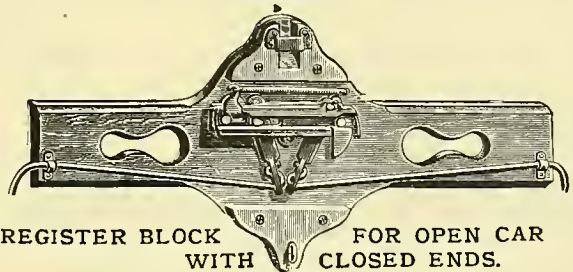
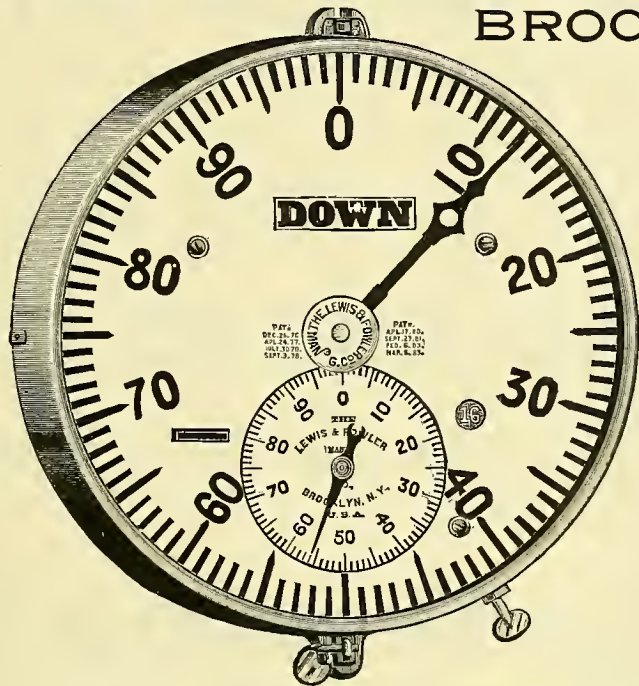
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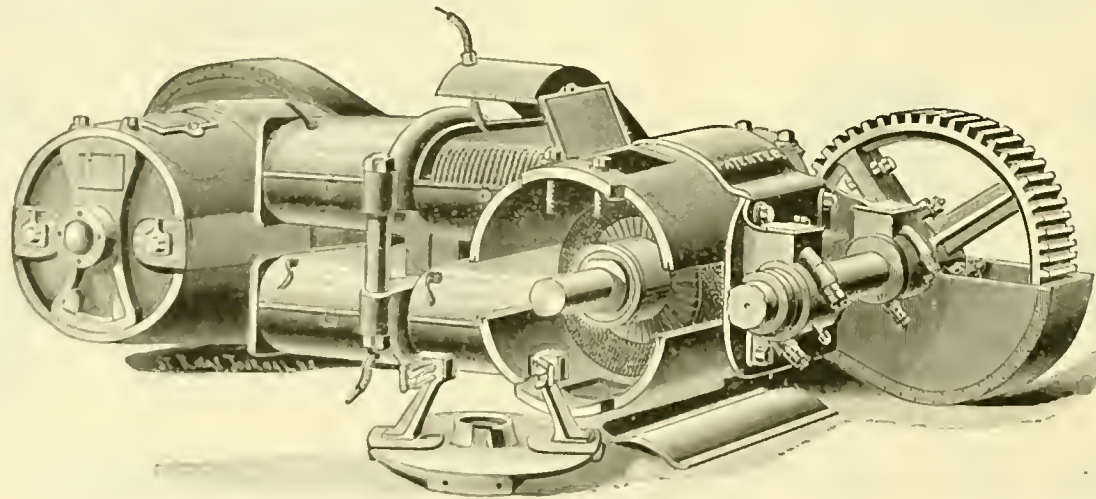
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**Conduit Roads.** Elsewhere in our columns will be found the second installment of a series of articles by Lieut. F. Jarvis Patten on Conduit Electric Railway Systems. This deals in an eminently practical manner with this important branch of street railway engineering. Lieutenant Patten has had an excellent opportunity to judge of the merits of the various conduit systems, through his connection with the Metropolitan Traction Company of this city, in the examination of the projects submitted to that company in competition for the sham \$50,000 prize offered for the best system not requiring an overhead trolley. While there are scores of systems, it is well to bear in mind that there are only very few distinctive types, under which all the varieties may be grouped. The treatment by Lieutenant Patten strongly emphasizes this point, and he has selected for description only such systems as are typical ones under each class. That a conduit road can be built and operate successfully there can be no doubt; it is merely a question of investing a sufficient amount of money to insure substantial construction that will withstand the heavy traffic of a city thoroughfare, and at the same time provide for proper and adequate insulation.

**Trolley Roads in Chicago.** It seems at last that Chicago is to have her share of overhead electric trolley roads. Some time ago the City Council gave the right to Mr. Yerkes to equip with electric power the cars operated on a number of streets on the West side lines. Work has already been undertaken on this equipment, and is now in progress. At the time these franchises were given, however, the City Council refused the request of the Chicago City Railway Company, operating the South side systems, to substitute electricity for horses on nearly all of its auxiliary lines. At that time Mayor Hopkins and the company were unable to agree upon any basis for the granting of the franchises. It is announced now, however, that terms have been agreed upon by which the company will accept the proposed ordinance. This requires the company to pay \$100,000 in cash, the payment extending over a period of 10 years, and to agree to pay \$150,000 additional for the purpose of defraying the expenses of track elevation in the southern part of the city, when that improvement has been decided upon. It is certainly a matter of congratulation that such additional facilities for rapid transit as these lines will furnish are to be provided for the residents of the southern section of the city. The company has about 100 miles of track now operated by horses, and by far the larger part of this is included in the proposed transformation to electric power.

**Street Car Collisions.** Elsewhere in our columns will be found an interesting review of the legal points involved in the respective rights of cars, vehicles and pedestrians to the public streets. The points brought out by Mr. Fisher, involving the responsibility of the street railway company in cases of collision, are of such importance that they should be brought to the attention of all employers charged with the care of a rapidly moving car in crowded streets. A recent decision in one of the Brooklyn courts bears out the point that drivers of ordinary vehicles have certain rights in the railroad tracks that the motormen are bound to respect. In this case it appears that a Mr. Arnson, on May 30, 1893, was driving an express wagon loaded with furniture upon the track of the Brooklyn City Railroad; that a trolley car, without any warning and at a high rate of speed, ran into the rear of the express wagon with such force as to break the wagon, throwing the plaintiff therefrom and severely injuring him. On the trial of the case, before Judge Osborn and a jury, the counsel for the railroad contended that it was a negligent act for the expressman to drive into the railroad track of a trolley road. On the other hand it was argued that a wagon had a right to use the track, and authorities were cited to support this position. This argument was sustained by the court in its opinion, as follows: "The railroad company had only a paramount right to the use of the street. The plaintiff had a right to drive on the track, or on the side of the track, as suited his convenience. If he drove on the track he was bound to respect the paramount right of the railroad company. In this case the plaintiff looked back to see if a car was near shortly before the collision, and had no warning of the approach of the car, for none was given, according to the testimony of a number of disinterested witnesses. The judgment of \$15,000 is affirmed."

**Mr. Yerkes Buys an Elevated Road.** By far the most important property during the past week was made in Chicago, where the control of the Lake Street Elevated road has passed into the hands of Mr. Yerkes and interests friendly to his enterprises. This gives Mr. Yerkes and his friends complete control over the entire railway system of the north and west sides, with the exception of the Metropolitan Elevated road, now under construction, and which, it will be remembered, will be operated by electricity when completed. These lines include the entire surface systems on both

sides of the city, the Northwestern Elevated railway now under construction and the Lake Street Elevated just purchased. The securities of the Lake Street line have for some time been on the down grade, so that the control, purchased at this time, has not required any great outlay of money. The 51 per cent. of the ten million stock at 20, which it is understood is the average price paid for the controlling interest, required only a little more than one million dollars. It is quite probable that these two elevated lines will form some sort of combination with the Alley Elevated for a down town loop, thus cutting off the down town facilities that had been counted upon for increasing the traffic of the new Metropolitan line. This would certainly cripple the Metropolitan, which, as an invader of Mr. Yerkes' territory, will most assuredly receive severe treatment. It is said that one of the results of the new deal will be the immediate equipment of the Lake Street line with electric power, and the adoption of a system of transfer tickets by which the auxiliary surface lines, now being electrically equipped, will be made to serve as feeders for the elevated. This practically insures the electrical equipment for three separate elevated lines in Chicago, and it is not unlikely that the Alley Elevated, should arrangements be made to use a common terminal, would also abandon its steam equipment and substitute electricity instead.

**The Pullman Strike and Boycott.** The street railways of the country are yet liable to be drawn into the Pullman boycott. Early in the week the press dispatches from Chicago reported that President Debs, of the American Railway Union, had received the following important telegram:

COLUMBUS, O., July 2.—National Association of Street Car Employees stands ready to assist you.  
 W. D. MAHON, President.

A strike was proposed on the Lake Street Elevated in Chicago because it was suspected that the company was using coal that came from non-union mines or was handled by the railroads most active in the fight against the American Railway Union. An electric road's employees, or those of any cable system in any part of the country, might strike for the same reason, or because some of the cars with which it served its patrons were made at the Pullman shops; while the drivers and stablemen on a horse road might rise up in rebellion and refuse to continue work because the company's supply of horse-feed was handled by railroads antagonistic to the rule of Debs and his satellites. If the men are really desirous of giving up their positions they can readily find some excuse for doing so. But we venture to hope that no such action will be taken by street railway employees who have no grievances whatever against the company for which they are working, thus inflicting damage and loss upon people who have not the slightest control over the agreements which Mr. Pullman and his men may choose to make with each other. Debs is now posing as the friend of the workingman, when in reality he is their greatest enemy; for this whole miserable business, while apparently resulting only in loss and inconvenience to the corporations affected by the strike and boycott, ultimately and inevitably shifts a large share of the burden of loss to the shoulders of the laborer himself. The year 1894 will long be remembered for the advance to prominence of two of the worst characters that could possibly menace the business and commercial interests of a peaceful country—Coxey and Debs—both of whom are agitators whose methods have already been tolerated beyond the safe limit. Breaking stone in the penitentiaries, provided for the enemies of good government, has often been prescribed as a remedy for such acts of violence as those contemplated by Debs and his insane supporters, and we hope the Federal authorities, notwithstanding the protests of the anarchist governor of Illinois and the helpless mayor of Chicago, will mete out swift punishment to such flagrant violators of law and order.



### LAKE STREET ELEVATED, CHICAGO, NOW CONTROLLED BY THE YERKES SYNDICATE.

The control of the Lake Street Elevated, Chicago, has at last passed into the hands of Mr. Yerkes and his friends. Ostensibly the purchaser was the Illinois Trust and Savings Bank, although of course it merely acts as agent for the real buyers. The purchasers include Marshall Field and others largely interested in the Northwestern Elevated and the North Side and West Side surface companies. There is much significance in the purchase, and there are other financial operations to follow it of even greater importance. There will be a combination which will probably include the Alley Elevated road, the Northwestern, and the Lake Street, and the combination will be closely identified with the North Side and West Side Street railroad companies. The Lake Street line will be immediately equipped, it is said, with electric motive power, and there is now little probability that the original plans of the Northwestern for boring a hole through business blocks for its own terminal will be carried through. The new deal, according to the Chicago *Tribune*, contemplates such arrangements between the elevated road and the surface company that there will be an interchange of traffic at a single fare, and the cross-town electric lines will be used as feeders for the elevated roads. The whole combination will be on the defensive against the Metropolitan Elevated, and there is little prospect now for a union loop which will take in all companies. It has not yet transpired just what corporate form the new combination will take. It can be said, however, with absolute certainty that the interests of the North Side and West Side surface and the Northwestern and Lake street elevated companies will hereafter be in perfect harmony, and it can be said with almost as much positiveness that the Alley Elevated will be included in this combination. It is of course unlawful for any one of these companies to hold the stock in any or all the others, and so the purchase of the Lake street, it may be set down, has not been made directly by the West Chicago Street Railroad Company. There is a pretty general belief, however, that the money obtained from the sale of the tunnel bonds to the Illinois Trust and Savings Bank recently is the money that went to Lake street stockholders.

Offers have been made and accepted by a number of stockholders to exchange their elevated stock for bonds on the basis of 18 for the stock against 55 for bonds. A number of stockholders accepted this offer. Bonds sold in the market the day of the transfer at 55.

The preparations which the West Chicago Street Railroad Company has been hurrying forward for equipping the horse car line underneath the elevated road with electricity, will now be diverted so that the elevated road itself instead of the horse car line will be speedily equipped. That will be the first important outward manifestation of the deal, and it is likely that trains will be running on the elevated road with electricity for the motive power within 60 or 90 days.

The *Tribune* continues: "The effect of this deal upon the value of the securities of the companies concerned is somewhat problematical. It is, of course, brought out as a bull card for the surface roads. But one needs to take any such theory with several grains of salt. In the first place, it is to be remembered that the total amount of traffic remains the same whether the controlling interest in the stock is owned by Mr. Yerkes and his friends or by other people. It is to be remembered, too, that outside holders of Lake Street stock are now emphatically in the position of minority stockholders, and they are minority stockholders in a corporation in which the interests of the majority in control lie outside of that corporation. Their position then, to say the least, is precarious, and it can hardly be argued with safety that the change will benefit the outside holders of the stock. As to the position of the surface railroad

it may appear at first that it has swallowed a bothersome competitor and also placed itself in a position to better meet the competition of a far stronger competitor. But it is well to figure at what cost this has been accomplished. The controlling interest in the stock has cost the West Side Company, or some one else whom the West Side Company will have to reimburse for all the benefits it receives, \$1,000,000. That means \$50,000 a year at least. The purchasers assume a floating debt which is said to amount to another \$1,000,000 and the bonds outstanding aggregate \$6,500,000. The change creates no new traffic and the traffic that the combined companies now have must still meet the competition of the Metropolitan and be cut down to a greater or less extent. It may be an exceedingly wise business policy for the West Side road to get hold of this competitor, but it does not follow it is a bull card. After all it only illustrates the weakness of the West Side situation since competition has come into it so strongly and offers few arguments in favor of the bulls on the West Side stock."

### ENGINES AND BOILERS FOR THE METROPOLITAN ELEVATED, CHICAGO.

The contract for the electrical equipment of the Metropolitan Elevated Railroad, of Chicago, as was announced in the last issue of the STREET RAILWAY GAZETTE, has been awarded to the General Electric Company. Since last week the contracts for the engine and boiler equipment have been awarded. The Edward P. Allis Company, of Milwaukee, was the successful bidder for the steam engines, and will furnish four engines, two having a maximum capacity of 3,100 H. P. each, and the other two a maximum capacity of 1,500 H. P. each. The General Electric Company's generators will be keyed to the shafts of the engines, which will be of the vertical cross compound condensing type, made after a pattern lately designed by the Allis company for direct-connected work, and of which this will be the first installation. The larger engines will be run at 75 revolutions a minute, and the smaller ones at 100 revolutions. This contract was negotiated and closed by J. B. Allan, business manager of the Chicago office of the Edward P. Allis Company.

The Babcock & Wilcox Company was awarded the contract for furnishing the boiler plant for the new road. This company has contracted to deliver and erect complete a battery of boilers aggregating 3,600 H. P. capacity, one-half of which is to be ready for use by Oct. 1, the remainder to be in readiness by Dec. 1. This is said to be one-third of the plant which is to be ultimately installed. The boilers are all to be provided with Babcock & Wilcox automatic chain grate smokeless furnace attachments. The contract was made by the Chicago office of the company.

### AMUSEMENTS TO INCREASE STREET RAILWAY TRAFFIC.

The street railway company at Concord, N. H., has been making special efforts to induce the public to use its cars. Among other attractions offered are those mentioned in the following extract from a local paper:

#### WILL WALK ON THE WATER.

The management of the street railway has secured for an attraction at Contocook River Park on Friday and Saturday evenings, at 7 P. M., Prof. Oldreive and his great aquatic show, which has astonished and delighted thousands in all parts of the country. In connection with his feats of walking on the water will be given a display of marine day fireworks, especially prepared by the Masten & Wells Fireworks Manufacturing Company of Boston, concluding the exhibit by the bombardment and blowing up of the fort; also the most thrilling feature of all, the naval battle between the water-walker, clad in a suit of armor, and two large full-rigged pirate ships in actual bombardment, hurling torpedoes, shells, etc. Finally the water-walker attacks the ships and blows them to atoms, producing one of the most realistic and startling spectacles of a lifetime. This exhibition will be furnished free to the patrons of the line, the only expense being the cost of transportation to and from the park.

### TROLLEY LINES FOR THE SOUTH SIDE CHICAGO.

The Chicago City Railway Company is about to get the permission it asked for some months ago to transform its auxiliary horse-car lines into overhead electric lines. The general ordinance which the aldermanic committee recommends covers the following routes:

Twenty-sixth, 31st, 39th, 51st, 63rd, 79th streets, Archer avenue from the river to 38th street, thence on 38th street to the terminus; 43d street from the Illinois Central tracks to State street, thence to Root street and thence to the terminus; Halsted street, Wentworth avenue and Ashland avenue from Archer avenue to the terminus; Hanover, Butler and Wallace streets, where tracks are now laid; State street from 63d to Vincennes avenue, thence on Vincennes avenue to the terminus. The special ordinances cover 63d street from Cottage Grove avenue to State street; Wallace street from 39th to Root; Halsted street from 69th to Summit, thence on Summit to 87th; Center avenue from 47th to 63d; also permission to lay a conduit in 21st street from State street to Cottage Grove avenue.

The ordinances provide for the setting of poles as directed by city authorities; for a deposit for restoring streets torn up; for a ten-year franchise; for a metallic return circuit, and that \$100,000 is to be paid for the franchises to be used in maintaining electric lights on streets used by the company, and for the payment of \$150,000 in the event of the elevation of the tracks of the Lake Shore and Rock Island roads. Permission is given to use an underground system and also for the use of any motive power, providing it be practically noiseless and is first approved by the mayor and commissioners of public works.

### ELECTRIC MAIL CARS IN BROOKLYN.

The mail service on the Atlantic Avenue Railroad Company's lines in Brooklyn, will require at the outset two special cars. Until these can be completed the mail sacks will be carried on the regular cars. Three daily trips each way will be made between the main office and Coney Island over the Fifth avenue line of the Atlantic avenue railroad. Mail will be delivered and collected on each trip at the following stations and offices: Stations C and V, West Brooklyn, Blythebourne, Van Pelt Manor, Bath Beach, Bensonhurst, Gravesend Beach and Coney Island. Connection by messenger will also be made at Thirty-sixth street for the Bay Ridge postoffice. A quicker service is guaranteed and the suburban offices named come in closer touch with the main office.

The new mail car will be simply the regular closed car slightly altered. A partition will divide the interior of the car in the middle. One section will be fitted up as a mail car, while the other will be left as a smoker. A postal clerk will keep himself busy sorting the mail during the entire trip, so that when he arrives at the main office the mail he has collected will be all ready to be sent out. Tracks will be laid so that the mail cars can be run into the annex of the post office.

### SOME MILWAUKEE CITIZENS WANT METAL TICKETS.

The residents of a certain section of the city of Milwaukee recently held an indignation meeting to protest against the use of pasteboard tickets. A committee reported the following resolutions, which were unanimously adopted:

WHEREAS, The Milwaukee Street Railway Company is showing gross impartiality among its patrons, selling clean, metal tickets on some lines and only, dirty, time-worn pasteboard ones on other lines, which high medical authorities declare capable of containing and imparting contagion, with small-pox rampant in the city; therefore, RESOLVED, That a committee be appointed by the chairman of this meeting, to see the aldermen of the First and Eighteenth wards and request them to secure action by the common council to compel the street railway company to discard the pasteboard, disease-breeding tickets and supply all conductors with metal tickets.

The chairman promised to appoint and notify the committee, see that it performed its duty and call another meeting in a few days at which it will report. The Milwaukee *News* says that among those who thus protested against what they considered such a great abuse were: "Captain Daileyski, Thomas Prescottski, the grocer; John Hanfoski, the blacksmith; Herman Baernski, the clothier; Mr. Wattenski, the crocker dealer; William Schromkienski, the livery man;



John Sennoski, groceryman; James Kinselenski, the coal dealer; Charles Hechtowsky, Joe Parkenski, Mike McGrawsky and many others."

#### HOW THE MANHATTAN ELEVATED HAS DEVELOPED PROPERTY.

The illustrations on this page are excellent evidence of the extent of the development which follows the building of any rapid transit line in a large and growing city. The views need no explanation, as they tell their own story. We have no doubt that views of the same character will be obtainable in five or ten years along the lines of the new elevated roads in Chicago as the development there will be even more rapid than it has been in New York City.

#### RESULTS OF ELECTROLYSIS IN ST. JOSEPH, MO.

City Electrical Inspector Stewart, of St. Joseph, Mo., has been engaged in investigating the electrolysis of buried pipes and recently made the following statement:

"Since the introduction of the use of electricity for propelling street cars, it has been observed that all metal pipes near such lines of road and their generating stations have been subject to rapid disintegration. Lead covered electric cables, gas pipes and water pipes, but a few weeks laid, have been almost entirely destroyed. This has become a

"Electricity at all times seeks to establish an equilibrium, or seeks its level and takes the course of least resistance to accomplish the result. It also divides in direct proportion to the resistance offered to its passage. When the track becomes a poor conductor, then the current is forced to take another path for its return; consequently it takes the earth. The earth would be a perfect return if the rails were in perfect electrical connection with it to a point below the surface, where there is constant moisture. Dry earth is a bad conductor; and consequently offers resistance to the passage of the current. In street railway practice the tracks are most all laid in pavements of granite, wood, asphalt and concrete, brick, etc. all of which are imperfect conductors of electricity; but being in direct connection with the earth become to a certain extent fair conductors. This is especially the case when the track, with its bonding, becomes a poorer conductor than the surrounding pavement.

"When the track ceases to be a perfect return for the current then it takes any and all conductors for its path to establish an equilibrium, passing always from the poor to the better conductor, seeking its level through paths of lowest resistance. Therefore, when the track fails to offer a perfect return, the current is compelled to take such conductors as offer the least resistance, which in the case under consideration, is the earth, together with the metal pipes of water and gas companies and the lead covered cables of telegraph, telephone and other electric companies.

"When the conditions mentioned above exist, the pipes and cables along the path of the current become subject to rapid corrosion. The cause of this corrosive action is known as electrolysis, which defined is chemical decomposition effected

gas pipes and the earth a difference of potential ranging from 25 to 50 volts, E. M. F. Measurements from gas pipes to water pipes show the same difference of potential as between the earth and the pipes. In two instances the difference of potential between the water and gas pipes ran as high as 40 volts, and a current of 51 amperes. An electrolytic bath of a weak solution of sulphate copper was placed in this current. The direction of the current was from the gas pipe to the water pipe. Copper was deposited at the rate of one-half ounce per hour. Surface exposed to electrolyte,  $\frac{1}{4}$  inch by  $1\frac{1}{2}$  inches. A 60d. spike in a bath of pure water was entirely destroyed in about six hours. Pieces of pipe buried in the vicinity were vigorously attacked within a few hours; and at the end of 10 days showed a very decided electrolytic action. These pieces of pipe were afterward buried in the earth where there was no indication of current. At the end of 60 days they were examined, when it was found that the action had continued to a considerable extent. This may be explained as follows: An indispensable condition of electrolysis is fluidity or moisture, and when this liquid or moisture is decomposed by electricity, its constituents are disengaged solely at the poles or electrodes; that is, where the current enters and leaves the liquid. The soluble salts in the moisture surrounding the pipes are decomposed and deposited upon them. These alkaline or acid salts continue their corrosive action although no electric current is present.

"An impression prevails that where the potential difference between the surrounding earth and pipes is low, that the electrolytic action is correspondingly small. This is a mistaken idea. It has been found that during the investigations and experiments referred to above that the destructive



TWO VIEWS ON THE NINTH AVENUE ELEVATED, NEW YORK, TAKEN IN 1879 AND 1889, LOOKING NORTH FROM 89TH STREET.

source of considerable expense and great annoyance to the companies owning such pipes and cables. The parties suffering from this trouble have very naturally and justly accredited the cause to the railway companies near whose lines of track the pipes are laid. The railway companies have, as a rule, stoutly denied the charge. But the matter has become so serious that the railway companies have been compelled to take cognizance of the fact and admit themselves to be the culprits.

"The prevailing system used by railways is known as the single trolley system. The current is taken by the motors on the cars from the trolley and returned by way of the rails and earth. One pole—generally the positive—of the dynamo at the generating station is connected with the trolley and the other pole is connected with the track and earth. This gives the current two paths for return, one by the track and the other by the earth. The rails at their joints are supposed to be bonded or bridged by a wire connecting one rail with the other and perfectly riveted in each. These bonds must offer practically no resistance to the passage of the current. In other words, they must be such conductors and of sufficient cross-section to offer no more resistance than the rails which they bond. So long as these bonds remain perfect and unbroken the track offers a perfect return for the current; and should the dynamo at the generating station be disconnected from the earth, the current will be entirely through the track and none diverted to the earth. But, unfortunately, these perfect conditions do not always exist. The constant passing of cars over the joints in time loosens and breaks more or less of the bonds, after which the joint offers a high resistance to the passage of the current.

by means of an electric current. According to Faraday, 'the amount of chemical action in any given time is equal in all parts of the circuit.' All substances which are susceptible of direct decomposition by the current are called electrolytes. The moisture of the earth is susceptible of direct decomposition: therefore, the earth is an electrolyte; the pipes and other metallic substances buried or in direct connection with it, the anodes and cathodes.

"The conductor leading from the positive terminal of the dynamo is called the anode, and that from the negative terminal, the cathode. The metal which is attacked or becomes dissolved is always the anode, upon which oxygen, chlorine, iodine, etc., are evolved. The inactive or passive metal is the cathode, and upon it hydrogen and the metals are evolved in all cases of electrolytic action. It has been observed that the corrosion of pipes is much greater in some particular localities than in others. This is on account of the nature of the soil, there being more alkali or acid in certain localities, offers less resistance to the current, and at the same time facilitates the chemical action. Theoretically, the current generated at the power station leaves the dynamo by the positive pole, to the trolley, thence to the motor on the car and to the track, which is electrically connected to the negative pole of the dynamo. If all these conditions were perfect, this would be the actual result; but the electrical continuity of the track becomes broken at joints, switches, etc., and the current must take the earth and the conductors buried therein for its return. From a series of observations, tests and measurements carried on for a period of over three years in this city it has been found that there exists between water and

corrosive action was quite as bad in localities where the potential difference was not above .5 of a volt, as where there was an indication of several volts E. M. F. The action depends entirely upon the volume of current. It is also found that the direction of the current is not uniformly from the water pipes to the gas pipes or from the gas pipes to water pipes, the direction changing in some instances two or three times within a distance of 100 feet. There has also been observed a difference of potential between different points of the same pipe.

"The remedies proposed by different railway managers are not numerous. Some of those offered are: 1. The more perfect bonding of the track. 2. Electrically connecting all pipes with the track and with each other. 3. The sinking of rods in the earth to the depth of eight or ten feet at intervals of from 30 to 50 feet and electrically connecting them to the track. The first one would probably come nearer to the desired result than either of the other two, provided the generator was disconnected from the earth and connected with the track only. The second remedy is impractical for several reasons, the principal one of which is that the electrical conductivity of the pipes is no better than the track with its broken bonds. A number of specimens can be shown where the pipes have been eaten away on each side of couplings. The only reasonable explanation that can be given for this is that the lead, oil and cements used with the coupling forms an insulator, or at least introduces a point of high resistance in the circuit and the current is diverted to the earth around the coupling. The third remedy has nothing to commend it, as the earth is used as the return."



## ELECTRIC RAILWAY MOTORS : THEIR CONSTRUCTION AND OPERATION.

BY NELSON W. PERRY.

(Twenty-sixth Article.)

### INSTRUCTIONS TO INSPECTORS AND SUPERINTENDENTS.

Upon you depends, more than upon any one else, the success or failure of any electrical system that is placed in your hands, provided, of course, the system in question is a fairly good one. Cases are not unknown where a given electric system has proved a failure under one superintendent and made to work satisfactorily in every way by his successor. The reverse is also often the case; that a success has been changed to failure by the transfer of the management from the hands of a competent man to those of one unqualified for this most important position. The first requisite in an inspector or superintendent is that he shall be familiar with every detail of the system with which his cars are equipped. If it is important that the motorman shall be familiar with his apparatus, it is much more important that his superiors, from whom he receives instruction, should know it also and in a broader sense. You must remember that the motorman is largely what you make him. He comes to you, perhaps, an untrained hand; perhaps, what is still worse, he has had instruction on another line by a superintendent who was incompetent or careless, and has thereby acquired habits which he must first unlearn.

You must realize that as you are responsible to your company for the proper working of the road, so you must hold those under you responsibility to yourself. Your reputation and success are therefore largely dependent upon the fidelity and ability of those whose training is in your care. Appreciating this, you will first train yourself. Procure from the company whose apparatus you are using full instructions as to the handling of their machinery, together with blueprints showing the wiring and connections of each individual circuit connected with the electrical equipment of your system. If not an electrician yourself you should call in some one who is, and who can and will go over with you every detail of your system, and explain the whys and wherefores of everything connected with your plant. Try to understand everything intelligently, and then try your hand at imparting this knowledge to the motormen in whose hands your reputation and success so largely lies. It is the experience of those who have tried it that the best way to learn a thing accurately oneself is by trying to teach others what you partly know yourself. This is true in mathematics, it is true in science in general, and it is true in the car stables, and the superintendent who tries most to impart knowledge to those under him will in a short while outstrip in knowledge him who perhaps at first knew more, but who through a mistaken idea of the dignity or importance of his position has kept his knowledge to himself.

The various means by which he himself has gained his knowledge should as far as possible be placed at the disposal of his employees, and they should be encouraged in every way to avail themselves of them to the fullest extent. In fact, a motorman who will not avail himself of such opportunities when offered is an unsafe man to trust with a car. On some roads the plan has been successfully adopted of furnishing each motorman a diagram of the connections that are being made as the handle of the controlling lever is moved from point to point. On this diagram are also given a few of the most important instructions, and these instructions are supplemented by verbal ones from time to time as occasion requires. Some roads also provide a reading-room for their employees, where a few standard works of reference on electrical subjects, and the street railway and electrical papers, are kept on file. This is an excellent plan, and another one is to hang upon the wall of the carhouse or other convenient place large diagrams of the motor connections and wiring circuits of the car. If equipments of more than one system of control or make are used on the line, each

should be similarly represented, so that the differences will be apparent to those who are to manage them. These diagrams might with profit be drawn to half size, or even larger, and in order that the different circuits may be the more readily distinguishable, they should be designated by different colors and the various parts of the equipment lettered for ready reference. These should be hung where the motormen are most apt to congregate when not on duty on their cars, so that they may discuss them at their leisure.

A spirit of emulation among the motormen as to the best care of the equipment of their cars and fulfillment of schedule time, should be fostered, and to this end a motorman should be kept on the same car as much as possible. That car should, as far as possible, be considered his own, and he should be held responsible for its record. Nothing is so subversive of effective service as the daily change of assignment of cars. No motorman can be held responsible for the monthly record of a car which has been handled by a dozen others beside himself, nor can he take a personal pride in its condition at the end of the month under such conditions.

Mr. P. P. Sullivan, of the Lowell and Suburban Street Railway Company, in speaking on this subject at a monthly meeting of the Massachusetts Street Railway Association, said: "In addition to creating an interest among the men, and in fact to help create such interest, we have prizes for the motormen whose cars have had the best records in point of expense, delays, etc., and in this manner we are also enabled to find out from the regular men who the best relief men are. Motormen are given printed forms which enable them to call the attention of the night foreman to certain things which may appear wrong, and such form is countersigned by such foreman and forwarded to the superintendent. All loss of mileage or taking off of cars is reported directly to the manager's desk, who exacts an accounting for the cause from the superintendent. By following the above methods we have been enabled to adopt a standard of car mile expenses, and the different foremen are given to understand that if the expenses are kept below such a figure they may expect a present at the end of the fiscal year."

He further says: "We assume that a man before taking charge of a car is absolutely ignorant, has no interest in the apparatus, and we aim to teach him, we endeavor to excite his interest and curiosity, so that he will look out for his motors, inquire for certain motors, create a rivalry so that a man will boast of his record; and we have such instances.

"In the carhouse skilled mechanics are in charge, who are held responsible for results; subdivision of duties and labors in relation to parts of machinery as far as practicable is practiced, so as to more readily locate responsibility. The object is that when a car leaves the shop newly equipped, such equipment shall be thoroughly done, through the best material and workmanship, and after that time a thorough inspection. Motors, trucks and cars are numbered, and an official record is then begun, and date and description of any repairs made are kept and comparisons formed and causes sought."

The ideas above suggested will readily commend themselves to every one who is not penny wise and pound foolish, for experience has already amply demonstrated that good system, good material, good workmanship and skillful employees who feel a genuine interest in their work are none too good for the best results.

But with all this, there will be failure if the cars are turned over to the motorman in anything but the best condition. It must be understood that the motorman is usually *not* a mechanic and he is *not* an electrician, and that if he were either or both he would have but scant facilities for the exercise of his talents while operating his car on the road. He will have done his whole duty if he handles intelligently what you give him and reports all troubles as soon as they arise.

In the training of motormen it is the practice on

some roads to put them first in the machine and repair shops, so that by this preliminary experience they may get an insight into the anatomy of the car equipment and the adjustment of parts to each other. This is certainly an excellent plan where practicable, and another one which is always feasible, but by far too seldom practiced, is to hold what the doctors would call "clinics" over disabled or diseased motors whenever such are brought in. For instance, if a motor is sent to the repair shop for sparking on account of any of the causes before mentioned, as many of the employees as it is possible to gather together should be called to witness the commutator spark while in action and be told the specific cause thereof, and then they should be shown, in the repair shop, that the diagnosis is correct and how the trouble is remedied. If a motorman has once seen the sparking due to an open coil, he will forever after recognize it. And so with the other troubles—an object lesson such as the one suggested will be worth more than all the verbal instruction you can give.

Regular inspection should be made every day, if possible. It does not pay to allow cars to run until they absolutely refuse to run any longer. In no case does the old adage "A stitch in time save nine" apply with more force than in this. I cannot, therefore, insist too strongly that repairs be made just as soon as it is discovered that they are required. If the motorman discover trouble he should fix it *if he can*; if he can't fix it he should run the car into the stables at the first opportunity and report. *In no case should he start out with a car that is not in condition, and it is the especial business of the inspector to see that he does not.*

One of the leading manufacturers of street car motors, in his instructions to inspectors, says: "Let us impress upon you the importance of keeping a careful watch of all nuts, bolts, screws and all wire connections, to see that everything is screwed up tight."

Daily examinations of connections of motors, trolleys, lightning arresters, fuseblocks, etc., should be made, and especial attention should be directed to the connection between the wire from the interior of the car and the trolley base to see that it is in good condition.

In addition to the daily inspection, at least once a month the car should be run over the pit, and the equipment given a most thorough overhauling.

For testing out faults the magneto bell is an instrument of great general utility, and the managers of electric roads will save their inspectors much time and trouble by providing one or more for their use.

### REORGANIZATION OF THE SCHUYLKILL ELECTRIC RAILWAY COMPANY.

The Car Equipment Company, of Philadelphia, has purchased the controlling interest of the Schuylkill Electric Railway Company, of Pottsville, Pa., and it is their intention to extend the line about twenty-five miles in and around Pottsville, connecting St. Clair, Middleport, Tremont, Schuylkill Haven and other towns near by, with Pottsville.

Jesse Newlin and Robert Alliston have retired from the old board of Directors and W. A. Barritt, Jr., and Charles H. Barritt, president and treasurer respectively, of the Car Equipment Company, of Philadelphia, have been elected to fill the vacancies. J. B. Stuart, of Philadelphia, has been appointed electrician and general superintendent and his success in the construction of the Pottstown, Camden and Gloucester roads will assure a perfect system for the roads at Pottsville.

The Schuylkill Electric Railway Company has a capital stock of of \$150,000, which was raised by popular subscription from the residents of Pottsville, and was fully paid. The road was originally built out of the capital stock, and the improvements or betterments from time to time were contracted for out of issue of bonds. The road has a bond indebtedness of \$95,000. It can readily be seen that there is a sound financial basis to work



from in the reorganization and improvement of the road.

The Schuylkill electric railway proper consists of 10 miles of road with 18 car equipments, about half of which are new and the remainder consisting of short apparatus which will be no doubt replaced in the very near future with more modern equipment. New feeder wire will be put in on the entire system to supply sufficient and additional power for the extra car equipment that will be

to any convenient place, the wagon carrying as part of its equipment steel pins to be driven into the ground, when no other efficient point of attachment for the guys can be found.

The cable road is patrolled by a force of inspectors. Every few blocks along the line, close to the track, is a trap covering a signal station. From this station the inspector signals for the wagon in case it is required, calling it either up or down town. On receipt of the signal, the wagon pro-

five equipments of these motors have been recently put in service on the lines of the Cincinnati Street Railway Company. The Card Company has also recently rebuilt or repaired a number of motors of the waterproof type, which went through the fire in the burning of the car barns of the Cincinnati Street Railway Company last winter.

**COMBINED SWITCH AND RHEOSTAT.**

In installing motors, the switch and rheostat being generally placed side by side, and being entirely separate from each other, it often happens that through haste or carelessness the current is thrown on by the switch before the resistance is cut in by the rheostat, and as a consequence the motor armature is burned out or the fuses blown.

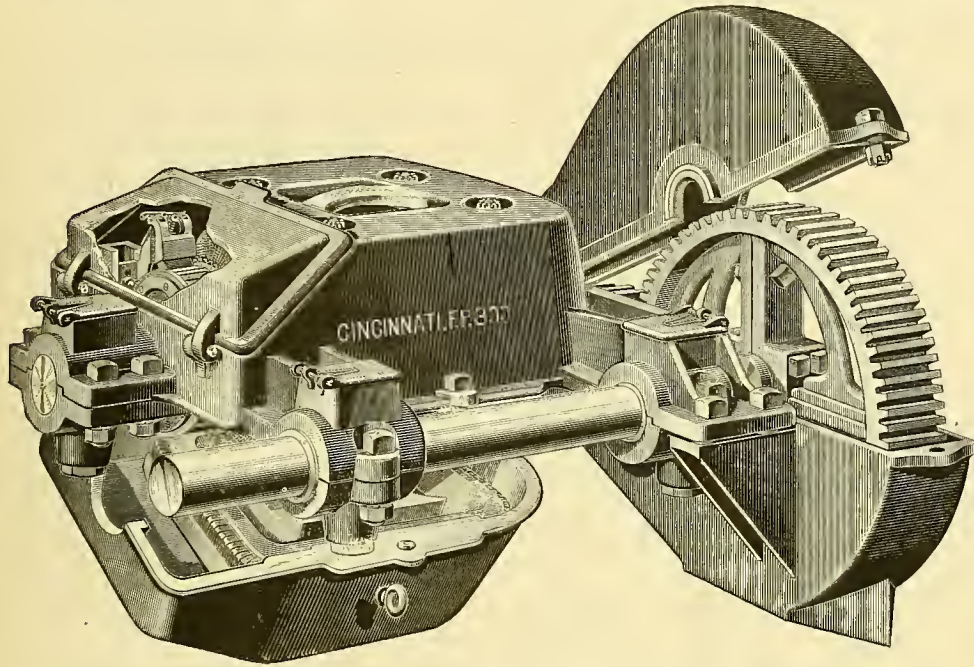
The W. S. Hill Electric Company, of Boston, Mass., has placed on the market a patent self-locking starting switch, in which the switch and rheostat are combined in such a manner that the switch cannot be thrown in without first putting in all of the resistance. This avoids any possible chance for an accident of the kind mentioned. It is said that the price is less than that of a switch and rheostat separate, thus offering the inducement of economy, as well as saving the risk of accident to the motor by its use. The device is shown in the accompanying illustration.

**ELECTRIC RAILWAY CONDUIT SYSTEMS.—II.**

BY LIEUT. F. JARVIS PATTEN.

Ingenious and varied have been the attempts made by different inventors to keep the feed wire absolutely covered throughout its entire length in a tube, thus insuring for it perfect insulation, while at the same time the trolley wheel, by operating some mechanical device, could have continuous contact with the feed wire as the car moved along. These conditions seem absolutely contradictory, yet such systems are comparatively simple, as a few examples will show.

Figs. 4 and 5 give the general idea of one of the simplest of this sort. A continuous trough is laid along the middle of the track, of which the illustrations represent a cross-section. At the bottom of the trough is the main conductor or feeder C. Above it the trough is filled to the road level with some non-conducting but flexible material, which has holes through it at short intervals, and these have metal plugs or bolts in them which are nor-



NEW RAILWAY MOTOR OF THE CARD ELECTRIC MOTOR AND DYNAMO COMPANY.

added, and a new car barn will be built at Palo Alto. The entire system will be overhauled and will be put in a first-class position as soon as possible.

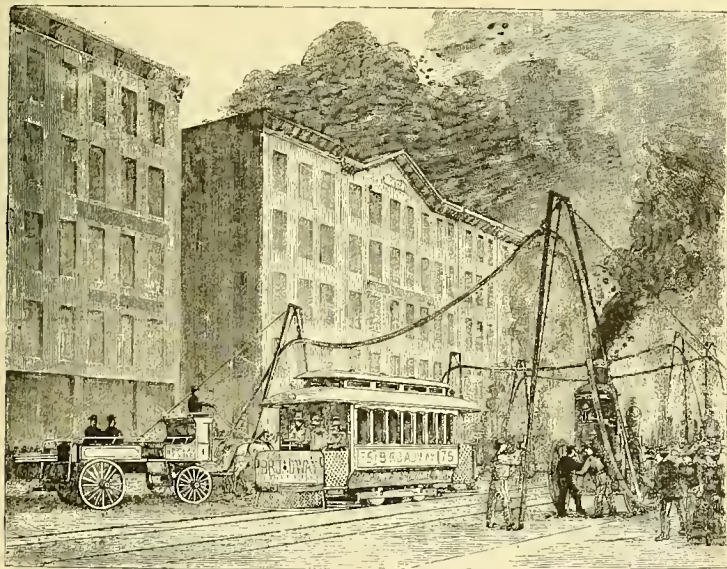
**HOW HOSE IS CARRIED ACROSS TRACKS IN NEW YORK.**

The most characteristic service of the patrol wagons of the Broadway line in New York is that which they perform at fires. Each wagon carries eight pairs of shear legs, 20 feet high, with corresponding tackle, straps and guys. On reaching the scene of a fire, the shear legs are set up on each

ceeds up or down the line as ordered, the driver watching as he goes until he reaches the place where his services are needed. The cut is reproduced from the *Scientific American*.

**NEW RAILWAY MOTOR OF THE CARD ELECTRIC MOTOR AND DYNAMO COMPANY.**

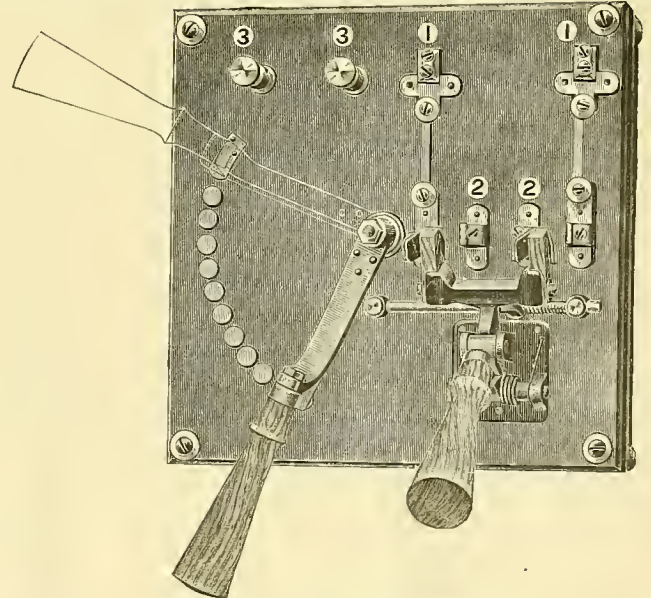
Recently this company has brought out a railway motor, which is modeled after the design of the General Electric Company's 800 motor, but differs from it in that the lower half of the frame is hinged, and can be swung down when it is neces-



CARRYING HOSE OVER BROADWAY CARS.

side of the street, and guyed so as to lean slightly forward or toward the center of the street. Straps are put around the lines of hose which have to be carried across the street, the falls are attached and the hose is hoisted as shown, leaving the way clear for the cars. It is obvious that, owing to the grips, no system of bridging the tracks is applicable to a cable road. The guys are fastened

sary to remove the armature. The armature shaft is held in place by a collar which, when unbolted, allows the armature to be let down. This motor is also provided with self-oiling bearings which are longer than those employed in the G. E. 800 machine, and the motors are also equipped with a steel shaft, while the cover is of a somewhat different pattern from the original type. Twenty-

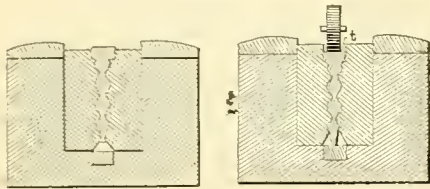


HILL STARTING SWITCH.

mally not in contact with the conductor, but can be forced down by pressure until contact is made. The trolley wheel exercising this pressure on the plugs as it rolls over them makes the necessary contact with the main. The flexible character of the material in the trough or springs suitably arranged removes the plugs from contact when the trolley has passed them. Another ingenious sys-



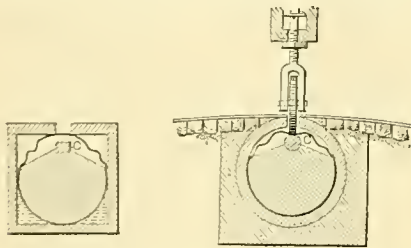
tem of the same kind is shown in Figs. 6 and 7. A continuous thin metallic tube *A* is partly filled with some non-conducting substance *B* which practically forms an inclosed non-conducting rod which, as shown in cross-section view, fills the metallic tube nearly to the top. To the upper surface of this non-conducting rod the main conductor:



Figs. 4 and 5.

*C* is secured which is still some little distance from the upper side of its inclosing metal tube, the upper half of which is made flexible, so that it can be forced downward under pressure, which, as before, the moving trolley wheel supplies. The entire contrivance is embedded in a suitable trough along the roadway. A serious objection to this system, simple as it may seem, is at once apparent: dirt, gravel and stones falling into the slot would soon hold the metal tube down in permanent contact with the conducting main.

Another inventor carries out the same general idea with the conductor above ground, thus avoiding the necessity of any roadway conduit. His plan is shown in Figs. 8 and 9, which picture the cross-section of a peculiarly shaped rail for one side of the track. It is made with a deep recess in the outside face in which the feeder main *B* is placed



Figs. 6 and 7.

in a box of non-conducting material that surrounds it on three sides. On the outside a flexible covering that can be forced inward under pressure closes the box containing the conductor, and contact pins placed at short intervals pass through the flexible outer side of the box when the trolley presses it inward, thus making connection with the feeder main. Another plan shown in Fig. 10 is one of the best of this class, most of which, though apparently operative and simple enough on paper, have some vital defect that renders their real value doubtful. In Fig. 10 we find the same general scheme for protecting the conductor and for mak-

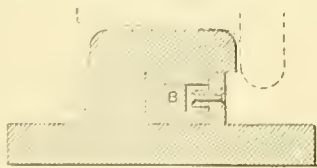


Fig. 8.

ing contact therewith, but in this instance the whole apparatus is placed in a shallow conduit under ground. There are quite a variety of systems of this general description, but the main idea or principle is the same in all.

Two systems of this class, however, stand apart for their simplicity and ingenuity. They are shown in Figs. 11 and 12, the latter having been put to a practical test on a track in San Francisco, where it worked well. The one shown in Fig. 11 has not yet been tried, but deserves notice for its novelty. To one side of the slot in a conduit are secured the wooden strips *C, C'*, shown in the figure in cross-section. They hold firmly the main feeder *B*, a copper rod which is completely inclosed in a flexible rubber tube *I*, similar to a pneumatic bicycle tire. This insulates the conductor in the most perfect manner, preventing water and moisture

from getting at it. On the under side of this tube at intervals of a few inches metallic buttons *F* are tightly riveted into the rubber tube along its entire length, while the tube itself is protected by a metallic shield *E*, so that water or snow falling through the conduit slot is prevented from reaching any conducting parts. The trolley wheel runs along the under side of the rubber tube on the metallic buttons, and, pressing them up against the conductor *B*, takes the current from them. When the trolley has passed a certain point the tube and buttons fall away from the conductor by their own weight. The system tried in San Francisco, Fig. 12, is very similar to the last. The main conductor is secured to the top of an inverted trough or box *E*, which is simply a creosoted wooden beam hollowed out on the under side, making a recess for

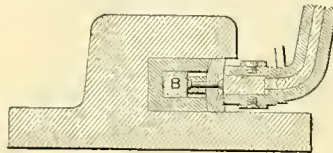


Fig. 9.

the feeder main. Across the edges of this trough a web of flexible substance—rubber or the like—is stretched and securely fastened to the sides of the trough, thus inclosing the feeder main completely. Contact-making buttons are placed in the web, and the trolley running on these forces them into contact with the main, as in the previous case described.

We have now to consider an entirely different type of conduit systems to which the term recent

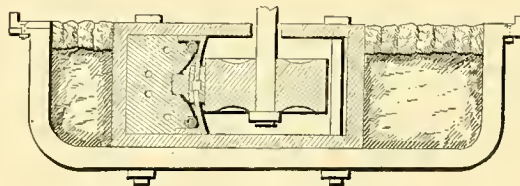


Fig. 10.

might appropriately be applied, not so much because they are particularly new as compared with those heretofore described, but because the latest and practical attempts at a solution of the conduit problem are of the type referred to and it now seems very probable that the coming electric conduit will be of this order.

In the different systems thus far considered there has always been a continuous feeder main or supply conductor extending from one end of the line to the other, and whether insulated or not the current was taken directly from it. Recent systems are all designed on the plan of using a sectional service conductor. That is, there is a continuous

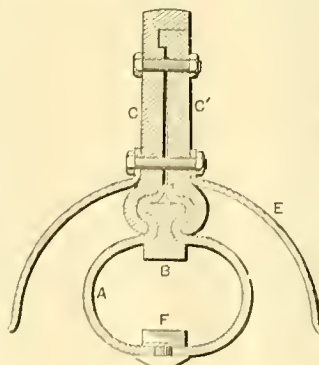


Fig. 11.

insulated feeder main the whole length of the track, then, either on the surface of the roadway or in the conduit, there is a succession of short disconnected rails or rods known as service conductors. They are insulated from each other, and normally so from the feeder main being connected to the latter only when actually supplying current to a car. The trolley runs along the service con-

ductors, and by the operation of electric mechanical devices each successive section of service conductor is placed in connection with the feeder main while a car is passing over it, and is again switched out of connection when the car has passed beyond it.

It may be mentioned here in passing that Messrs. Ayrton and Perry, of England, were first to take abroad U. S. patent on such a system, and

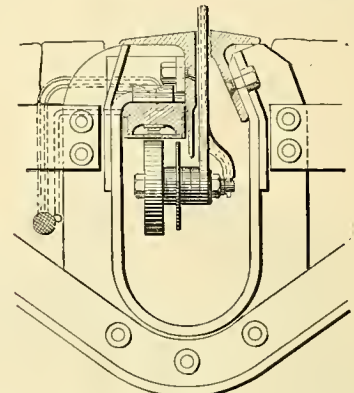


Fig. 12.

their claims still subordinate all systems where, in sectional service conductors are used. Yet, although such systems were described as early as 1881 they were not given serious consideration until within a few years. The Ayrton and Perry patent in England bears date of February, 1881, consequently the U. S. patent of 1885 will expire in February, 1895, so that these systems can only be held in check by this broad patent for about eight months more.

The most recent type of the sectional service

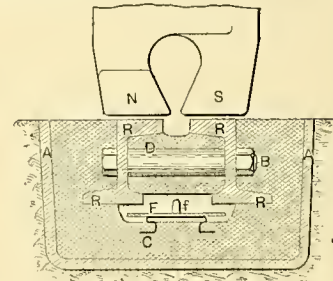


Fig. 14.

conductor and that which will doubtless supersede all others at an early day is what is popularly known as the "middle rail," or "third-rail system." It presents many advantages. There is no slot and no open conduit whatever, so they are sometimes described as closed conduit systems. The general plan is about as follows: A feeder main is buried in a closed trough or conduit beneath the roadway, generally along the middle of the track. Above the conduit and exposed in the roadway is the so-called middle rail or service rails, which are disconnected rails 10 to 20 ft. long,

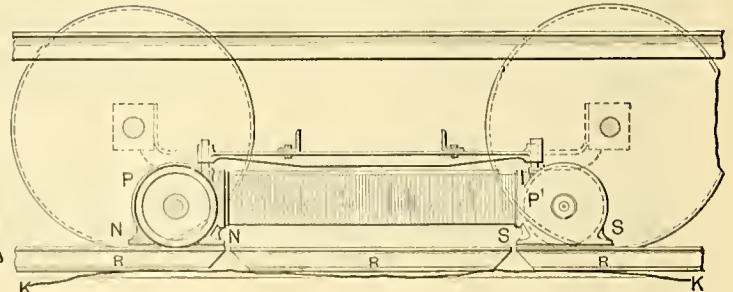


Fig. 13.

on which the trolley runs. They are not ordinarily in connection with the feeder main, but when a car approaches a section of such rail it is automatically connected to the feeder, and when the car has passed it is immediately cut out again.

One of the simplest and most ingenious of these systems is the "Lineff," which was tried in London some years ago with pronounced success. It was



the first system of its class patented in this country, and has since found many imitators, though none of them has yet been put in operation this side of the Atlantic.

The Lineff system is shown in Figs. 13 and 14. Swung to the car truck between the wheels is a long electromagnet *NS*, its polar ends sliding along just above the middle rails; this magnet also carries the trolley wheels *P, P'*, which take up the current. There is one at each end, as there are always two live middle rails.

The magnet is strongly energized by a coil extending its entire length, supplied by the working current. The middle rails *R, R* are laid in short sections, are of iron, and become magnetized under the ends of the traveling car magnet. In this system there are two middle rails, separated by a considerable space, and the north pole of the magnet runs over one of these, and the south pole (at the other end) over the other. Each rail, therefore, immediately under the magnet pole, becomes magnetized, and is practically a continuation of the magnet pole downward into the trough beneath.

In a shallow trough beneath the middle rails is a long continuous strip of sheet iron *F*, Fig. 14, and *KK*, Fig. 13. This strip of iron normally lies down flat throughout its entire length on the main conductor, which is bare and secured to the bottom of the trough. But wherever a car magnet stands on the track, there the iron strip *KK*, Fig. 13, and *F*, Fig. 14, is lifted up by the magnetism of the rails and held firmly in contact with them, thus connecting always two service rails under the car to the feeder main. This peculiar action is worthy of notice. Imagine the car in motion, the flexible iron strip moves up like the back of a snake with a creeping motion, the important feature of which is that the contact is never broken, no make and break, no taking hold and letting go, so that there cannot possibly be any sparking, a feature of the very highest importance, which will be referred to later. An interesting and very recent system is that of G. W. von Siemens, of Siemens & Co., the promoters of the Budapest line, and shows what advance has been made since the time of the first conduit road built.

(To be continued.)

#### THE LAW OF NEGLIGENCE AS APPLIED TO ELECTRIC STREET CAR COLLISIONS.

BY R. D. FISHER.

The marvelous development of rapid surface transportation and the almost universal appropriation of the streets of the American cities and the public roads leading to the numerous suburbs and resorts by the various electric systems have resulted in the springing up of a very large and increasing class of suits for personal damages, and in the development of a new body of the law, which has been formed by the application of old rules to the new conditions, and the revolution of some relatively modern doctrines applicable to the use of streets and highways. The roads have always been the king's highway, along which all persons had an equal right to pass. The learning and judicial wisdom and patience that have been expended in the settlement of the rights of the pedestrian and the driver of a vehicle, public or private, or the rights of respective vehicles, their relative duties and obligations when passing or meeting upon the highway, have developed a most interesting branch of the law. The difference between the rights of steam railways and street railways is marked and unquestioned, although in many respects somewhat similar. One of the distinguishing differences is in the exclusiveness of the right of a steam railway company to occupy its track as against all other persons or modes of locomotion. The street railway, however, occupies the surface of the highway subject to the common use, not only of the balance of the road but also of that part covered with the tracks, by either the pedestrian or the driver of a vehicle. The authorities thus far examined are not entirely agreed in their description of the easement en-

joyed by the transportation company. It is always conceded not to be exclusive, but is generally held to be superior. Whether or not this is an accurate description of their right, their privilege is undoubtedly a preferential one, as against all other modes of locomotion along that part of the highway occupied by the track. This concession is absolutely essential to the preservation of the rights conferred by their franchise, the development of the objects for which they were organized, and for the great benefit of a very large proportion of the population of the cities which must make use of it for the purposes of business and travel. It is evident, therefore, from the numerous late decisions on the subject of collisions, that the preferential use of the lines of their track by cable and electric companies closely approximates the right of exclusive use granted or conceded to steam railways. All courts agree, however, that there still remains with the pedestrian and the users of vehicles and of horses the old right which they always enjoyed—to use all the king's highway at their pleasure and for their convenience. It is only expected and insisted that they shall yield the track to the electric company, and shall keep out of the way of the cars, so far as may be possible, barring the accidents of sudden emergency. None of the rules which have been the outgrowth of the litigation springing from accidents happening along steam railways has been applied, save in a limited manner, to these rapid modes of transit by electricity. It is quite universally adjudged that, before one can cross a steam railway, he is bound to stop, look and listen, to discover the approach of a train, before he shall be permitted to cross the track and escape the responsibility of his own negligence if he fails in any of these requirements. While, in a sense, and a very limited one at that, this rule has been applied to the acts of the pedestrian or the driver of a vehicle in crossing the transportation company's line, the difference between the steam railway and the electric or cable line must be borne in mind. The absence of the exclusive right to the occupancy of the streets compels the distinction. This is a matter of education for motormen and other drivers of vehicles that the law impliedly imposes upon them. The officers and managers of street railway lines should instruct those in charge of their trains that the grant of a franchise to the company in no manner takes away from other users of the highway their right to its entire occupation, save that their right to enjoy is limited by the contractual right of the transportation company, and its preferential privilege in the use of that part of the road occupied by the tracks. If in these modern days of swift activity the pedestrian or the driver of a vehicle were compelled to stop, look and listen, before he crossed the tracks, it would impose an unnecessary and unusual burden and restriction upon his common-law right to use the king's highway, which still remains with him. But notwithstanding this exception, neither the pedestrian nor the driver of a vehicle may undertake to cross a track heedlessly and recklessly, and without the exercise of the greater care which he is bound to use in crossing the tracks of a company lawfully using powerful, rapid and dangerous modes of locomotion. In a careful examination of the authorities on this subject we discover some difference in their expression of this principle. The courts of Pennsylvania lay it down as an absolute rule that, if one heedlessly makes the attempt to cross such a track, he is guilty of negligence *per se*, which will absolutely bar his right of recovery. Some other State courts hold the failure to look to be proof of negligence which will bar the recovery where there is nothing in the case which would in any manner qualify this proof of negligence, and leave a fairly debatable question open for consideration of a jury. Other States, again, as Minnesota and Illinois, say through their highest judicial tribunals that there is no hard and fast rule in a case of this description, and that a failure to look would not, as a matter of law, and regardless of circumstances, be treated as negli-

gence. It is not every case that is brought that affords circumstances sufficient to compel a court to definitely and absolutely express a notion respecting this matter, yet it is very difficult to imagine circumstances which would excuse the injured party for his neglect to use his eyes as well as his ears to guard against an accident occurring while he is crossing the track. Suits for damages growing out of collisions have greatly increased since the advent of electricity, and we herewith append a few citations of cases recently determined which are of more than passing interest and importance:

Carson v. Ry. Co., 150 Pa. St. 180; Ward v. Ry. Co., 17 N. Y. Sup. 427; Ehrisman v. Ry. Co., 23 Atl. R. 369; Wood v. Ry. Co., 52 Mich. 402; McClain v. Ry. Co., 116 N. Y. 459; Ry. Co. v. Righter, 42 N. J. Law, 181; Adolph v. Ry. Co. (Mion.), 52 N. W. R. 903; see also Beach on "Contributory Negligence"; Booth, "St. Ry. Law," sec. 316; Meyer v. Ry. Co., 6 Mo. App. 27; Sheets v. Ry. Co., N. J. Sup. 24 Atl. 483.

It is gratifying to the managers of rapid transfer companies to know that the above cases all unite in holding that a person must use his senses in order to prevent accident and escape injury. These cases hold that if the proofs show that the complaining parties failed to do either, and this contributed directly to the injury, the law will be applied to the facts, and such complainants will not be allowed to recover.

It is within the knowledge of almost all persons whose business it is to use the streets that the cars propelled with great force and high speed move along the lines at frequent and most regular intervals. The law presumes that these circumstances and this knowledge advise people of the necessity to be on the alert and the lookout for passing cars before going upon or crossing the track. Because they fail to use such knowledge cannot always be depended upon as being conclusive of their negligence, yet it bears strongly upon the question whether parties are reasonably attentive and prudent in their conduct.

Under the power of police regulations, cities may provide by ordinance that cars shall not be run at such a rate of speed as will jeopardize the safety of the traveling public (see Mahan v. St. Ry. Co., 34 Minn. 29, and Bemis Mun. Ord., sec. 241). But if there be no public regulation on the subject, the company may run its cars at any rate of speed convenient to it and not dangerous to the passengers and the public along the track. The point requiring the most vigilance is that of street crossings. The general rule is that between street crossings cars have a preferential right of way, but this rule does not apply to the crossing of tracks at street intersections. At such points the car, the private vehicle and foot passengers have a right to cross, neither having a superior right to the other. The law presumes that these respective rights must be exercised with due regard to the rights of the other, and in such a careful manner as not unreasonably to abridge or interfere with the rights of the other. This equality of right does not relieve one from the duty of taking proper precaution to avoid accidents. Neither does the fact that travelers should give the right of way to the street car relieve the motorman from exercising due care to prevent a collision. The degree of diligence which the law exacts of a motorman is determined with due regard to the character of the train, weight and momentum of the cars and the possibility of changing their speed or course to avoid collision. Great vigilance is demanded of a motorman at a point much frequented by children, and when danger is increased by darkness. A motorman is bound to notice the presence of other vehicles and footmen, and if by reason thereof he apprehends danger, duty requires him to regulate the speed of his car so it may be quickly stopped should occasion require it. All motormen should be impressed with the fact that they are not justified in assuming that because a private vehicle can turn in any direction, the driver of the latter will under all circumstances get out of the way. Such presumption, unaccom-



panied by a precaution to avoid a collision, renders an absolute liability. A presumption that a person is able to get out of the way, and will do so, can be indulged only so long as the danger of injury is not at hand, but no longer. On the other hand, a motorman has the right to suppose that a person duly warned will not attempt to cross the street immediately in front of the car; and if his warning be not heeded, and the motorman cannot avert the collision by his best endeavors, such person cannot recover for an injury sustained.

The motorman or driver in charge of a car owes a very great duty to the general public, to his passengers and to the company employing him. The common-law duty of such servant is to exercise ordinary care and diligence to ascertain whether the track ahead is clear and to avoid striking persons or objects, but the law does not command him, at his own peril or at the peril of the company, to keep his eyes constantly directed to the track or street in front of his car. Perhaps the most common excuse for claimants is that of charging motormen with temporary diversion. Whether or not it is in law negligence on his part to direct his attention elsewhere than in front of his car must depend upon the facts in each case. But if a motorman permits his attention to be engrossed by conversation with passengers to an extent of preventing a proper lookout ahead, and a collision or injury results, his conduct amounts to negligence and liability. But negligence cannot be predicated upon the bare fact that the driver is looking in any particular direction at any particular time. His attention may, without any negligence on his part, be momentarily diverted, if he does not withdraw his attention from the car for an undue length of time, and in such case if a per-

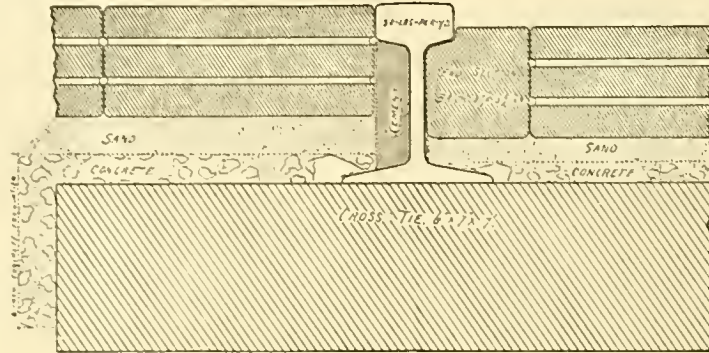
**ELECTRIC PLANT OF THE AURORA GRATA CATHEDRAL, BROOKLYN.**

The accompanying illustration shows the interior of Aurora Grata Cathedral in Brooklyn, N. Y., which has been recently equipped with an electric light plant, Edison system, of over 500 incandescent lights. The work of wiring, which was exceedingly difficult, owing to the high arched ceiling, was done by the Complete Electric Construction Company, of New York; and Okonite

**THE T-RAIL AND BRICK PAVEMENTS.**

The accompanying illustration shows a proposed cross-section of 80-pound T rail, with brick pavement, on six inches of concrete foundation. The Citizens' Street Railroad Company, of Memphis, has recently laid some 72-pound rail 4 1/4 inches high by 4 1/4 wide.

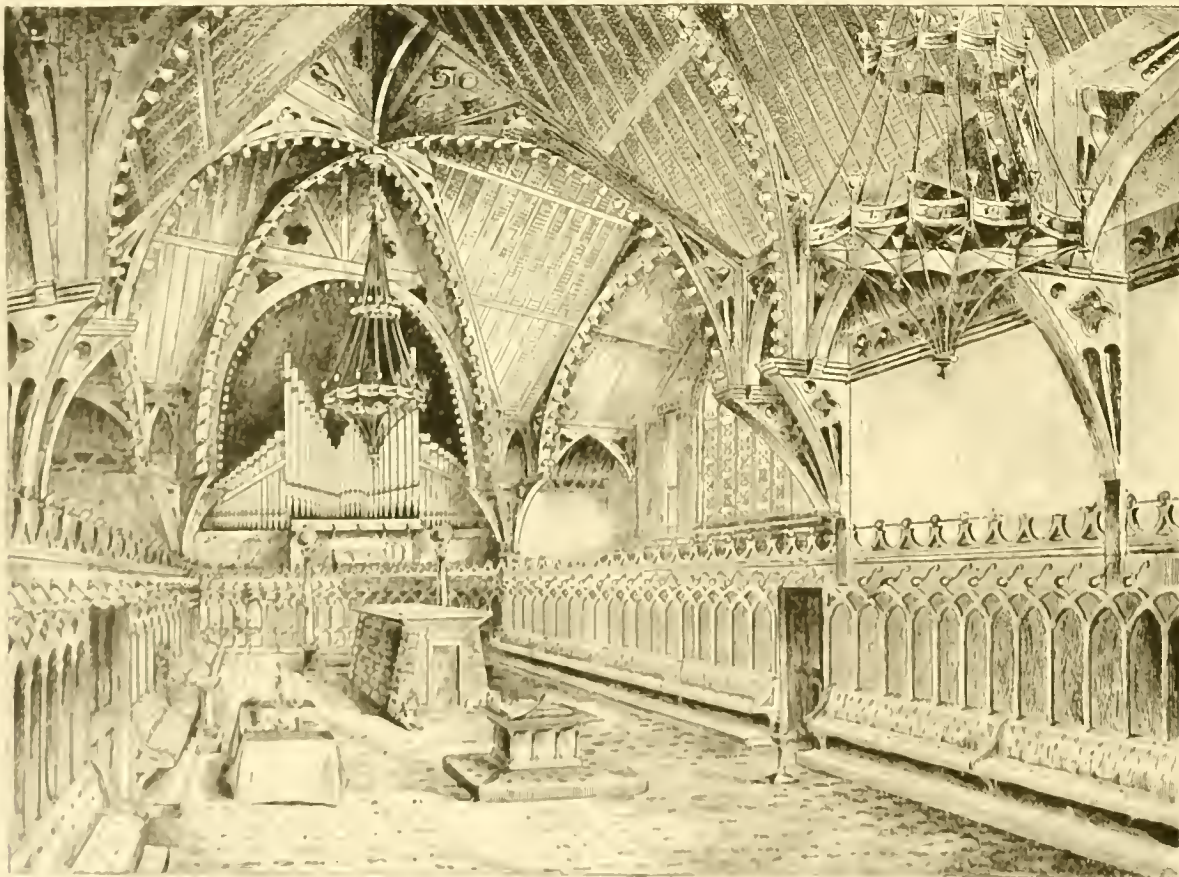
This short piece of pavement, as laid, is a neat and close-fitting job, and I think shows conclusively that the T-rail, laid in the manner shown



T-RAIL CONSTRUCTION WITH BRICK PAVEMENT.

wire was used throughout the building. The lamps are red, white and blue, covered with ornamental shades made by the Phoenix Glass Company, and so controlled at the switchboard that any one color, or all the colors, can be used at one time, or a number of combinations of colors can be obtained producing a beautiful effect. The switchboard, which was furnished by the Brooklyn Electric Manufacturing Company, is of black

with brick pavement, with not impede or interfere with street traffic any more than the tram or flanged rail, says Niles Meriwether, in a recent number of *Paving*. It seems to be almost impossible to maintain for any great length of time the Johnson or any other form of street rail when mounted on a chair, no matter how well laid and paved around. There is, however, no question of the fact that a Johnson rail center, bearing girder



AURORA GRATA CATHEDRAL, FITTED THROUGHOUT WITH OKONITE WIRE

son of a street car crossing the track directly in front of an approaching car, he is guilty of contributory negligence, because he recovery, even though it appears that in the exercise of extra care which the car might have been stopped in time to avoid the collision. Let motormen understand that the law requires them to exercise great vigilance at all times, and especially a very great degree of vigilance at street intersections, especially at crossings usually through, and at curves in the track or street.

marble and with its mountings forms a handsome specimen of what can be done in this line.

As will be seen from the illustration, the building is architecturally artistic, and the introduction of the electric light adds greatly to its beauty. The fire underwriters pronounced this installation as one of the best that they have ever passed on, and so expressed themselves on the official certificate. The building is used for Masonic meetings, and among its frequenters are many well known electrical and street railway men

seven to eight inches high, spiked directly to the cross-ties, makes a superior street-car track.

Providence, R. I. At a recent meeting of the common council the committee on railroads were directed to look into the matter of fenders for electric cars and report at an early date as to what fenders were the most practicable, and also what action had been taken in the matter of the Union Railroad Company. The committee now has the matter under consideration.



## NEW ENGLAND NOTES.

(From Our Special Boston Correspondent.)

THE MASSACHUSETTS STATE LEGISLATURE was prorogued on Monday evening after an unusually long and busy term, during which much time has been devoted to street railway matters and particularly the solution of the rapid transit problem in Boston. After a long and bitter fight including hearings without number, the Meigs elevated railway bill has been introduced, rejected, remodeled, reintroduced, and handed round until the promoters themselves avowed their inability to recognize it as their bill, even Captain Joe V. Meigs, inventor, has been almost entirely dropped from the project. The day of prorogation a number of prominent men met the Governor to protest against the project; these were followed by the Mayor of Boston and others, who favored the bill; the outcome being that the Governor signed the bill in its amended form. As the measure now stands provision is made for submitting the act to the people of Boston for their approval, and nothing material can be done under it until such approval is secured. It provides that the capital stock shall be not less than \$10,000,000 and not more than \$20,000,000, the amount of bonds not to exceed \$20,000,000. There is a provision for a tunnel to East Boston, also for a new bridge to Charlestown, also for a branch road to South Boston. A subway may also be built from Boylston street to Merrimac Square. The decision of the people, as a whole, is now eagerly awaited.

**TROUBLE OVER A CROSSING.**—There has been trouble of late between the New York, New Haven & Hartford Railroad Company and the Dartmouth & Westport Electric Railroad Company, which is owned by the syndicate which controls the Fall River and New Bedford systems. The electric company desired to lay a track across the steam road, to which the officials of the latter strenuously objected. The two companies had their men ready and everything necessary for protracted trouble. The trouble came when an attempt was made to lay the tracks. After some parleying, however, and when the guerilla warfare had exhausted the tempers of all engaged, a truce was proclaimed and a decision arrived at to submit the dispute to the law courts for settlement.

**NEW ROAD IN BROCKTON, MASS.**—Wealthy citizens have organized the West Side Railway Company in Brockton, Mass., to build and operate a new line of electric street railway in that city. The road will transverse some of the best parts of the city, and be about five miles in length. The capital stock will be \$5,000,000, and the following gentlemen constitute the first board of directors: Messrs. J. C. Snow, J. E. Carr, Pardon K. Bacon, H. F. Woodward, Albert Barrows, A. B. Hastings and Edwin Keith.

**BOYNTON ELECTRIC RAILROAD.**—Last Saturday the Boynton Bicycle Railroad bill for a road from Boston to Lowell was recalled from the Governor that some perfecting amendment might be added. When the bill was finally acted upon some flaws in language and in the numbering of sections were overlooked. These were remedied on Monday in both Houses and the bill received the Governor's signature.

**WEST END WORK IN EAST BOSTON.**—It will be late in the ensuing fall ere the railway through East Boston will have their electric equipment complete. A big new power house has to be built and equipped.

## FINANCIAL DEPARTMENT.

Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

**A POOR WEEK FOR TRADING.**—What with the holiday coming in the middle of the week, all financial operations have been more or less seriously interfered with. The whole situation bears a neglected air, and the dullness everywhere apparent has not failed to affect the street railway stock and bond market. It is calculated that \$125,000,000 were disbursed in New York, Chicago, Boston, Philadelphia and Baltimore for July dividend and interest payments, but, while this big sum must seek re-investment, the caution animating money holders has not allowed them so far to do anything but place the cash on deposit in banks until the financial situation, so far as it is affected by strike news, tariff legislation, treasury deficit, gold exports, etc., is more defined. When this flood of money is thoroughly set in motion, the street railway securities market must feel its effect to an appreciable degree.

**LONG ISLAND TRACTION'S** antics have absorbed the trading fraternity's attention. The default by the Brooklyn Heights road on the dividend due the Brooklyn City Railroad was the most sensational development, but the fact that Long Island traction continues weak, despite the fact now made public that the default was only a technical one in order to enable the Brooklyn City road to secure

the \$250,000 guarantee funds so as to reimburse it for money expended in improvements and charged to operating expenses, shows that there is something coming and lends color to the reports of internal dissensions and sensational developments about forthcoming. There are hints of a collapse of the whole combine; and when one takes the continued weakness in the stock and the many adverse rumors attending the decline, in connection with the sudden vim of late marking the Flynn suit to break the lease, the report has more meaning than at first appears. In this connection it is stated that the default spoken of above was intended to influence feeling in this every suit. Flynn wants to break the lease of the Brooklyn City road to the Long Island Traction Company because, as he alleges, the road earns more than the dividends paid and stockholders are being defrauded of their rights. The Long Island Traction Company in defaulting on the dividend, strives to create the impression that the road is not earning the 10 per cent. guaranteed on the stock and so deny all of Flynn's allegations. An early outcome of the suit is now promised.

**OTHER LOCAL STOCKS** offer no special feature. Third avenue, Second avenue, Dry Dock, Forty-second street and other shares generally active have betrayed very little life of late. There is a good demand from many sources for these stocks, but the scarcity is as pronounced as ever and the lack of offers has more to do with the lack of trading than any absence of orders as these latter are plenty enough. General liquidation of long holdings is never a characteristic of a purely investment market, and street railway stocks offer no exception to this fact.

**METROPOLITAN TRACTION** has declared another dividend of  $1\frac{1}{4}$  per cent., whether quarterly, semi-annual or what is not stated. Stockholders have been awaiting some such distribution a long time, but now it is made they are left in the dark as much as ever when or what the next dividend will be. The policy of the management is not to take the public or the stockholders into its confidence, and all information furnished does not tell much.

## NEWS OF THE WEEK.

**Madison, Wis.**—The Four Lakes Light and Power Company has commenced suit to wind up the affairs of the Madison City Street Railway Company and for the appointment of a receiver. The plaintiff has furnished the power for operating the road and has been as lenient as possible in enforcing payment of its bills. The amount due May 10, 1894, was not paid, nor has anything been paid since that time, for light and power for operating its road. The light and power company brought suit upon the amount due May 10, 1894, and recovered judgement June 19 in the sum of \$749.30. Execution was issued and returned wholly unsatisfied June 23. Thereupon suit was brought to wind up the affairs of the corporation. In addition to the amount embraced in the judgment the street railway company is indebted to the electric light company in the sum of about \$1,500, making its entire claim about \$2,300. W. B. Strong, ex-president of the Santa Fe, is the chief bondholder.

**Columbus, O.**—Some progress has been made in the project for the construction of the proposed suburban electric railway from Columbus to Reservoir Park and the establishing of a new summer resort there. Columbus and Cleveland capitalists are behind the project, which means the construction of 30 miles of electric road and the erection of a summer hotel, bath houses and amusement halls at the reservoir. The right of way is said to have been secured along the route, which follows the old National Road (East Main street). The line is to run from Columbus to Hebron and thence to Reservoir Park. A contractor has been secured and the necessary preliminaries all attended to, except securing the franchise from the county.

**St. Louis, Mo.**—The last formality of the transfer of the franchise of the Grand Avenue Railway Company to the Union Depot Company took place last week, when the directors resigned and had their places filled by the stockholders of the Union Depot. The new directors are John Scullin, J. Harry Scullin, Fred Scullin, James Campbell, John G. Kelly, J. H. Roach, A. C. Church, W. F. Reed, George M. Bloch and Thomas Ralston. J. Harry Scullin was elected president, and J. H. Roach, secretary and treasurer. The contracts for the grading and rails let June 20 were approved. The officers say the road will be in operation by the first of October.

**The Chicago Rawhide Manufacturing Company,** Chicago, has opened a branch store at 191-193 High street, Boston, under the management of Mr. John T. Emery, and will carry a full line of its goods at that location. This company has just been awarded a gold medal through its London agent, at the Irish Industrial Exposition at Belfast, Ireland. The company reports good home business, and has a very large foreign trade.

**The Intramural Railway** at the World's Fair paid \$128,406 for the privilege of operating its trains. The amount paid was based upon the traffic, a certain percentage of the receipts for each passenger being paid over to the treasurer for the privilege of the concession. The Electric Launch and Navigation Company, which operated the electric launches on the lagoons, paid for their privileges \$110,615.

**Chicago, Ill.**—A verdict of \$25,000 was rendered in Judge Clifford's court last week in favor of the plaintiff, in the suit of John Barron against the Chicago City Railway Company. Barron was injured Feb. 16, 1890. He was riding on an Archer avenue car, standing on the front platform. He claimed the driver of the car threw him over the dashboard and that he fell under the wheels, crushing his spine.

**Reading Road Reduces Rates.**—Following the recent introduction of 16-minute trains between Philadelphia and Germantown to meet threatened competition of the trolley lines, the Reading Railroad has announced a considerable reduction in the fares of commuters and frequent riders, amounting, in some instances, to 30 per cent., and that additional train service will be provided.

**Washington, D. C.**—Mr. Catchings has introduced a bill in the House to incorporate the National Rapid Transit Company. This is a corporation, with capital fixed at \$15,000,000, which proposes to build an electric railway between Washington and New York, over which cars may be operated at a speed of 120 miles an hour. The bill was referred to the Committee on Judiciary.

**Milwaukee, Wis.**—It is rumored that the Milwaukee Street Railway Company will soon stop carrying firemen and policemen free, because of the increased taxation the city is about to levy upon its property. It is also reported that the big list of free-pass books carried by city attaches about the courthouse and elsewhere is to be materially reduced.

**Work Stopped in Jacksonville, Fla.**—The Pensacola (Fla.) News says: "Dr. J. Y. Porter, State Health Officer, has notified the mayor of Jacksonville that the extensive upturning of earth on the streets of cities in Florida, cannot be permitted during the summer months, and the work of relaying the street railway in that city must be stopped."

**Annual Convention of Employees.**—The annual convention of the Amalgamated Association of Street Railway Employees of America and Canada will meet in Milwaukee on October 9. The local committee of arrangements consists of James Flint, Daniel McQuarrior and O. Brennecke. The convention will remain in session about a week.

**Pine Bluff, Ark.**—The drivers on the Citizens' Street Railway struck last week because their demand for an increase in wages was refused. Their places were filled and no interruption was caused.

**Stuebenville, O., Road Sold.**—The Steubenville Street Railway was sold last week to a local syndicate for \$12,365. The road is 5 miles in length. It is reported that the system will be improved.

**Corsicana, Tex.**—The franchises and property of the Corsicana Street Railway Company has been purchased by B. R. Moffett. The line is  $4\frac{1}{2}$  miles in length and has been operated by mules.

**Milwaukee, Wis.**—General Manager Wyman has given notice that after July 1 only 62 tickets a month will be allowed to shop employes of the Milwaukee Street Railway Company.

**Fort Dodge, Ia.**—The City Council has given an exclusive contract for 25 years to S. T. Meservey for an electric street railway and lighting plant.

**Kansas City, Kan.**—The Kansas City Electric Street Railway Company has asked the City Council to grant it a franchise.

**Atlantic, Ia.**—Plans for an electric railway have been about perfected.

## NEW INCORPORATIONS.

**Cleveland, O.**—The Cleveland & Elyria Railway Company has been incorporated by Benjamin F. Phinney, Jay Comstock, J. M. Gasser, H. D. Coffinberry and Dalas Beh. The capital stock is \$100,000. The new company proposes to build a railway line to be operated by electric or other motive power between Cleveland and Elyria, for the purpose of conveying passengers, freight, express matter, and the United States mails on and through the streets and roads between the two points named.

**New York, N. Y.**—The Traction Construction Company has been incorporated. Offices will be located in Denver, New York City and Chicago. The capital stock is \$50,000. The business to be prosecuted is to build, construct and operate railways, tramways, electric and cable railways, car houses, etc. The promoters are Geo. E. B. Hart, Wm. B. Dowd, New York City, N. Y.; Henry A. Kirkham, Denver, Col.



**Boston, Mass.**—The Brockton & East Bridgewater Street Railway Company has been incorporated. The capital stock is \$100,000. The company will operate, construct and maintain a street railway to run through Brockton, West Bridgewater and East Bridgewater. The promoters are Aaron Hobart, Robt. O. Harris, East Bridgewater, Mass.; Horace B. Rogers, Brockton, Mass.

**Boston, Mass.**—The Bridgewater & East Bridgewater Street Railway Company has been organized. The capital stock is \$100,000. The company will locate, operate, construct and maintain a street railway to run from Bridgewater to East Bridgewater; length, three miles. The promoters are James C. Leach, Bridgewater, Mass.; Robert O. Harris, Aaron Hobart, East Bridgewater, Mass.

**Boston, Mass.**—Brockton & Stoughton Street Railway Company, with a capital stock of \$150,000, has been organized. The company will locate,

operate and construct a street railway to run from Brockton to Stoughton. Those interested in the enterprise are Charles Tenney, George F. Walker, Stoughton, Mass.; Horace B. Rogers, Brockton, Mass.

**San Antonio, Tex.**—The Manufacturers Transportation Company has been incorporated with \$50,000 capital stock. The company will construct, maintain and operate a street railway for transportation of freight, etc. The promoters are Chas. Hugo, Philp Carl, Geo. H. Kalteper, J. E. Mugge, Chas. Kroeminger.

**Elizabeth, N. J.**—The Duluth-Superior Traction Company has been formed, with a capital stock of \$2,000,000. The promoters are John H. Davis, New York City, N. Y.; Frank Bergen, Elizabeth, N. J.; Edward V. Douglas, Philadelphia, Pa.

**Abingdon, Mass.**—A new company, to be known as the Hanover Street Railway Company, has been formed, to construct an electric railway from As-

sinippi to the Rockland line, a distance of 2½ miles. The capital stock is \$10,000.

**Philadelphia, Pa.**—The Aramingo Avenue Passenger Railway Company, with a capital stock of \$12,000, has been incorporated. The promoters are Jos. C. Lugar, Hyland C. Murphy, Nelson Sailer, Philadelphia, Pa.

**Philadelphia, Pa.**—The East Aramingo Passenger Railway Company has been incorporated with a capital stock of \$18,000. The promoters are Jos. C. Lugar, Hyland C. Murphy, Thos. B. Foot, Philadelphia, Pa.

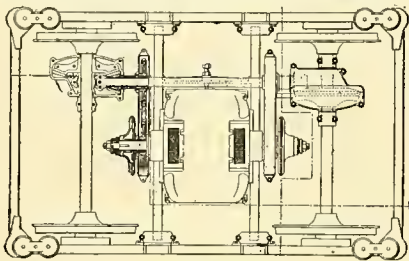
**Philadelphia, Pa.**—The Delaware Valley Electric Railway Company has been incorporated by Simon Friedberger, Gabriel H. Lang, Jacob C. Dedier, Philadelphia, Pa. The capital stock is \$1,000,000.

**Philadelphia, Pa.**—The Ambler Electric Railway Company, \$12,000, has been incorporated. The promoters are Jas. W. Shapp, Daniel B. Shapp, Philadelphia; N. H. Lazellers, Norristown, Pa.

## RECORD OF STREET RAILWAY PATENTS.

### U. S. Patents Issued June 26, 1894.

**521,778. Railway Car Truck;** Norman C. Bassett, Lynn, Mass., Assignor to the Thomson-Houston Electric Company, of Connecticut. Filed April 20, 1891. The combination of a motor truck frame having side bars with pedestals thereon, axle boxes with side



No. 522,067.

lugs, springs interposed between the side bars and side lugs, removable supports for said springs and means for clamping said supports in place.

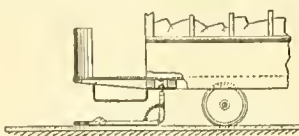
**521,865. Traction Device for Canals;** Francis A. Poocek, Scranton, Pa. Filed Feb. 13, 1893. A traction device for a canal or other water way, consisting of an elevated structure adjacent thereto, an upper supporting rail and a side bearing rail carried by said structure but insulated from each other and electrically continuous, so as to serve as working conductors, and an electric locomotive hung upon the upper rail and steered by the side rail, and comprising current collecting devices bearing upon said rails.

**521,891. Conduit Electric Railway;** Charles J. Reed, Orange, N. J., Assignor, by direct and mesne assignments, to the Reed Electric Company, Philadelphia, Pa. Filed April 14, 1892. A pair of mains or leads located in a slitted conduit and overlapping or crossing each other at intervals, in combination with three or more trolleys carried by a car and extending through the slit of the conduit into contact with the mains and having electrical connections with one or more propelling electric motors on board the car.

**521,892. Conduit Electric Railway;** Charles J. Reed, Orange, N. J., Assignor to the Reed Electric Company, Philadelphia, Pa. Filed Feb. 13, 1893. In an electric railway system an insulated current feeder or main having circuit connection through an exposed contact inclosed in a water-tight switch-box with a magnetic switching lever electrically connected with an exposed trolley conductor, said lever lying in close proximity to a non-magnetic box cover, in combination with a portable magnet adapted to actuate the switching lever through the cover, and additional permanent magnets adapted to hold or secure the switching lever in either of two positions.

**521,897. Method of Forming Storage-Battery Plates;** Charles Sorley and James K. Pumpelly, Chicago, Ill., Assignors to the Pumpelly-Sorley Storage-Battery Company, same place. Filed March 24th, 1893. The method of forming a storage or secondary battery plate, which consists in clamping a sheet of lead between two plate forms, and then bringing the same against the gang of saws, which cut through the metal of the plate, thus leaving the plate of an integral piece, but with an outside frame, and a series of ribs.

**521,908. Automatic Safety Joint for Electric Wires;** James H. Curry, Wilkesburg, Pa., Assignor of to Frank B. Tomb, same place, Samuel J. Graham and A. H. Childs, Pittsburg, Pa., and Robert A. Gillispie. Filed Nov. 22, 1893. An automatic safety joint for electric circuit wires, consisting of a box or support having two insulated anchorage pins, and two arms con-



No. 522,070.

nected with said pins by a loose slotted connection with supporting seats for sustaining the arms when under tension, and a bridge connection for the two arms for electrically connecting them when supported by tension in these seats.

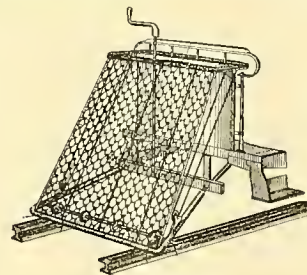
**521,966. Safety Guard for Cars;** August Seffel, Brooklyn, N. Y. Filed Feb. 23, 1891. In combination, a vertically movable cradle, a lever for engaging and releasing the cradle, a dog in position to engage the lever, a spring engaged with the dog and lever and means for operating the dog, the said spring serving when the parts are in their normal position to hold the cradle elevated, and when the dog is recocked, serving to force the cradle downwardly.

**521,981. Safety Appliance for Street Railway Cars;** Frank W. Jenkins, Brooklyn, N. Y. Filed Aug. 4, 1893. The combination with a car having the platform rounded, of a wheel mounted loosely and in horizontal position below the platform, the wheel having a diameter equal to the gage of a track on which the car runs, the front parts of the wheel circumference projecting slightly beyond the rounded edge of the car platform and an incline guard extending from the car platform to the wheel.

**522,003. Guard for Cars;** Gustav Boehm, Long Island City, N. Y. Filed Feb. 12, 1894. The combination with a guard connected with the car platform, of an apron at the front end of the guard, springs for throwing up the apron, a sector and blocking lever for holding the apron in position, and means for disconnecting the blocking lever by the weight of the person upon the guard.

**522,057. Trolley Stand;** Elazer F. Heastings, Avalon, Pa. Filed April 12, 1894. A trolley stand, comprising a base, a bracket held to turn horizontally thereon, a second pole-carrying bracket pivoted on the first bracket, and bow springs projecting from opposite ends of the first bracket and pivoted to opposite ends of the pole-carrying bracket.

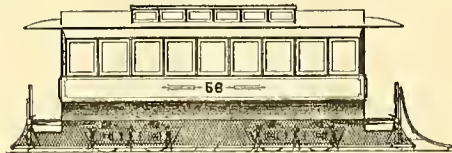
**522,067. Means for Suspending Electric Motors from Cars;** Robert Lundell, Brooklyn, Assignor of two-thirds to Edward H. Johnson, New York, N. Y. Filed Sept. 4, 1893. A car or vehicle having a single propelling motor yieldingly sustained beneath its frame and the rotary part thereof connected at its opposite



No. 522,069.

ends through sprocket wheels and sprcket chains to shafting, which in turn is geared through speed reducing gearing to two of the axles thereof, in combination with a sliding support for the motor and means for compensating for undue stretching of the sprocket chains (See illustration.)

**522,070. Car Fender;** Marguerite Maidhof and Victor F. Maidhof, New York, N. Y. Filed Jan. 25, 1894. In a car fender, the combination with a pivot plate attached to the car, of a fender comprising a platform, a back pivotally connected with the said platform, a vertically disposed pivot on the said back and engaging the



No. 522,115.

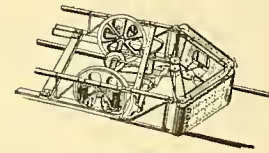
said pivot plate, and wheels journaled on the front end of the said platform and adapted to travel on the track rails. (See illustration.)

**522,096. Automatic Switch Operating Mechanism;** Cyrus P. Bachelor, Pavtucket, R. I. Filed Feb. 23, 1893. The combination with a car, a stationary transverse guide-rod supported below the same, a block, loosely mounted thereon, a vertically reciprocating spring-actuated pin arranged on the car and connected with the block, and a spring for supporting the block normally at a certain point upon the rod whereby it is adapted to operate a switch-tongue.

**522,099. Life Guard for Cars;** Joseph J. Beals, Cambridge, Assignor of one half to Wallace L. Broadbent, Boston, Mass. Filed Dec. 26, 1893. A life guard for street railway cars comprising net supporting frames one near the top of the dash board and the other near the ground in advance of the former, combined with a net composed of diamond shaped wire loops enchainned together in line up and down the net and each loop of a given line of loops being connected by short links with the loops of the adjacent lines at each side thereof. (See illustration.)

**522,100. Safety Guard for Cars;** Joseph W. Betz, Brooklyn, N. Y. Filed Dec. 8, 1893. In a safety guard for cars, a latching device for the support of a binged fender frame, comprising a case beneath the car platform, a slide block therein, a depending latch limb on said slide block, adapted to hook onto the front of the fender frame and slidable in a slot in the case, an upright arm on the slide block, reciprocable in the case and in a slot in the platform, and a spring in the case pressing upon the slide block.

**522,115. Wheel-Fender and Safety Attachment for Street Cars;** Frank H. Homer, Patchogue, N. Y. Filed Jan. 24, 1891. The combination, with a



No. 522,147.

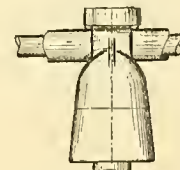
street car, of a fender netting inclosing the wheels and the space beneath the floor, and provided with a cross-roll at each end of the car, a take-up safety device supplementing said fender-roll and having a jointed connection with the dash-board, a latch for holding said take-up safety device in its normal position, a treadle connected to depress the fender-roll and a trip device connecting said treadle and latch for releasing the take-up safety device, whereby both devices are depressed simultaneously. (See illustration.)

**522,147. Flexible Bell Fender for Street Railway Cars;** Richard B. Chambers, Chester, Pa., Assignor to Crosby M. Black, same place. Filed March 6, 1894. Flexible traveling endless belts having adjustable rollers arranged in sliding bearing in slots and swinging shields or frames with connecting rods, and operating the pivoted table or semi-rotary yoke, having a recess and imparting its motions by rods to a clutch and a friction clutch, and a hand or foot lever and stationary vertical bearing shafts. (See illustration.)

**522,149. Car Fender;** Hebrri G. Chitain, New York, N. Y. Filed Feb. 23, 1894. The combination of a section having its upper end connected to the front of the car, another section pivotally connected to the lower edge of the first section, an arm connected to the second section, a spring acting on the arm, a chain having its opposite end connected to one of the sections, and the arm with a frame having a roller and hangers.

**522,173. Reversible Car Seat;** Robert H. Weatherly, St. Louis, Mo., Assignor to the Scarritt Furiture Company, same place. Filed Jan. 5, 1893. The combination of a frame having vertical slots on opposite sides thereof, the seat frame, lugs secured to the seat frame and movable laterally in said slots, a back intersecting arms or links pivoted to the back and lugs, stops on the frame arranged to serve as a fulcrum for the arms only when the arms are nearly in their normal position to raise the front end of the seat and to support the arms when in the normal position.

**522,175. Insulator;** Jahan M. Anderson, Boston, Mass., Assignor of one-half to Albert Anderson, same place. Filed Mar. 22, 1894. An insulator composed of a body portion of insulating material, a metal crown having upright arms or ears forming a slot or channel for the reception of the conductor to be supported, a shield or guard fitted in said slot and adapted to engage the upper surface of the said conductor, and a cap fitted



No. 522,175.

upon the said upright arms to close the said slot at its upper end and provided with a depending flange to engage the said shield or guard. (See illustration.)

**522,180. Trolley Wire Hanger;** Thomas J. McTighe, New York, N. Y., Assignor, by mesne assignments, to Frederick K. Fitch, same place. Filed Jan. 23, 1893. Renewed Jan. 22, 1894. A trolley wire attachment consisting of an ear or casting of suitable shape having a slotted screw-threaded stud adapted to receive the trolley wire, a flat plug substantially filling the slot, the adjacent clamping faces of the slot and plug being curved longitudinally, and a screw cap adapted to fit the stud and press the plug against the trolley wire.



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**The Fender Question.** Aside from the strike, the question that seems to be uppermost in the minds of street railway men is the consideration of equipping the cars with suitable life-guards and fenders, and the use of such other precautions as will tend to reduce the liability of serious accidents. In Rochester the work of equipping 150 cars is under way. In Jersey City experiments have been carried on with various fenders. In Washington, D. C., a movement is on foot to force all the street railway companies to adopt what may be selected as the best fender, although it is extremely probable that the "forcing" process will be unnecessary if the commission appointed will simply convince the street railway company that any particular fender is the best that can be adopted. At various other points tests have been made and commissions are being appointed to investigate the question and select what appears to be the most suitable fender for giving the protection desired. It is certainly not an easy matter to decide between the scores of fenders now offered, and new ones are constantly being brought to the attention of street railway men.

**New York Rapid Transit.** As elsewhere detailed in this issue, the people of New York City are finally to have an opportunity of expressing their opinion as to whether or not they want an underground road built along the lines of the plans adopted by the last rapid transit commission. At their meeting this week the commissioners practically decided to submit the question to the people at the November election. Under the law the vote cannot be taken on this question until after the routes have been laid out and the plans of construction adopted, the consent of property owners obtained and detailed plans and specifications prepared. If the question were to be voted upon this year, therefore, it would be necessary for the commission to adopt, without change, the routes and plans of the old commission. If a new plan were to be selected, it would be impossible to submit the question before November, 1895; but by accepting the work of the old commission all these preliminaries have been disposed of and the matter is ready

for a vote. As the commissioners have authority, after the question has been decided, to make any change in the routes and plans or any addition to them that they may deem advisable, they will apparently not be seriously hampered by any defects in the plans adopted by the old commission, while at the same time, they will get the full benefit of the immense amount of work done by their predecessors.

**Increased Earnings.** It is certainly a matter for congratulation that the reports from nearly all the street railway companies show that the traffic is on the increase and that the earnings are in some cases far ahead of those for the corresponding months of 1893. The Baltimore Traction Company, for instance, reports much larger receipts than at this time last year. The New England Street Railway Company's earnings show a considerable increase. The reports from Columbus, O., Buffalo, N. Y., and other places show similar results. This, of itself, is an indication that the general business of the country is improving, for the large falling off in street railway receipts has been very largely due to the general stagnation of business, resulting in the failure of thousands of workmen to use the street cars in traveling to and from the factories and shops in which they were employed. The heaviest decreases were noticeable in manufacturing towns and here the greatest increases have been noted during the past few months. During the next six months very nearly every well-located street railway in the country will experience appreciable gains in receipts, while at the same time the operating expenses are upon a much lower basis than 12 or 18 months ago, before the hard times had forced the companies to cut their unnecessary expenses. This increase of the margin between receipts and operating expenses, by the swelling of the former and the reduction of the latter, will be satisfactory to stockholders and holders of street railway securities, and will be the means of inducing additional capital to invest in this class of property.

**Economy in a Small Plant.** The condensed report of a test of a small electric railway plant operating only three cars over about eleven miles of track, as given elsewhere in our columns, will prove of interest to many of our readers. Already plants of this type operating in suburban districts are quite numerous, and the indications are that they will become even more popular, as their advantages in developing suburban property become better known to owners of real estate in the outlying districts of our smaller towns and cities. The figures given respecting economy are of special interest. Reference to the report will show that the average indicated horse power developed by the engine was 70, with a steam consumption of 24½ pounds per indicated horse power per hour. Of this total about 10 H. P. was taken up by engine and pump friction, 15 H. P. was consumed by the main belt, the armature shaft and the electrical resistance of the generator. It appears that about 38 pounds of steam were used by the engine for each electrical horse power hour actually delivered by the dynamo to the line. This seems to be an excessive consumption, but, if cheap fuel is obtainable, is not to be given undue consideration. It results, of course, on a road operating so few cars, from the violent fluctuations of load, and in this case, from the fact that the average load was not more than one-half that at which the machines, including boiler, engine, and dynamo, were best adapted for economical operation. Among the results of the test, as pointed out by the *Engineering News*, a fact worthy of especial notice is the very large consumption of steam by the jet which atomized the fuel oil in the furnace. About one-seventh as much steam was required to spray the oil in the furnace as was produced by its combustion. We frequently hear it said that one great advantage of oil fuel is that it does away with hand stoking of fires, and is delivered in the furnace without cost. When we come to consider the matter, however, it is evident that a steam jet

for spraying oil in the furnace is merely an automatic stoker. If any steam user were invited to buy, or even to take as a gift, an automatic coal stoker which required one-seventh of all the steam the boilers made to run it, he would be apt to decline with thanks. Yet it is well nigh universal in the use of oil as fuel to spray it with a steam jet without a passing thought as to how much or how little steam is used in that way.

**End of the Strike.** It is a matter for congratulation that the recent strike did not extend to the street railway men throughout the country. The strike has failed to accomplish the purpose which President Debs, of the American Railway Union, boasted would be the result; and, indeed, it has failed to accomplish any good purpose whatsoever. The result has been what every sensible and level-headed man, whether laborer or business man—if a business man may be classed as other than a "laborer"—might easily have foreseen. The cause of the strikers was in this case unfortunately the cause of revolution and anarchy, and this, when brought into open conflict with the numerous forces of law and order, must of necessity lose its fight. The original point at issue—the alleged abject condition of the Pullman employes—has been wellnigh lost sight of, and it is interesting and instructive to read what a former employe of the company has to say on the subject. Wm. A. Lincoln, who occupied an official position in the Pullman company from 1880 to 1886, writing to the Springfield (Mass.) *Republican*, says:

"My information of the present difficulty, which comes from well-informed parties on the ground who are not in any way connected with the Pullman company and who are in close touch with the workmen, is that a majority of the men did not want to make the present strike, but that they were forced into it by labor agitators and the labor unions; that they are heartily sick of it, and would have gone back to work long ago if they had been allowed by their leaders to do so. . . . I believe the Pullman company has always paid the men at Pullman liberal wages. I know the savings of those who had the habit of saving ran up very fast, and of the entire number of employes more than one half of the number had, before this strike began, accounts in the savings bank at Pullman which averaged over \$250 to each account. . . . In the last fiscal year, which closed August, 1893, the average amount paid to every man, woman and child employed at Pullman for the year was \$613; the year previous it was \$590. The time I was there I think it was about \$550, showing that wages have been increasing there of late years, and I think this average will compare favorably with any of the factories or mills around here. The cost of living at Pullman is less than in Springfield, provisions of all kinds are cheaper, clothing as cheap, and rents—about which so much has been said—are about \$2.50 per room per month. Suites, in flat or apartment buildings of two, three, or four rooms, range from \$5 to \$8.50 per month, and single or separate houses of six to eight rooms are rented at \$12 to \$18 per month. These rents are scheduled at much less than the same space can be rented in the poorest quarters of Chicago, and when it is considered that these houses are substantial brick dwellings with modern improvements, having water, gas, perfect sewerage, absolutely clean streets, adorned by lawns, flowers, parks, all dirt, garbage and ashes being daily removed by the company, with ample playgrounds for the children and athletic grounds for the older boys and men, with fine schools in their midst, a public library of 10,000 volumes, reading-rooms and other places of amusement, with an entire absence of saloons, or other degrading influences—it would seem as though it would be an ideal place for a workman to bring up a family. . . . The workmen are not compelled to occupy the company houses, in fact one-half of them do not, as they prefer to live outside at a distance where they are not deprived of their "liberties"—which, so far as I know, consist in living where they can be as disorderly as they choose, keep a cow or pigs in the backyard and chickens in the cellar, which things are forbidden on the Pullman territory. The company does not oblige its tenants to burn gas, they can use kerosene or tallow candles if they choose; water they have to take from the company, as there is no other source, but this is not a source of profit to the company beyond simple interest on the capital invested; in fact, they claim now that they are furnishing it at a considerable loss."



## OPERATION OF PITTSBURG ROADS.

The annexed table gives a condensed summary of the operation of the street railways of Pittsburgh for one year:

	Receipts.	Exp'ses.
Central Traction Company.....	\$183,721	\$171,677
Citizens' Traction Company.....	711,577	387,628
Duquesne Traction Company.....	357,714	256,004
Pleasant Valley Traction Company.....	397,123	312,326
Manchester Traction Company.....	482,347	274,687
Pittsburg Traction Company.....	422,560	365,784
Birmingham Traction Company.....	332,049	171,874
Second Avenue Traction Company..	111,379	71,686
West End Traction Company.....	121,576	72,726

The number of passengers carried by these companies were: Central, 3,926,521; Citizens', 14,594,850; Duquesne, 6,889,970; Pleasant Valley, 7,942,480; Manchester, 9,646,946; Pittsburgh, 8,364,852; Birmingham, 6,875,378; Second Avenue, 2,362,962; West End, 2,528,177.

## REORGANIZATION OF THE LAKE STREET ELEVATED, CHICAGO.

Immediately after the transfer of the controlling interest of the Lake Street Elevated to Mr. Yerkes and his friends was made, as announced in our last issue, the old board of directors resigned, and a new board was elected, composed of the following: William Ziegler, Clarence A. Knight, John A. Roche, John A. Witbeck, B. E. Sunny, A. S. Littlefield, Solomon Sturges, Jr., A. P. Richardson and D. H. Louderbach. The present officers will continue to hold their positions, at least for a time. Only four of the old board of directors retain their positions, namely, Ziegler, Roche, Knight and Witbeck. The composition of the new board suggests several conclusions. The entrance of D. H. Louderbach into the directory indicates that the Northwestern Elevated scheme will now either be abandoned entirely or that its plans will be greatly modified. B. E. Sunny is the manager of the General Electric Company in Chicago, and from this it is argued that the General Electric Company will get the contract to make the change from steam to electric power on the road. It is learned on good authority, says the *Chicago Herald*, that the control of the Lake Street company has not been purchased by the West Chicago Street Railroad Company, nor in fact by any company. The purchase has been made by Messrs. Yerkes, Field, Higginbotham, Doane and other wealthy people who can be relied upon to pull with Mr. Yerkes in any question which may come up involving the interests of the West Chicago road. It is claimed, too, that on the question of a downtown loop the influence of the Lake Street company will be against any plan likely to help the interests of the Metropolitan Elevated road.

## IMPROVEMENTS IN THE BALTIMORE TRACTION COMPANY'S LINES.

President Brown, of the Baltimore Traction Company, says that the rumor recently circulated that he intended to resign the leadership of the traction company is without foundation. Not only has he no intention of resigning, but he has now under consideration several improvements in the traction lines which will greatly increase its mileage and give additional facilities. When the City Council meets in the fall he says he will ask permission to lay several new lines as feeders to the traction system. If these ordinances are granted, he says that within the next twelve months his company will have in operation in the city and suburbs 120 miles of electric and cable railway lines. The company now operates 78 miles of road, so that the contemplated additions will aggregate 42 miles.

President Brown said he was encouraged to advocate and push these contemplated extensions and improvements by the improved business of the lines under his control. He said that the receipts of the traction company for June were far in excess of any month's receipts of the company since last September. Continuing, he said: "It is diffi-

cult to realize the extent to which rapid transit in this city will be advanced in time. Since I have taken the presidency of the traction company the City Passenger Company has put in operation the Hall's Springs and the Green lines. These parallel some lines of the traction company, but have had no appreciable effect on the receipts of our lines. The loss to us the first day or two the new lines were put in operation was about \$50 a day. This has since been recovered, and the receipts of these traction lines have been much heavier than before."

## UNDERGROUND RAPID TRANSIT FOR NEW YORK CITY.

The New York Rapid Transit Commissioners at their meeting this week took action that will without doubt bring the question of public construction of any proposed system before the voters of the city at the next election in November.

It will be remembered that the old commission located an underground route up Broadway and the Boulevard, on the west side of the city, and as far as Forty-second street in Fourth avenue, on the east side, and that from Forty-second street a line was contemplated from Forty-second street and Fourth avenue under Vanderbilt avenue to Forty-third street, thence north in Madison avenue. In lieu of the consents of property owners in Madison avenue the Board went to the Supreme Court to secure a commission to thus locate a road under Madison avenue. Then the property owners secured the adoption of an amendment to the Rapid Transit act prohibiting the construction of a road under that avenue unless the consents of a majority of property owners, both in value and in number, should be obtained. As this was all but impossible, the commission was very effectually stayed. That is the situation at present.

Practically, then, the action for the Commissioners was to adopt the plans for an underground system of their predecessors, leaving open for consideration, after the people have voted upon the general questions, a scheme for rapid transit north of Forty-second street on the east side.

The following somewhat extended resolution, which was unanimously adopted, shows what it is proposed to do:

Whereas, This Board is of the opinion that the best interests of the city of New York and of its inhabitants imperatively demand that the question as to the municipal construction of a rapid transit railway shall be submitted to the electors at the general election to be held in November, 1894;

Whereas, By the terms of the Rapid Transit act it is required that, before the question of municipal construction is submitted to the electors, this Board shall either (1) locate new routes, adopt a general plan of construction and obtain the consent thereto of the local authorities and of the property holders, or, if the consent of the property holders is withheld, then the approval of the General Term of the Supreme Court, and prepare detailed plans and specifications therefor; or (2) shall adopt the routes located by the commission organized under the act of 1891, and the general plan of construction approved by it, for which the necessary consents have already been obtained;

Whereas, If the Board shall proceed at the present time to locate new or additional routes and to adopt new plans of construction, the consideration of the same and the obtaining the consents thereto of the local authorities and of the property owners, or, in lieu thereof, the approval of the Supreme Court upon the report of Commissioners, will necessarily cause such delay as will prevent the submission of the question of municipal construction at the general election to be held in November, 1894;

Whereas, The routes and general plan of construction adopted by the Rapid Transit Commission organized under the act of 1891 and for which the necessary consents have been obtained, are approved by this Board;

Whereas, It is provided by the Rapid Transit act, as amended, that if the electors of this city shall vote in favor of the municipal construction of a rapid transit railway, this Board may thereafter change or modify the routes and plans proposed, or adopt other or different routes and plans for a rapid transit railway, and power is thus reserved to this Board, after such election, to adopt such additional routes as may, in its judgment, be necessary or desirable, and thus to make suitable provision for rapid transit on the east side of the city, north of Forty-third street;

Resolved, That it is the sense of this board that the routes and plans located and approved by the commission organized under the act of 1891, and for which the necessary consents have already been obtained, should, if practicable, be adopted by it, to the end that the question of the municipal construction of a rapid transit railway may be submitted to the electors of this city at the general election in November, 1894.

Resolved, That the counsel and chief engineer of this board be directed to report at the next meeting of the board, whether or not, in their opinion, there exists legal or engineering obstacles which ought to prevent the adoption by this board of routes, plans or specifications for a rapid transit railroad approved by the commissioners organized under the act of 1891, and that if they shall be of the opinion that the adoption of such routes, plans and specifications by this board is practicable, the counsel shall prepare for its consideration such further and more formal resolutions as they may deem necessary to effectuate its views as herein expressed.

The general scheme for an underground system proposed by the old Rapid Transit Commission contemplated a four-track tunnel. It is what was known as the Worthen plan, with some modifications suggested by expert engineers who were consulted by the Board. The routes adopted were from the Battery up Broadway to the Boulevard at Fifty-ninth street, then northerly to Spuyten Duyvil Creek and the City line. The east side line runs from Union Square north under Fourth avenue, and (as first laid out) Madison avenue, and east of Madison avenue to the city line. The plans include a loop around the Battery, of course, below the surface; another under the City Hall Park, to permit of close connection with the Brooklyn Bridge, and a third loop under Union Square, forming a junction where the east side road begins. North of the City Hall to Spuyten Duyvil Creek there are to be four tracks with a two track road between the latter point and the city limits and a three track road below the City Hall. Four tracks are provided on the east side also.

## AMERICAN STREET RAILWAY INVESTMENTS.

This is the title of a new book just issued as a supplement to the *Street Railway Journal*. It comprises a total of 216 pages and 24 maps, and gives complete financial and commercial statistics of the properties and securities of over 1000 street railway companies. The growing importance of the street railway as a safe investment has created a demand for just such a handbook as the one now available. The change from animal to mechanical traction that has been going on so rapidly during the past six or seven years has required the investment of a large amount of capital in the bonds and stocks of the reconstructed roads, and this has resulted in greater interest in the financial statistics of these properties. In this publication detailed information regarding the operation and management of the roads is given in a complete, yet condensed form. The population of cities and towns and particulars as to the mileage, track, equipment, power stations and financial reports. Wherever the value of the property is affected by such details the tax rate, debt, etc., are also given, as well as general information about the commercial interests of the city. An invaluable feature of the book as a work of reference is the date, attached to the report of each road, that the information was received from its officers. The publishers have certainly succeeded in compiling a valuable book in regard to properties of which it has heretofore been almost absolutely impossible, with few exceptions, to obtain any definite and reliable information.

## BROOKLYN BRIDGE TRAFFIC.

The reports of the Secretary and Treasurer of the Brooklyn Bridge, which were handed in at the meeting of the trustees on Monday of this week, show a great falling off in the traffic receipts. Some of the figures are as follows:

Treasurer's report: Cash in bank and on hand June 1, \$389,561.76; traffic receipts, \$98,603.96; receipts from rent and other sources, \$28,519.28; total, \$516,685; expenditures, \$355,589.48; cash in bank and on hand July 1, \$161,095.52.

Secretary's report: Traffic receipts from New York, \$46,448.31; from Brooklyn, \$52,155.62; total, \$98,603.96, a daily average of \$3,286.79, or \$119.16 less per day than for June of last year. The decrease for the month was \$3,575.21. The total number of passengers transported was 3,298,617, a daily average of 109,954 for June, as against 114,114 for May, a daily decrease of 4,160.

New York City, N. Y.—The State Railroad Commissioners have granted, subject to the usual conditions, the application of the Broadway and Seventh Avenue and the Metropolitan street railway companies to use cable power on the railroad connection in Lexington Avenue between Twenty-third and Thirty-sixth streets and in Twenty-third street between Lexington Avenue and Broadway.



**ELECTRIC RAILWAY CONDUIT SYSTEMS.—  
III.**

BY LIEUT. F. JARVIS PATTEN.

Although this later Siemens system has probably not yet been put into operation, it is unquestionably a feasible and operative plan, as one of the same general class has been in successful operation in the United States for the past six months on a half-mile track.

The later Siemens plan requires no continuous conduit, and is typical of the latest class tried. It is shown in Figs. 15 and 16. There is a sectional service rail  $R+$ , and a continuous return rail  $R-$ , and the sectional service rails are less than a car length, and only one section, that beneath the middle of the car, is alive at a time. The switching in and out of the service rails is accomplished in a novel way. Beneath the center of the track, midway of each sectional rail, is placed a closed

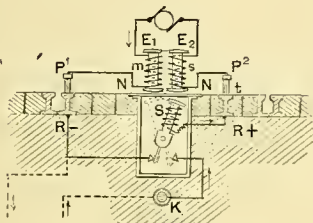


Fig. 15.

iron box that contains a pivoted iron magnet  $S$ , Fig. 15. The pivot is placed below its center of gravity, and the magnet is free to swing between stops in a direction crosswise of the track. When this tilting magnet is against the right hand stop its corresponding service rail is connected, and when it is against the left hand stop the service rail is disconnected. On the car frame are placed two actuating magnets that control and move the tilting magnets as they pass over them. They are indicated as  $E_1$  at the forward and  $E_2$  at the rear end. The forward is placed slightly to the right of the center line of the car, and the rear one is placed a little to the left of the same line. The magnets on the car are given sufficient strength to swing the tilting magnets beneath the track to one side or the other on passing them, and if we imagine the car moving in the direction indicated by the arrows, then the forward car magnet,  $E_1$ , will throw the tilting magnet,  $A_2$ , Fig. 16, over to the right and connect the sectional rail,  $t_2$ , to the feeder

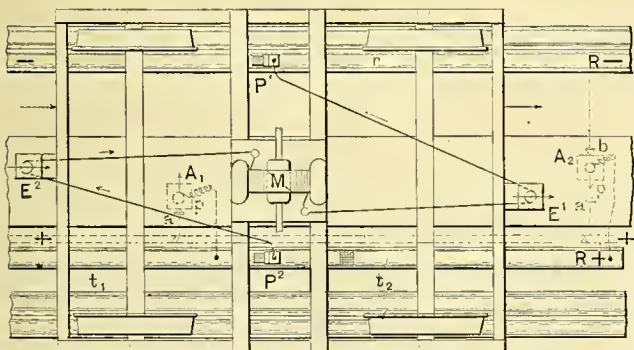


FIG. 16.

main, and soon after the contact brush  $P_2$ , by which current is taken up, will have passed on to this rail, and the rear car magnet,  $E_2$ , being then over the tilting magnet,  $A_1$ , will throw it to the left and cut out the rail section,  $t_1$ , which the car is about to leave.

One objection to the system just described becomes apparent from a moment's consideration. Its operation depends entirely on the certainty of action of the car magnets in tilting those beneath ground, and the system is not designed to the best advantage to do this because the two magnets do not form together a complete iron magnetic cir-

cuit. Thus the car magnets both have north poles downward, and the tilting magnets have south poles upward, which helps the attraction somewhat, but the attraction should be very powerful to be certain, and if the magnets above and beneath ground were so designed as to form when in conjunction a nearly complete magnetic circuit of iron there would then be ample strength and certainty of action with a minimum expenditure of current. With a view to introducing this feature the writer designed a system shown in Figs. 17 and 18, which has some of the features of the one just described.

A moving car magnet  $N S$ , Figs. 17 and 18, and tilting magnets  $n s$  and  $n_1 s_1, n_2 s_2$ , same figures, operate as before to cut in and out middle rail sections  $W_1 W_2 W_3$ , Fig. 18, and the mechanism for this may be contained in boxes buried beneath

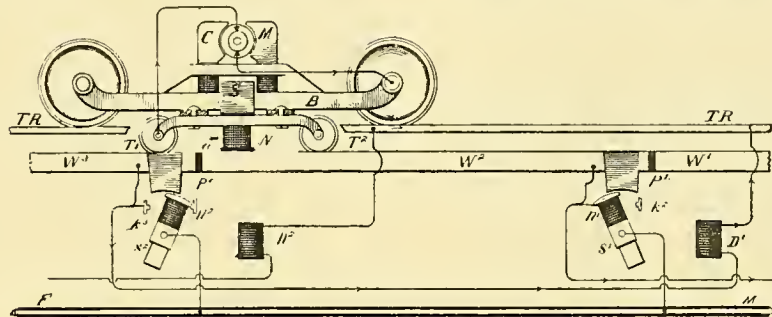


FIG. 18.

the track, one for each sectional rail, or it may be placed in a continuous conduit, a cross-section of either being shown in Fig. 17; the part  $Y$  representing either the frame of a box or the cross-section of a conduit or its yoke frames. The yoke piece  $Y$ , it will be seen, is made with a heavy flaring top and has an open recess  $P$  on each side directly underneath the bipolar magnet  $N S$  on the car and directly over the magnet  $n s$  in the box. In the recesses  $P, P'$  cast-iron paving blocks are inserted that are formed to just fit into and fill these recesses, the two blocks being separated by a wooden beam having a width equal to the space between the car magnet poles. This beam rests on the yoke pieces and serves as a support for the middle rails. In this system the upper and lower magnets when in conjunction have the paving blocks between their respective poles and so form together a complete magnetic circuit of iron, thus insuring certainty of action at high speeds besides affording a very firm and solid structure.

plan, of course, obviates putting down so many boxes—one for every 12 or 15 feet of track—but on the other hand the wire connections from the box to the rail sections are tripled in number and the box apparatus is more complex; so it is difficult to say if anything is gained by this.

The writer will close this article with the description of a system of his own invention designed to remedy some weak points in systems of the most recent type.

To these systems the most obvious, objections, if some must be raised, are: First, the heavy construction cost due to the necessity of laying down so many boxes in building a large and heavy conduit, either 264 boxes to the mile with their inclosed apparatus or a continuous conduit. If this first cost could be materially diminished without sacrificing efficiency it would be a gain.

Second, the continuous running cost of operating the automatic switching devices or box magnets is not inconsiderable.

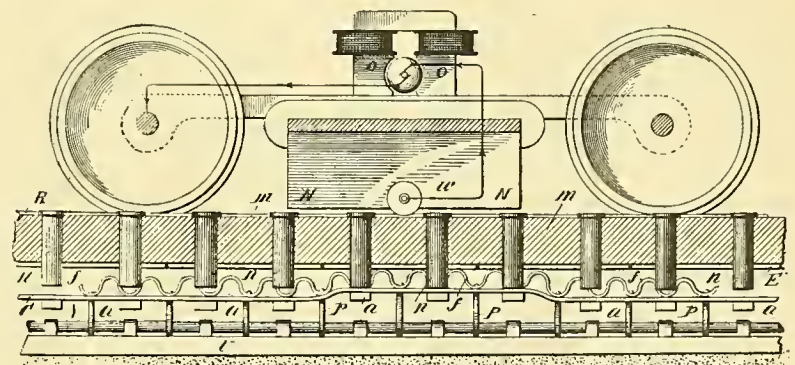


FIG. 20.

A word is necessary to explain how the tilting magnet is thrown back to its normal position after the car has passed its section. When thrown to the forward position, Fig. 18, in which its rail section is connected as  $n_1 s_1$ , which connects the section  $W_2$ , it also connects another circuit which goes back to the box and another magnet  $D$  in the rear which operates a system of levers that throws the last tilting magnet back to its normal position and disconnects the rear working section at the same instant and by the same action that a new one is cut in.

To all systems of this class one evident mechan-

With 150 cars on the road there would be this number of magnets taking current all the time, say 3.3 amperes on a 500-volt circuit, means about 150 H. P. continuously wasted. If this item could be done away with the saving would be great. The Patten system, shown in Figs. 19 and 20, has some novel features that make its construction cost less than an ordinary conduit or box system, more positive and reliable in action than the latter, and there are no magnets external to the car. Two wooden beams,  $M, M'$ , Fig. 19, are laid along the middle of the track, these support the middle rail sections,  $R$ , and also a series of round cast



iron plugs or bolts, which are driven through the wooden beams at intervals of a foot from center to center; they are flared out and rounded at the top, and so offer good protection to the wooden structure and prevent its rapid deterioration. These cast iron plugs are placed in pairs opposite each other at intervals of about a foot along the beams, and their distance apart measured cross-wise of the track being about the same as that between the centers of the car magnet poles.

The car magnet is made about 5 feet long length-wise of the car, and is hung between the wheels so as to clear the cast iron plugs about 1 inch. Thus, owing to its length, it always stands immediately over four or five of the cast iron plugs or bolts which become magnetized by its action, and so form as many prolongations of the poles of the car magnet down into the shallow closed conduit below which need be only about 16 inches by 8 inches in cross section underneath the wooden beams that form a solid cover for it.

The car magnet is energized by a battery on the car, but only slightly, because, as nearly all the lines of force of the car magnet will take the greatly diminished iron path through the plugs of cast iron, these will become very strongly magnetized with but slight magnetization of the car magnet. Just beneath the ends of the plugs are the cast iron armatures *a, a*, which as the car

be altogether superseded, and it is safe to say that some mid-rail closed conduit or box system is the next immediate future in electric railways for cities.

(Concluded.)

**ELECTRIC RAILWAY MOTORS: THEIR CONSTRUCTION AND OPERATION.**

BY NELSON W. PERRY.

(Twenty-seventh Article.)

**LOCATING FAULTS.**

When starting a new car, or one whose connections have been changed, or in fact any car that has come from the repair shops, *always* try the motors *one at a time*, to see that the revolution of the controller handle moves the car in the same direction with each motor.

To find an open circuit in the car wiring, try both controller handles; if one works, the trouble is probably in the other. If neither works, the trouble is probably not in the controllers. If in one controller, throw the canopy switch to "off." Now hold one of the wires from a magneto bell on the iron work of the truck or motors, and touch successively with the other wire, while the handle of the magneto bell is being rapidly turned, the different contact fingers on the controller; if they ring, the ground connection through that finger is

to flatten out the surface so that it will extend over the insulating mica between it and the next block, causing a short circuit. Some authorities say that a hammer should never be used at all and that the high block should be filed down. But whatever the remedy, a commutator that presents either high bars or flats must be absolutely true after treatment, and this can only be insured by turning it down on the lathe.

The lathe is the remedy also for a rough or eccentric commutator or for mica projecting beyond the surface, as well as for unevenly worn commutators. The turning down of a commutator, however, is a nice piece of work and should only be entrusted to experienced hands. The cutting should not go deeper than absolutely necessary to remove the difficulty and should not extend to the outer end of the commutator; a narrow ridge should always be left on the edge. Crocker & Wheeler say: "In turning a commutator in a lathe a diamond-pointed tool should be used, this being better than either a round or square end. The tool should have a very sharp and smooth edge, and only an exceedingly fine cut should be taken off each time in order to avoid catching in or tearing the copper, which is very tough. The surface is then finished by applying a 'dead smooth' file while the commutator revolves rapidly in the lathe." After turning down or sand-papering, the spaces between the commutator blocks should be carefully examined for copper dust or other conducting material. If found, such should be removed. The commutator should be carefully lubricated from time to time,

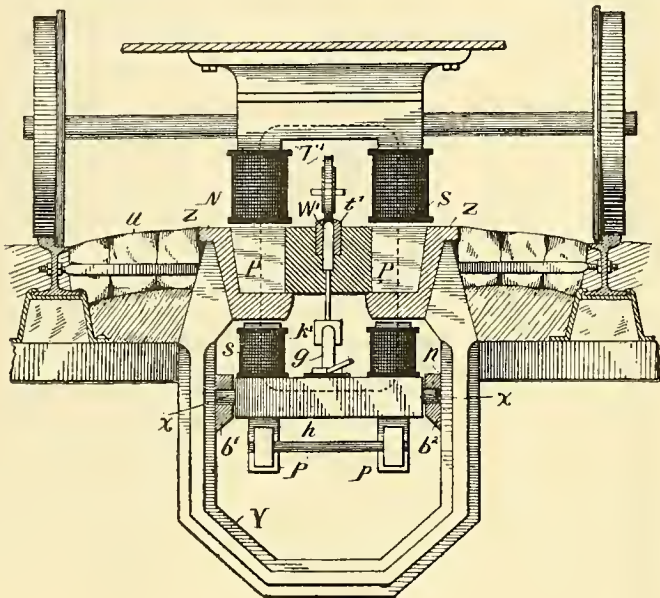


Fig. 17.

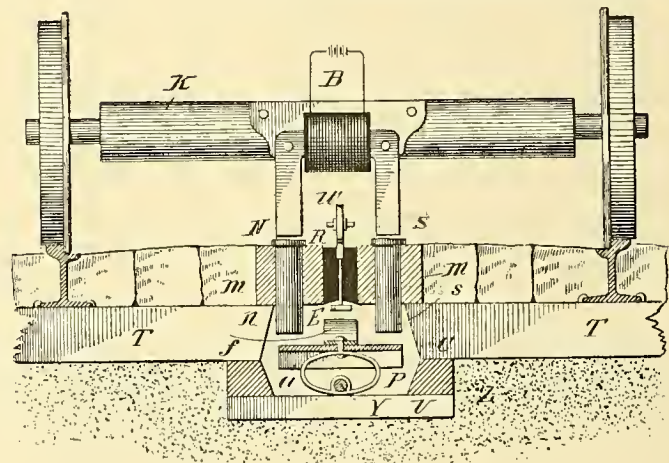


Fig. 19.

moves along are successively pulled up against the ends of the plugs, one dropping off at the rear as the next is pulled up in front.

These armatures on being caught up bring the convoluted ribbon of copper wire which is connected to the feeder main in the bottom of the conduit into contact with the middle rail section above. The iron armatures, weighing only a few pounds apiece, are readily drawn up and firmly held by the magnetism of the iron plugs, and when released fall away by their own weight.

Normally, these armatures are supported at a distance of about an inch from the lower ends of the cast-iron plugs, upon a continuous flexible strip of suitable material, which in turn is supported by a series of copper bands, or a continuous spiral band susceptible of being slightly compressed or flattened under the weight of the armatures; they also serve to connect the convoluted ribbon at the top to the feeder main below. The system has the continuous creeping contact of the Lineff system, and there can be no sparking if sufficient contact points are provided, the detailed arrangements of which need not be described here.

In conclusion, it may be said that these various recent systems have been so thoroughly and carefully worked out by engineers of ability that there is little likelihood of any new system springing up with sufficient novel and meritorious features to eclipse them all. They are too far developed to

all right. If the bell fails to ring through any one of the fingers, you have located the circuit on which the trouble exists. Trace out that circuit and correct the trouble. If all points ring on one controller pursue the same method with the other. If both are all right, look for a break or loose connection in the wire running from the trolley base to the fuse block, or to the canopy switch.

The wearing parts and those requiring the most careful attention are the following:

**COMMUTATORS.**

The color of the commutator is in itself a pretty good guide as to its condition. As long as it retains a good gloss and is of a chocolate color, it probably does not require attention. It should, however, be carefully examined to see that it is clean and true.

To clean it, remove the brushes and then, while the car is running with that motor cut-out, use fine sand paper applied on a block of wood which exactly fits the curvature of the commutator. Never use emery paper, as the emery itself is a conductor of electricity, and particles detached from the paper may find lodgment between the commutator segments and cause future short circuits.

In case of high bars on the commutator, sometimes they may be hammered down by placing a piece of wood or leather between the hammer and the block. Never hammer a commutator block directly with the hammer, however, as it is likely

great care being taken, however, not to use an excess. A little vaseline is perhaps as good a lubricant as anything for either the commutator or controlling switch.

The brushes should be examined frequently—once a day is not too often—and the brush-holders should be cleaned whenever found to be dirty. Brush-holders should never be permitted to become loose, and the brushes should not be allowed to become too short, for in this case, in the adjustment of the holders, the springs will not give sufficient pressure for good contact. Brushes should fit curve of commutator perfectly, and new ones should be filed or sand papered, if necessary, to make a good fit. Brush tips should be kept clean, and should not be allowed to become wedged in the holders.

**THE DROP METHOD OF TESTING FOR FAULTS.**

While it is entirely beyond my province to discuss the methods of electrical testing at this time, there are one or two simple methods that are so generally available that it seems well to introduce them here.

If a break or bad contact in a circuit is suspected it may be readily located by what is known as the "drop method." This is founded on the principle that if everything is normal in a circuit the resistances between any two points equidistant on that circuit should be about the same. If one terminal



of a galvanometer be fastened to one point of a circuit and the other be successively applied to other points on the same circuit at equally increasing distances, the needle will register in a circuit which is intact a regular increase of deflection with every successive point touched. The reason for this is that the galvanometer being connected up in parallel with the conductor registers the relative resistance of the portion of the circuit tested and that of its own circuit. The latter being fixed, the indications will be greater as the resistance of the circuit measured is greater. If when the galvanometer wire touches a new point on the circuit, the increase of deflection is much greater than it should be, it indicates that there is trouble between this point and the last one touched. A common way of applying this method is to fix the two terminals in a handle of some kind, so that their distance is not varied, and then move these two terminals along the circuit. Since the length of wire measured in this case is always the same, the reading of the galvanometer will always remain the same if everything is right. If the deflection increases at any point, the trouble is at once located between the two terminals of the galvanometer. In testing for breaks in the armature coils the two points are applied to adjacent commutator blocks all around the commutator. The deflection of the galvanometer should not vary between any two successive segments, but if it does, there is a loose connection or a break somewhere in the coil or connections between the two.

INSULATION TEST.

Another simple test that is not only of great use, but also available to even the least technical if he have but a magnetic bell, is the test for insulation resistance. It is very desirable to know that those portions of your apparatus that should be insulated from each other are so insulated as for instance the armature windings from the armature core or the brush holder from the brushes. The ordinary magneto bell is rated to ring through from 10,000 to 30,000 ohms resistance. If, therefore, one terminal of the bell be connected to each of the parts that should be insulated from each other, as, for instance, the armature shaft and a commutator-segment, or the brush and the brush-holder, and the bell can then be caused to ring, it indicates either a very poor insulation between the parts, or else a bad short circuit. Its failure to ring does not, however, indicate that the insulation is perfect or sufficient, since it merely indicates that the resistance is somewhat greater than 30,000 ohms (if that be the resistance through which it is rated to ring), whereas, the insulation resistance between armature coil and core should not be less than 100,000 ohms for every 100 volts used on the circuit. This test should, therefore, be considered only as a crude one and more as a test for short circuit than as a test for insulation.

A much more reliable test is that known as the *voltmeter test*. This requires a sensitive high resistance voltmeter, such as the Weston. The Weston 150-volt instrument usually has a resistance of its own of about 15,000 ohms. (Its exact resistance is always stated on a certificate pasted inside the case). Apply the galvanometer first to some circuit or battery having a high electromotive force—say 100 volts—and note the deflection of the needle. Then connect the parts whose insulation resistance is to be tested with this same circuit in series with the voltmeter—if the armature resistance is to be tested, for instance, connect one terminal of the circuit with the armature shaft and the other with one terminal or binding-post of the machine, and note the new deflection. It will be less than before, because an increased resistance (the insulation resistance) has now been placed in series with the galvanometer resistance. The insulation resistance will then be found by the equation: Insulation

$$\text{resistance} = \frac{D \times R}{d} - R, \text{ in which } D \text{ is the de-}$$

flection due to the galvanometer alone;  $d$  = the deflection when the machine is in series with the galvanometer, and  $R$  is the resistance of the galvanometer or voltmeter. Thus if the circuit employed in testing is 100 volts, then  $D = 100$ . If the second deflection, viz., that through the galvanometer (say 15,000 ohms), plus the insulation of the machine is 1, our equation becomes: Insulation resistance

$$= \frac{100 \times 15,000}{1} - 15,000 = 1,485,000 \text{ ohms.}$$

BEARINGS.

The importance of keeping the bearings in first-class order will, of course, be apparent at once. Be watchful at all times that they do not become too much worn, else the armature is likely to strike against the fields and become ruined. If, on inspection, you find that the clearance between armature and pole pieces is becoming small, put in new bushings at once. Do not wait until the clearance becomes dangerously small. Looseness of the armature bearings can be detected by lifting on the armature first at one end and then at the other. Loose bearings on the main axle may cause gears to break by reason of their being thrown out of alignment. The grease boxes on the motor should be given careful attention, and should be filled every night or morning before the car is sent out. There is no economy in using an interior lubricant—rather the reverse; but the best grease is liable to thicken, and before adding fresh, the old should be stirred up with a little oil. In removing covers to inspect grease boxes, be careful that none of the dirt or sand falls into the boxes. Occasionally all the grease should be removed, the boxes thoroughly washed with gasoline, and a small quantity allowed to run through the bearings to cut any grease which may have found lodgment there and hardened.

GEARS AND PINIONS.

The life of the gears and pinions depends very largely upon the intelligent care they receive. Proper lubrication is one of the most largely contributive agencies toward long life, but they should be carefully examined every night to see that they have not become loose on the shaft. Since they usually have tapering seats, they may be tightened by firmly tapping them with the hammer. With this frequent examination there is no danger that they will become unduly worn without your knowledge. Tighten up all the bolts whenever examining them. Drive up the key or feather to insure tightness of gears and pinions, and if these are too much worn, throw them away and substitute new ones. The unusual "knocking" noises sometimes heard when the car is in operation are usually due either to worn keys, worn-out gears, or to some hard object which has become lodged between the teeth. This knocking sound is a warning that must be heeded at once, and the above causes are the first to be suspected. Investigate, and if the pinion is worn out, throw it away and put on a new one with a new key. A new pinion will not, however, go well with an old and worn gear. If the gear be but slightly worn and too good to throw away, keep it to go with some slightly worn but equally good pinion, but don't allow a new wheel to mesh into an old one.

On fitting new gears note carefully that the teeth mesh properly before putting them into use. This is best done by revolving the armature by hand while the car is jacked up. The fitting of new gears is a nice operation, and should not be entrusted to any but a responsible person.

CONTROLLERS.

The controllers should be thoroughly overhauled every night; the contact rings and fingers cleaned and polished when found to be rough, and a little vaseline rubbed on; the screws that held the contact rings should be tightened if loose, and the ratchet wheel and pawl at the top of the cylinder, as well as the upper and lower bearings of the cylinder, should be carefully lubricated, taking care, however, that too much lubricant is not used and that it does not run down upon the cylinder. In equipments not employing the usual platform cylinder, the equivalent parts beneath the car should receive their appropriate attention. When

ever a part becomes worn it should be replaced. In fact, the directions in regard to the controlling devices may all be summed up thus: See that they are in perfect order every night or morning before the car leaves the stables.

WINTERS' BRAKE APPLIANCE.

The accompanying illustrations represent an appliance which is designed to make the brake of a street car self-acting. The device, which is the invention of David L. Winters, of Pueblo, Colo., is a friction clutch that is supported by the axle, and has a chain attached to it connecting it with the brake rod. The axle revolves inside the clutch, and when the brake is not in use the clutch rests about one-quarter of an inch from the car wheel. When it is desired to apply the brake the clutch is

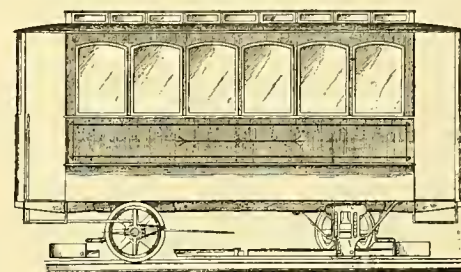
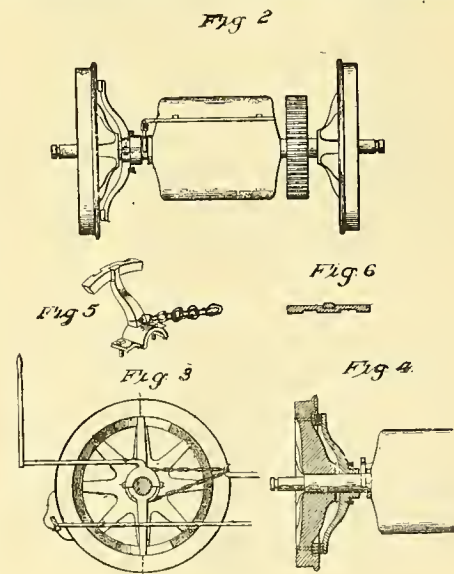


Fig. 1.

pressed against the car wheel, and as it turns with the latter it winds up the brake chain. It is immaterial what kind of a brake is used, as it is apparent that the clutch will draw from any direction, and the direction in which the wheel turns makes no difference. In Pueblo the inventor is using the clutch in connection with an improved rocker shaft brake on a McGuire truck. It is stated that by merely laying the hand on the lever the car may be brought to a stop as quickly as may be desired. In case of an accident the wheels may be locked instantly by a very slight exertion. Power sufficient to accomplish this may be applied, it is stated, by one finger. As the clutch is but a quarter of an inch from the car wheel, it is apparent



Figs. 2 to 6.

that almost any amount of leverage can be brought to bear with but little hand play. With an appliance which the inventor has just designed, the clutch can be operated from each end of the car with the same effect.

Of the accompanying drawings, Fig. 1 represents the most simple way of applying the clutch. The inventor's first experiments were conducted with such an application of the clutch. Fig. 2 is an end elevation, Fig. 3 a side elevation, and Fig. 4 a section. Fig. 5 illustrates half the entire clutch, showing one arm, one shoe, one-half of the drum and the chain. A circular band may be attached to the arms of the clutch instead of the



shoes. In the inventor's experiments the effect of the band and the shoes was practically the same.

The clutch which the inventor is using in Pueblo is somewhat different from that shown in

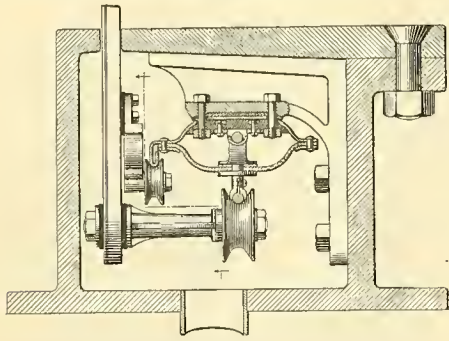


Fig. 1.

the drawings. It has four arms instead of two and is made of light wagon tire iron. When the clutch is cast, two arms, which may be made as heavy as desirable, will be adequate. The clutch which has been in use on a car in Pueblo for several months has given great satisfaction.

**ASHLEY'S UNDERGROUND ELECTRIC RAILWAY SYSTEMS.**

In the accompanying illustrations are shown some details of two systems of underground electric railway conduits invented by Frank M.

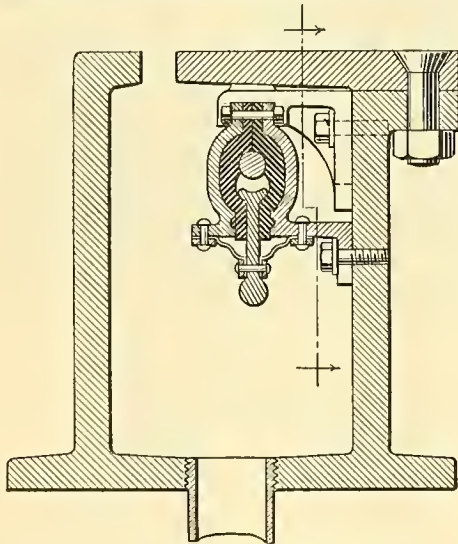


Fig. 2.

Ashley, a mechanical and electrical engineer of New York City. Fig. 1 shows a sectional view of the conduit, consisting of a box-shaped structure, having a slot at one side through which the trolley arm projects into the conduit. It will be noticed that the cover is held in position by a bolt and rests on a bracket. This bracket is in turn bolted to the side wall of the conduit proper, thus forming a strong support for the top of the conduit. The bracket also supports from its under side a conduit. This conduit is made water-tight



Fig. 4.

and consists of a top plate of metal having one of its sides turned under. It is used as the return conductor in this system, or if the rails are used as the return in the ordinary manner this may be dispensed with. The main conductor is held in insulated clamps within a sealed compartment. The sectional conductor is held by the under portion of the flexible material. The trolley arm supports two trolley wheels, as shown, the lower one being the current collector and the upper one the return conductor to the metal top. The

trolley wheels carried by the car are drawn along in contact with the conductors, and as the under portion of the sealed conduit is flexible the conductor is raised until the shoe on the opposite end engages with the main conductor.

The current consequently flows from the conductor through the trolley wheel and arm to the mo-

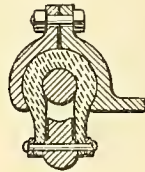


Fig. 3.

tor and returns to the opposite conductor through the upper trolley wheel.

Fig. 2 shows the same character of conduit, in which another method of supporting the conductor is used. Here the return current is carried through the rails. Fig. 3 shows a modification of the sectional conductor. This is made sufficiently flexible by dividing its upper rim as shown in Fig. 4. This method saves the trolley arm from carrying a whole length of sectional conductor at one time. The inventor claims that the system as thus constructed can be easily inspected and repaired,

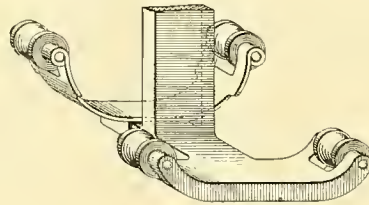


Fig. 7.

and that it would be cheap in first cost as compared with a cable system. It is specially designed for resisting the strains of heavy traffic.

Still another system invented by Mr. Ashley is shown in Fig. 5, 6 and 7. This is also a conduit system, having a slot in the top of the conduit through which the trolley engages the working conductor. Fig. 5 shows a horizontal portion of the interior of the conduit proper and a sectional view of the method of insulating the main conductor and the contact making devices. Fig. 6 shows a sectional view of the box which supports the sectional conductor, and Fig. 7 shows the collecting trolleys. As shown in Fig. 5 the main conductor is insulated from the pipe which contains it by a rope of insulating material wound around it. The contact boxes are shown in detail in Fig. 6.

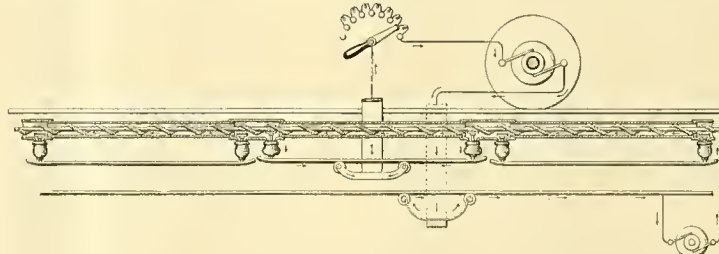


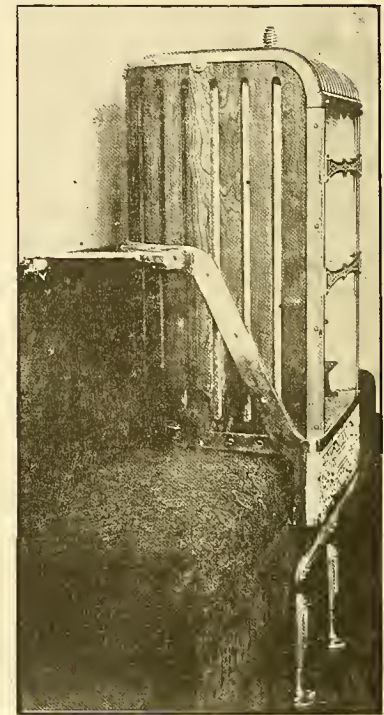
FIG. 5.

The electrical circuits are shown in Fig. 5. The path of the current will be readily understood from an inspection of the figure. As the car travels along, the collector raises successively the sectional contact bars into contact with the main conductors; and as the carrier leaves one section, it drops by gravity and the next section is raised into contact with the conductor. As each box is water-tight,

no moisture can collect on the main conductor and it is claimed that although the conduit should be flooded with water, the cars could still be operated, as the leakage would be small.

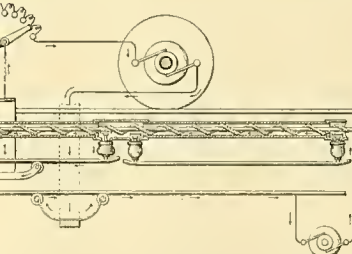
**COLUMBIA MAGAZINE CAST-IRON STREET CAR HEATER.**

The accompanying cut shows the Columbia street car heater, as manufactured and sold by the McGuire Manufacturing Company, of Chicago. It will be noticed that very important additions have been made since last year. In the first place the frame intended to hold the stove in position is made of a solid casting, and embraces the front apron, the strap that passes around the back, and the arms that fasten it to the top of the seat rail, all in one piece. It will be noticed that the legs



Columbia Heater.

are made adjustable, so that the frame can accommodate itself to any form of car seat, and when in position look like the arms of any easy chair, and are as firm as any part of the car. This frame is first set in over the car seat, the legs adjusted and fastened, and then the stove is simply lifted into position. This operation can be finished inside of ten minutes by any ordinary mechanic, and when the stove is in position it cannot be disturbed except by the use of tools. It is adjusted so as to rest above the cushion, apparently resting upon it. It can be placed in any car without cutting or fitting either the stove casing or the car seat. It does not rest upon, and, consequently, does not wear out either



the seat, cushion, or coverings, either front, top or back. It can be set upon the floor of the car, and for this purpose a handsome stand is used, placing the stove at any height desired by the railway people. It is a self-feeder, holding twelve hours' fuel, and, it is claimed, it requires no attention whatever from conductors. The fire is supposed to be started before the car leaves the barn, so that



the car goes out warm in the morning. It is but actually an ornament to any car. It is said to burn one pound of hard coal per hour, heating a 21-foot car, equal to a cost of about five cents per day. The exterior is always cool, so that the passengers can sit in actual contact with it, and cannot burn themselves. Patents have been allowed and the McGuire company has purchased the sole right of sale and manufacture.

**TESTS OF SMALL ELECTRIC RAILWAY PLANTS.\***

BY JESSE M. SMITH.

This paper gives the results of a test made in October, 1893, on the power plant of the Wyandotte & Detroit River Railroad, which is a suburban road running from Detroit to Trenton, Mich., 10.5 miles long.

The plant contains two tandem compound condensing engines, rated at 150 H. P. each, and guaranteed for a maximum load of 225 H. P., made by the Phoenix Iron Works Company, Meadville, Pa. Each engine is belted direct to a Westinghouse railway generator of 150 E. H. P. The vacuum is obtained by a Conover air pump and condenser belted directly to the engine shaft. The boiler feed pump is driven from the air pump shaft. Steam is supplied by two Manning vertical boilers. One engine and dynamo only were used during the test. It will be noted at the outset that each engine and dynamo are designed to deliver an average of 150 H. P., but that during the test the average load on the engine was only 70 I. H. P. and the maximum 141 I. H. P. The best conditions of economy were therefore not realized. The test was made under commercial conditions for the owners of the plant. All the machinery had been run about three months and no adjustments by the makers had been made since it was first put in. No special care had been taken to get very close regulation either of the engine or generator. One boiler was fired with coal, and used exclusively to supply steam for the fuel atomizer of the other boiler; "straight crude oil" was used exclusively as fuel for the boiler, which supplied steam to the engine, and no steam was used from that boiler for other purposes. Indicator cards were taken at intervals of five minutes during the 17½ hours of the test. A Tabor indicator was applied directly to each end of each cylinder, and all operated by the same mechanism. Indicator cards were taken simultaneously from the four indicators by two persons on a signal given at the proper time, without regard to the load on the engine. The speed of the engine was determined by a continuous revolution counter which was directly connected to the shaft of the engine. The variation of speed was shown by a tachometer belted directly to the engine shaft, and constantly in service. It was carefully compared with the revolution counter when on constant speed, and was made to agree with the counter. The speed of the dynamo was taken at four different times by a revolution counter held in the end of the shaft for five consecutive minutes each time. Three readings gave 604 revolutions, and one reading gave 603 revolutions, per minute. The speed of the air pump was taken in the same way.

The steam gauges on the boilers were connected to the boiler near the bottom, so that they show the pressure due to a head of water of about ten feet in addition to the steam pressure. The boiler gauges therefore show about five pounds more pressure than the pressure of the steam in the boiler. The standard gauge, when placed on the steam pipe of the engine just above the throttle valve, showed about five pounds less pressure than the boiler gauge, so that there was practically no loss of steam pressure between the boiler and engine.

The amperes were measured by a Weston standard ammeter connected in series with the station ammeter. The volts were measured by a Weston standard voltmeter connected to the bus

\* Abstract of a paper read before the American Society of Mechanical Engineers.

bars of the switchboard. Volt and ampere readings were taken every ten seconds by a different person at each instrument, the time being given by a third person.

The water used by the boilers was taken from the overflow of the air pump, and weighed in two barrels on two scales, and was pumped from the barrels by the regular feed pump worked from the shaft of the air pump. The feedwater passed through a closed heater with brass tubes, the heater being connected with the exhaust pipe between the engine and condenser. The fuel oil was stored and fed by the Snell water pressure system. The amount of fuel oil fed to the atomizer was measured by measuring the number of gallons of water which flowed into the storage tank.

The dimensions of the plant and data, and the results, are given in the following tables:

**Boilers.**—Kind, Manning vertical tubular; number, 2; size, known as 61 inches; rated capacity, 150 H. P.; inside diameter of firebox, 6 feet; height above grate, 3 feet 6 inches; number of tubes, 184; outside diameter of tubes, 2½ inches; total length of tubes, 14 feet 10 inches; length of tubes below water line, 10 feet 7 inches; heating surface in firebox, 89.2 square feet; heating surface in tubes below water line, 1,272.7 square feet; heating surface in tubes above water line, 511.1 square feet.

**Engine.**—Kind, Phoenix Iron Works Company tandem compound, condensing; diameter of high pressure cylinder, 11½ inches; diameter of low pressure cylinder, 20½ inches; stroke of piston, 15 inches; piston valves on both cylinders, both controlled by shaft governors; number of flywheels, 2; diameter of flywheels, 78¾ inches; face of flywheels, 16¾ inches; weight of rim of each flywheel, 2,445 lbs.

**Air Pump.**—Kind, Conover, belted to engine; size, No. 7; diameter of piston, 15 inches; stroke of piston, 7 inches; revolutions per minute, 67.

**Boiler Feed Pump.**—Kind, single acting plunger driven from shaft of air pump; diameter of plunger, 3 inches; stroke, 6 inches.

**Dynamo.**—Kind, Westinghouse four pole railway generator; rated capacity, 150 E. H. P.; standard speed, 625 revolutions per minute; speed when tested, 604 revolutions per minute.

**Cars.**—Maker, Jones; length 16 feet; weight, 11,500 pounds; number of seats, 22; kind of motors, Westinghouse; number of motors, 2; rated power of each motor, 30 E. H. P.; number of cars in use, 3.

**Road.**—Length, 10.5 miles; kind of rail, T; weight of rail per yard, 52 and 56 pounds; supported on cross ties; ties covered with sand, and resting on sand, except from Wyandotte to Trenton, which is stone ballasted.

**SPEED OF ENGINE AS CONTROLLED BY GOVERNOR.**

Revolutions per minute by revolution counter, average for eight minutes with dynamo belt off.....	238 revolutions
Average revolutions per minute on regular work during 362 minutes.....	234.3 "
Percentage of variation of revolutions....	1.58
Minimum revolutions per minute, dynamo producing 180 amperes, engine developing 165 I. H. P.....	227 revolutions

**DISTRIBUTION OF POWER USED.**

Power consumed by friction of engine, air pump and boiler feed pump, with main belt off.....	9.22 I. H. P.
Friction of engine, air and feed pumps, and dynamo, with brushes off.....	11.34 I. H. P.
Friction of dynamo and belt.....	2.12 I. H. P.
Power consumed by engine, air and feed pumps and dynamo, with brushes on and main circuit open.....	14.34 I. H. P.
Power required to charge fields of dynamo.....	3.00 I. H. P.
Percentage of engine capacity required by friction of engine, air and feed pumps.....	5.15
Maximum power developed by engine as shown by indicator cards, during economy test.....	141.1 I. H. P.
Minimum power developed by engine, as shown by indicator cards, during economy test.....	21.27 I. H. P.
Average power developed by engine, as shown by 208 sets of indicator cards, during economy test.....	70.1 I. H. P.
Average electrical horse power delivered by dynamo.....	45 E. H. P.
Average indicated horse power delivered to pulley of dynamo, estimating friction of armature shaft to be the same as friction of belt.....	59.81 H. P.
Average number of cars in use during test.....	2.89 cars
Number of passengers on cars during 17½ hours.....	1,014
Average number of passengers on cars per single trip.....	15.2
Average number of passengers on cars at any one time (estimated).....	8

Weight of 10 persons at 140 pounds each.....	1,400 pounds
Weight of cars.....	14,500 pounds
Total weight of cars and persons.....	15,900 pounds
Average weight in motion.....	44,950 lbs.
Average electrical horse power per 1,000 lbs. of weight moved.....	0.98 E. H. P.
Average horse power developed by engine per 1,000 lbs. of weight moved.....	1.52 I. H. P.
Average electrical horse power per car.....	15.54 E. H. P.
Average horse power developed in engine per car.....	24.25 I. H. P.
Average watts delivered by dynamo per horse power developed in engine.....	478.8 watts
Average watts delivered by dynamo per horse power delivered to belt of dynamo.....	557.3 watts
Average speed of cars per hour, including all stops, twenty-one miles in 1.5 hours.....	14 miles per hour
Average speed of cars between stops.....	15.38 miles p'r h'r
Total car-hours.....	50.25
Time of test.....	17.33 hours

**ECONOMY TEST.**

Duration of test.....	17½ hours
Average horse power developed in engine as shown by 208 sets of indicator cards taken at five-minute intervals.....	70.1 I. H. P.
Average horse power delivered by dynamo as shown by 6,209 sets of readings taken at ten-second intervals.....	45 E. H. P.
Net average steam pressure in boiler by half-hour readings.....	111.8 lbs
Average vacuum by half-hour readings.....	25.2 ins.
Steam used by engine per hour.....	1,721.1 lbs.
Steam used by engine per horse power per hour.....	24.55 "
Steam used by fuel oil jet per hour.....	291.5 "
Steam used by engine and fuel oil jet per hour.....	2,008.8 "
Percentage of steam used by fuel oil jet, fuel oil used per hour for engine, 20.25 gals.....	133 lbs.
Fuel oil used per horse power per hour for engine.....	1.9 "
Additional fuel oil which would be required to maintain oil jet for one hour.....	22.58 "
Average temperature of water flowing from air pump.....	91.8° Fah.
Average temperature of feedwater entering boiler.....	126.6° "
Rise of temperature of feedwater due to heater.....	34.8° "
Percentage of fuel saved by heater.....	3.06%
Fuel oil required to evaporate 1,000 lbs. of water from 126.6° Fah. into steam at 112 lbs. pressure.....	11.79 gals.
Water evaporated from 126.6° Fah. into steam at 112 lbs. pressure per gallon of fuel oil.....	84.81 gals.
Ditto per pound of oil.....	12.9 lbs.
Area of steam outlet of atomizer.....	.07 sq. in.
Which is same as a round hole .3 in. diameter.	

It will be noted that 14.5 per cent. of the total steam generated was used by the fuel oil atomizer. The atomizer was not properly proportioned for the work, and did not receive enough air. The flame was red and evidently not economical. The atomizer and furnace have since been arranged with much better results.

In this engine the piston valves which distribute the steam to both high and low pressure cylinders are controlled by the governor.

It will be noted that while this is a condensing engine the high pressure cylinder does a good share of the work even on the lightest loads, and the receiver pressure does not vary greatly either during a single revolution, or during a change of load of from 21 to 101.8 H. P. While the load changes 488 per cent., the average receiver pressure only changes 167 per cent., and even when the engine ran with the belt off and developed 9.2 H. P., there was no negative work in either end of either cylinder. These results, which I believe to be highly important, both for economy and close regulation, are due to the valves of both cylinders being controlled by the governor.

The results of a study of the indicator diagrams are given in the following table:

I. H. P. in H. P. cylinder	Set No. 1.	Set No. 2.	Set No. 3.
Crank end.....	2.4	13.8	25.3
Head end.....	2.5	14.8	26.1
I. H. P. in L. P. cylinder			
Crank end.....	8.3	16.6	25.2
Head end.....	7.8	17.6	25.2
Total I. H. P. in receiver	21.0	62.8	101.8
Maximum pres. in receiver	5.9	9.0	11.0
Minimum " " "	4.0	6.4	7.5
Average " " "	4.9	7.2	8.2



The variations in load in a plant of this kind are not only extreme, but rapid, and were from 5 to 134 amperes. In one interval of 10 seconds the load increased 115 amperes, which equals 120 i. h. p.

During the regular operation of the plant and with these extreme variations in load, the needle of the tachometer never left the space enclosed by the 230 and 240 revolution marks.

NEW ENGLAND NOTES.

(From Our Special Boston Correspondent.)

**STRIKE AT NORTH WOBURN, MASS.**—There is a determined strike in progress on the North Woburn street railway, which system is practically owned by Messrs. A. F. Breed and E. C. Foster. The men have asked for an increase of wages which the company refuses to give. The road has been completely tied up so that not a single car is running. On Monday evening the men held a protracted meeting and decided not to submit the matter in dispute to the state board of arbitration, but to hold out a while longer for the increase of wages asked. A somewhat novel feature of this strike is that the men have secured nearly a dozen "barges" and sufficient number of horses to work them and are doing all the carrying business there is to be done. It is reported that the company is going to try to run its cars without the help of any of its former employees. The strike is exciting a good deal of interest, as the road runs through a very populous district, and the public is fairly supporting the new barge line; indeed, it is stated that the men are actually making more money than if they were working for their regular wages.

**WORCESTER, MASS.**—A matter of some importance to street railway companies has been brought up in Worcester, Mass. The city solicitor, in an opinion written at the request of the aldermen, has decided that the board of alderman has no authority to license one electric street railway to run over the tracks of another company. He says, however, that there is no valid objection to two companies combining for a joint use of track if the aldermen are willing.

**ANNUAL PICNIC OF EMPLOYEES.**—The employees of the Lynn and Boston Street Railway Company have just had their annual outing at the Salem Willows, a delightful summer resort reached by the road. It was an evening picnic and proved a great success. Special cars were run to the rendezvous from Chelsea, Lynn, Marblehead, Danvers, Beverly, Salem and Wenham to convey the employees. General Manager Foster was present.

**LEWISTON, ME.**—The Lewiston and Auburn (Me.) Horse Railroad Company has disposed of its entire system to Mr. N. O. Pope, a New York capitalist. Mr. True, representing the General Electric Company, is interested in the undertaking. The road will now be equipped with electricity.

**CARS** are now running regularly between Dartmouth and Westport, near Fall River, where a week or two ago there was a dispute between the electric railway company and the New York New Haven and Hartford Railroad Company.

FINANCIAL DEPARTMENT.

Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

THE STAGNATION IN BUSINESS that marks all quarters of the financial world as a result of the distrust and uneasiness created by the serious labor troubles on the Western railroads has affected the market for street railway bonds and stocks as much as any. A broker who for the last five years has practically devoted himself exclusively to this branch of the securities market tells your correspondent he has never within his range of experience, covering, as it does, practically Wall Street's entire record of street railway stock and bond quotations—witnessed such utter suspension of all trading in street railway securities as was noted in the last ten days. That investors and speculators should hesitate in making new ventures is not strange when one appreciates the real gravity of the situation. Here is present a state of affairs where law and order, and vested rights of corporations and individuals are set at utter defiance by mobs of unorganized traffic disturbers. The spread of confidence resulting from a cessation of the gold export movement and the elimination of tariff legislation as a factor in the financial situation has been rudely arrested, and a blow has been dealt to commercial progress that far outweighs in effect and importance the baneful influence of the bituminous coal miners' strike and of the other causes above mentioned. How much business has been interfered with can be understood when one knows that makes a specialty of the stock, and ordinarily effects the transfer of

a few hundred shares a week, vouchsafes the information that it has not made a trade in Third Avenue shares in two weeks. This absence of business is more remarkable when it is remembered that the first of July always witnesses the distribution of many millions of dollars in interest and dividend disbursements that always seek street railway securities and other purely investment offerings as a source of profit. This year some \$125,000,000 were distributed in the various Eastern centers of finance; yet very little of this vast sum has been put into anything but bank vaults, people with money preferring to await the outcome of present conditions before feeling inclined to invest in anything that may be adversely affected by labor troubles. The President of the National Association of Street Railway Employes denies that the members of his organization will help along the anarchistic campaign of Debs, Sovereign & Co. by striking, but this has not resulted in re-awakening the demand for street railway securities.

**SOME TRADING.**—Of course it should not be understood that there is absolutely nothing doing. There is still a market for securities, and good offerings still find favor, but the trading is chiefly confined to the big houses. For instance the \$500,000 City and Suburban 5s. offered for subscription at 104½ and accrued interest by Messrs. Alexander Brown & Sons, of Baltimore, were all closed out on the first day subscriptions were opened, thus showing that there still is a chance for good cheap issues to be disposed of.

**METROPOLITAN TRACTION** has been granted permission by the New York State Railroad Commissioners to build and operate a cable road on Lexington avenue, between Twenty-third and Thirty-sixth streets, and on Twenty-third street, between Broadway and Lexington avenue, so as to connect the company's cable roads on the two last named thoroughfares. The Traction people argue from the ease with which they obtained this right that they will have no greater difficulty in securing permission from the Board of Aldermen to lay and operate cable roads on St. Nicholas and Manhattan avenues, for the franchise of which they are fighting against the Third Avenue Railroad people. The Lexington avenue cable is being rushed to completion and horse-cars will soon be run on the tracks from Thirty-sixth to Ninety-sixth street. Work will soon be begun on the cut through the Manhattan Elevated Railroad Company's property at One Hundred and Second street. Condemnation proceedings to open Lexington avenue at this point will cost the city a round \$100,000. It will not cost the Traction company a cent, and will be of benefit to it and it alone, as the ground on either side will continue to be owned by the elevated railroad people, and taxpayers will not reap a cent's worth of advantage, except so far as they secure improved transit facilities. This shows what kind of a pull the Metropolitan Traction Company has with the city authorities.

**THE JUNE STATEMENT** of the Columbus (O) Street Railway Company, in which New York and Philadelphia capital is largely interested, control of the property being invested in a local syndicate, makes a favorable showing. Its gross earnings for the month aggregated \$50,355, an increase of \$376, while operating expenses amounted to \$21,288, a decrease of \$9,451, thus making its net earnings \$29,066, an increase over June, 1893, of \$9,828. For six months ended June 30, gross earnings footed up a total of \$264,272, an increase of \$3,710, while operating expenses decreased \$42,858 to \$128,280. Net earnings were, therefore, \$135,992, an increase over the same period of last year of \$46,568. All these decreased operating expenses are due to the introduction of the trolley.

**BOSTON** sends a report that the recent good buying of West End Street Railway stock is for the account of a new interest which will result in a change in management, but the report so far lacks confirmation.

Financial Notes.

**Increased Earnings.**—The New England Street Railway Company's earnings for the week ending June 30 were as follows:

	1894.	1893.	Inc.
New Haven.....	\$5,479	\$5,095	\$384
Plymouth.....	659	611	48
Total.....	\$6,138	\$5,706	\$432
Month of June:			
New Haven.....	\$22,191	\$19,715	\$2,476
Plymouth.....	2,761	2,453	308
Total.....	\$24,952	\$22,168	\$2,784

**Detroit, Mich.**—It is stated that Contractor Thomas Nevins, of Orange, N. J., has purchased the street car lines in Detroit. The contract was signed last week. Mr. Nevins had the option, which expired on July 9. English capitalists were anxious to secure the roads, and induced the Mayor

of Detroit to delay granting the franchise beyond the time named, in the hope of defeating Mr. Nevins. Mr. Nevins went to Detroit last week and closed the deal. He will pay for the roads, which comprise 80 miles of tracks, 30 of which are already equipped with the trolley system, \$3,250,000, of which \$4,000,000 will be in cash and the balance in bonds.

**Sioux City, Ia.**—Receiver Moller, of the Sioux City Cable Railway Company, has filed his final report. He states that he has turned over all the company's property to the consolidation company and that of \$9,746.12 in cash he has turned over \$9,000. He asks the permission of the court to keep the remainder as compensation for his services as receiver.

**Street Railway and Illuminating Properties.**—Trustees of the Street Railway and Illuminating Properties have further set aside \$60,000 to buy in their preferred shares. The trustees have canceled 456 additional shares of the preferred stock, paying \$98.48 per share. This makes a total of 11,943 preferred shares canceled to date.

**Madison, Wis.**—Col. W. L. Moore has been appointed by Judge Siebecker as receiver for the Madison Street Railroad Company on application of the Four Lakes Land and Improvement Company. The claims against the road aggregate \$8,000.

**Westinghouse Business.**—It is stated that the Westinghouse Electric and Manufacturing Company's June business was above \$500,000. Prospects are that July will be still better.

**Duluth, Minn.**—The Duluth Street Railway Company has filed with the Secretary of State a thirty-year 5 per cent. mortgage for \$2,500,000, that is given to the Manhattan Trust Company, as trustee, to secure a new issue of bonds.

**Dividend.**—The New England Street Railway Company has declared its regular quarterly dividend of one per cent., payable July 16, to stockholders of record July 12.

NEW INCORPORATIONS.

**Port Jervis, N. Y.**—The Delaware Valley Railway Company, of Pennsylvania, capital \$1,000,000, has been chartered. The treasurer, Simon Friedberger, is also treasurer of the Wakefield Electrical Engineering Company, of Philadelphia; Mr. Ellicott Fisher is president and Mr. Michael W. O'Boyle, secretary. Among other incorporators are G. H. Lang, Joseph S. Potsdamer and Louis Lang. This company will construct and operate 40 miles of road, from Port Jervis, N. Y., to Stroudsburg. A large force of men will begin the work at both ends of the line at once, and at least 25 miles will be built before the end of the year.

**Elizabeth, N. J.**—Articles of incorporation for the Duluth and Superior Traction Company have been filed at Elizabeth with the clerk of Union County. The company's capital is placed at \$2,000,000. It will engage in the business of constructing and operating electrical street railways in the cities of Duluth, Minn., and Superior, Wis. The incorporators are Edward V. Douglas, of Philadelphia; John H. Davis, of New York; and Frank Bergen, of Elizabeth. Mr. Bergen is the counsel in New Jersey for the Consolidated Traction Company.

**Minneapolis, Minn.**—The United Electrical Corporation has filed articles of incorporation with the State auditor. The incorporators are George R. Kibbe, Paul W. Bossart, John H. Finney and Samuel Grant. The company will manufacture and sell electric lighting and heating, power and street railway plants, and will own and operate telephone lines, besides dealing in telephone appliances. The capital stock is placed at only \$10,000.

**Waukegan, Ill.**—The Bluff City Electric Street Railway Company at Waukegan has been incorporated with a capital stock of \$200,000, to operate an electric street railway, etc. Incorporators, Dewitt L. Jones, S. D. Talcott and Charles Whitney.

NEWS OF THE WEEK.

**Philadelphia, Pa.**—The first trolley car ran over the Fourth and Eighth streets line of the People's Traction Company early in the week. Additional trolley cars will be added every day, the horse cars being gradually retired, until in a week or 10 days, it is hoped, all the horse cars will have been replaced. The People's Traction Company has 300 new cars for the lines it intends to put in operation within the next few weeks. Half of them are summer cars, 40 of which were built by the Lamokin Car Company. The St. Louis Car Company built the remainder. The closed cars are 20 feet long inside, longer than any others in the city, except the Woodland avenue line, and the summer cars are longer. They are finished in the very best style, and are claimed by the company to be the handsomest trolley cars in the United States. The closed cars have windows of plate glass. The summer



cars have 10 seats and will accommodate 50 people without crowding. Half of the motors are of the Sperry type and the other half General Electric. There are two motors of 25 H. P. each on each car. The cars equipped with the Sperry motors will be provided with an electric brake.

**Electricity on the Manhattan Elevated.**—It has been reported that the management of the Manhattan Elevated has been again considering the question of an electric equipment as a substitute for its present steam locomotives. The General Electric Company is said to have had several conferences with the Manhattan company, and to have submitted plans, specifications and estimates. The intention of the Manhattan company, however, is now said to be to await the result of the equipment of the Metropolitan Elevated, Chicago, and compare the figures obtained there with the Manhattan operating expenses before making any change. F. K. Hain, general manager of the Manhattan company, is quoted as saying: "We are trying no more experiments at present. I will go to Chicago and look at the Metropolitan road as soon as it is in operation. I cannot say what we will then do. For the present our steam locomotives suffice."

**Utica, N. Y.**—The following call was issued last week: "A meeting of the stockholders of the Utica Street Railroad Company will be held at the office of the company, 25 Mainstreet, Utica, N. Y., on the 13th day of July, 1894, at 3 o'clock in the afternoon of that day, for the purpose of electing a board of seven directors, and for the transaction of any and all other business which may properly come before the meeting." There were rumors of a reorganization, but nothing definite had been determined upon. It was said, however, that a proposition had been made to the bondholders to withdraw their suit for dissolution with the understanding that certain capitalists will furnish the funds needed to put the road in complete condition for making money. Receiver Benton has demonstrated that it is capable of doing this. The road has been operated by the receiver since January, 1892.

**Detroit, Mich.**—An interesting decision has just been rendered bearing upon the liability of construction companies. On Sept. 1, 1892, the Warren Scharf Asphalt Paving Company was engaged in paving between the tracks of the Citizens' Street Railway Company. Mrs. Jennie Standart, in crossing the street where work was being done, fell because of the excavation and was severely injured. She brought suit against both corporations, claiming \$5,000 damages. Judge Frazer took the case away from the jury as far as the street railway company was concerned, but the jury found for the plaintiff and against the paving company in the sum of \$2,500.

**Worcester, Mass.**—A local paper says that the travel on the street railways Wednesday, July 4, was unusually heavy. The Consolidated Road carried 57,000 people including transfers, the largest business in the history of the road with the exception of July 4, 1892. More than 8,000 people were carried on the North End road, an increase of 3,000 above any former record. The Dummy road carried about 20,000 passengers. The Worcester and Milbury and the Worcester, Leicester and Spencer roads together carried about 18,000 people, the Milbury road leading by a narrow margin. Together the five roads carried some 90,000 people.

**Youngstown, O.**—A press dispatch of June 11 says: "Every employee on the street railway went on a strike at midnight, and this morning not a wheel was turning. Barnum's circus was in town and everybody was walking. Manager Anderson had until 5 o'clock last night to settle the question of restoration of wages, but he would not agree to it, and every man was notified not to appear this morning. Manager Anderson is reported to have said that he will close the road for a week until he has time to get plenty of men, and then every branch in the city will be run."

**Indianapolis, Ind.**—Argument on the merits of the case which involves the perpetuity of the charter of the Citizens' Street Railway Company was begun last week before Judge Woods. The question at issue is whether the charter is perpetual or whether it expired last January, the company claiming that it has a perpetual right to the streets of the city, while the city claims that the charter rights have ceased to exist. The plant and the franchises involved in the case are estimated to be worth \$6,000,000.

**Milwaukee, Wis.**—The rule limiting the number of passes allowed to shop employes to 62 per month did not go into effect on July 1. An arrangement was made with the men whereby the company is to issue books to all classes of employes with 100 tickets good for one month. These will be used until the company has had time to find how many tickets are being used on an average by each employe, and then the men will be confined to that number. The men are satisfied with the proposition.

**New York City, N. Y.**—It is proposed to reduce the fare on the cable cars crossing the Brooklyn Bridge still further to 2 cents on September 1 next. The question is now under consideration by the board of bridge trustees and is meeting with some opposition, owing to the fact that the receipts are not up to the average. Last Saturday the receipts were only \$3,292, the lowest for a Saturday during the past two years.

**Paterson, N. J.**—The adoption of the Foster automatic fender by the Paterson and Central electric railway companies has induced the manufacturers to locate in Paterson, where work will be carried on at the shops of the Paterson Machine Company.

**Ann Arbor, Mich.**—Arrangements are under way for reviving the street railway plant and putting the cars in operation. If the bondholders sign the necessary agreement the cars will be running in two or three weeks.

**Brooklyn, N. Y.**—Some of the Intramural Railway cars from the World's Fair grounds were put in operation last week on the Brooklyn Bath & West End Railroad.

**Trenton, N. J.**—The Railroads and Bridges Committee of the Common Council is preparing an ordinance to regulate the speed of electric cars. It is stated that eight miles an hour will probably be the limit fixed.

**New Haven, Conn.**—The Fairhaven & Westville Company is replacing its old car barns by a new building for the storage of electric cars.

**Chester, Pa.**—The Chester Traction Company will experiment next week with car-fenders, which will be put on the Darby cars.

#### PERSONAL.

**T. A. Roberts**, superintendent of the Augusta (Ga.) Railway Company died about two weeks ago. A local paper says: "The death of Superintendent Roberts of the electric railway deprives that company of a popular and efficient officer, and brings to an untimely close a useful and busy life. Not yet 30 years of age, Mr. Roberts has proven himself an intelligent and capable man, and has filled places of responsibility with credit to himself, and satisfaction to his employers. He was very popular both with those under him and above him in authority, and he will be missed both as officer and friend."

**Thomas Williams**, one of the most popular and efficient members of the police telegraph department of Brooklyn, has been appointed chief telegraph operator at police headquarters. Mr. Williams has for several years been one of the most valuable members of the telegraph corps, and he has gained a host of friends in that department.

**David W. Dunn**, recently with the Narragansett Electric Lighting Company, of Providence, R. I., and formerly with the Thomson-Houston Electric Company, is now connected with the engine and boiler department of James Beggs & Co., of New York.

**William Finnegan**, of Albany, has recently assumed the position of superintendent of the Glens Falls, Sandy Hill & Fort Edward Street Railway Company in place of J. A. Powers, resigned.

**Edward P. Shaw, Jr.**, has been elected manager of the Pawcatuck Valley Street Railway Company, and has appointed Harry W. Tracy superintendent.

#### TRADE NOTES.

The **Altoona Manufacturing Company** reports the following orders received during June: One 280 H. P. engine for the Akron Street Railway Company, of Akron, O., to be direct coupled to a 250 H. P. generator built by the Walker Manufacturing Company, of Cleveland, O.; one 150 H. P. inclosed type self-oiling engine for the Watson Mining and Manufacturing Company, of Monongahela City, Pa., for an electric mining and haulage plant; one 65 H. P. inclosed type self-oiling engine for the Lyceum Theatre, Philadelphia; one 175 H. P. standard center crank engine for the Freeport Electric Company, Freeport, Ill.; one 65 H. P. inclosed type self-oiling engine for Knight Brothers, Fayette county, Iowa. There is also considerable more inquiry and with a settlement of the railroad strike it is believed that a substantial improvement in business will be the result.

The **Ohio Brass Company**, of Mansfield, O., is now making a new design of the Westinghouse type of trolley wheel, in which oil is used as a lubricant for the steel spindle in addition to the graphite bushing. The center of the hub of the wheel is hollowed out around the graphite bushing and the recess filled with felt packing. Holes are provided so that the felt may be kept saturated with oil which in turn feeds through the graphite bushing to the spindle, keeping the graphite moist and lubricating the bearing thoroughly. They claim that this adds

about 25 per cent. to the life of the wheel. It is advisable that a few drops of oil be poured into the well every few days. These wheels are made of extra hard quality of bronze metal and proportioned so as to give the longest possible wear.

**D. J. Wessels**, formerly of the Short Electric Railway Company, has been appointed general manager of the Genett Air Brake Company, with offices at 33 Wall street, New York. These offices are conveniently located for street railroad men, being in the heart of the financial district. Mr. Wessels reports business as being very promising. The company has just closed a contract with the New Orleans Traction Company to equip a number of its cars with its air-brake. The matter of braking is receiving unusual attention at this time, owing to the numerous accidents which have recently occurred. Mr. Wessels predicts that the Genett air brake is destined to become in street railway practice what the Westinghouse brake has become on steam roads.

**Edward F. Austin**, contracting engineer and manufacturers' agent, Pittsburg, Pa., has just completed the installation of a 50 H. P. M. A. Green improved automatic engine to operate a 500 light Westinghouse dynamo in a Pittsburg church. He has also sold to Jones & Laughlin one 150 H. P. M. A. Green side crank engine to operate their electric cranes; two 60 H. P. engines for the McIntosh-Verner Building, and one 150 H. P. engine to the Watson Mining and Manufacturing Company, of Monongahela City, to run electric mining machinery.

**A Good Business.**—Despite hard times, strikes, etc., the McLean Armature Works, Chicago, reports that it has never been so busy in its repair department on armatures, commutators, etc., as at present. Having the best of facilities for turning out work with remarkable promptness, this company is able to secure repair work from nearly every section of the country. The company has lately added a department for the manufacture of electroliers and combination fixtures, and is already turning out some handsome goods.

**The Buyers' Reference** for the second quarter of 1894 is issued in a new form, giving, in addition to the descriptive articles published in former issues, a very comprehensive and useful list of manufacturers of the various supplies used in electrical and street railway work. This list is printed on a tinted column running through the entire book. The publication appears as before in three editions, one of which is for the use of purchasing agents of street railways who will appreciate the improved character of the book.

**The Pettingell Andrews Company**, of Boston, Mass., has published a handbook of street railway track and trolley equipment, containing a number of useful rules and tables for those who have anything to do with the purchase of material for street railway construction or repair work. It gives, in addition, illustrations and descriptions of standard railway material, for which this company is the selling agent. Frank X. Cicott is the manager of the railway department for the Pettingell Andrews Company.

**The Convertible Car Manufacturing Company**, Chicago, is in receipt of letters from Superintendent Bowen of the Chicago City Railway Company, President Steel of the East Side Railway Company, Portland, Ore., and others, all speaking highly of the cars now in use and under their personal observation. The company is greatly encouraged with the outlook, is figuring on some big contracts, and preparing for a very large business.

**The Abendroth & Root Manufacturing Company** has opened a western office at 1422 Monadnock Block, Chicago, and has appointed George K. Hooper as its representative. Mr. Hooper has already commenced active work and anticipates some good sales of the well known boilers manufactured by his company.

**The Crescent Electric Company**, armature experts, 15 West Randolph street, Chicago, say that notwithstanding the traffic blockade, business is very brisk with armature and commutator work from lighting plants, power stations and street railways.

**A Neat Souvenir.**—The Okonite Company is sending out to its friends and customers another of its ingenious souvenirs. This time it is a purse with the Okonite trade mark stamped upon its side. The purse has an automatic "slide valve" lock.

**The United States Projectile Company** at Brooklyn, N. Y., is making extensive additions to its machine shop, and has placed the contract for this work with the Berlin Iron Bridge Company, of East Berlin, Conn.

**The Wallace Electric Company**, Chicago, has added a large line of electrical house goods to its extensive line of lighting and railway specialties and is now preparing an illustrated catalogue of these goods.

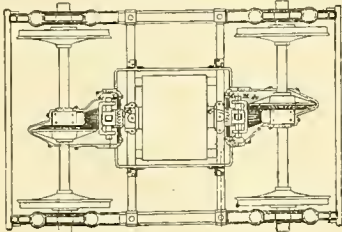
**Baltimore, Md.**—The Fremont Avenue line of the Baltimore Traction Company was opened for traffic on the 8th inst.



# RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued July 3, 1894.

**522,189. Electric - Railway - Car - Truck;** Francis O. Blackwell, Lynn, Mass., Assignor to the Thomson-Houston Electric Company, of Connecticut. Filed May 1, 1891. The combination with a railway truck of an electric motor flexibly supported thereon and a flexible coupling connecting said shaft with the gearing on the axle, said coupling consisting of two perforated forks arranged at right angles, and a rigid cross-bar having its arms loosely received in the apertures in said forks. (See illustration.)



No. 522,189.

are arranged above the track rails on which said car travels, said yielding arms being each normally supported above said track rails and provided with bearing portions adapted to contact with said track rails by a downward yielding movement of said arms.

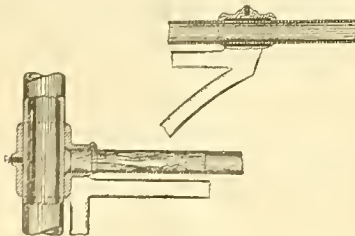
**522,216. Wire Support for Overhead Electric Railways;** Arthur W. Jones, Boston, Mass., Assignor to the Thomson-Houston Electric Company, of Connecticut. Filed May 21, 1892. The combination with a pole of a bracket having sleeves encircling said pole, a socket, and an eye in line therewith, an arm running through said eye and having a dowel of insulating material connecting it with the socket, and a sleeve of insulating material interposed between the arm and the eye. (See illustration.)

**522,224. Trolley-Car;** Herbert J. Lycett, Bryn Mawr, assignor to John A. Brill, Philadelphia, Pa. Filed Nov. 9, 1893. A car having a platform or support upon its roof, which platform is arranged to be raised and lowered, combined with a trolley pole or arm carried by said platform, and a wire or conductor connecting with said trolley pole or arm, said wire or conductor being extensible or flexible to permit the raising of the platform.

**522,232. Electric Safety Fuse;** Joseph Sachs, New York, N. Y. Filed April 10, 1893. The combination with a fuse wire and the terminals thereof of a block of insulating material to which the parts are connected, and a recess in such block, and a chemical substance such as silicic acid in such recess around the wire to combine with such wire under an excess of current and form a non-conductor.

**522,274. Dynamo-Electric Machine;** Charles E. Scribner, Chicago, Ill., Assignor to the Western Electric Company, same place. Filed June 1, 1893. Renewed December 7, 1893. The two pole pieces of a dynamo electric machine, each provided with two cores, each pole piece being on opposite sides thereof, and the coils thereof being included in a shunt around the translating devices which are being supplied with current from the machine, in combination with a third core for each pole piece connected with a projecting portion of each pole piece, said extra or auxiliary pole pieces being on opposite sides of the armature and in the same place, and with the other cores in a plane at right angles to the axis of the rotation of the armature, said extra pole pieces being provided with coils included in the main circuit.

**522,275. Regulator for Dynamo-Electric Machines;** Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Oct. 14, 1893. Renewed Dec. 7, 1893. The combination with



No. 522,216.

the brush carrier of a dynamo, impelled by a constant force toward a position where the brushes will receive increased current, of an electric motor in the circuit of the dynamo adapted to act intermittently upon the brush carrier to impel it in the opposite direction, the speed of the motor increasing with the current through it, whereby the main current is kept constant.

**522,286. Dynamo Electric Machine or Motor;** Charles S. Bradley, Avon, N. Y. Filed Oct. 26, 1893. A dynamo electric machine or motor provided with a plurality of armature windings, independent pairs of brushes coupling said windings in series, a field-magnet coil in series relation to an intermediate pair of brushes, and an electrical connection between the frame and some point between the intermediate brushes.

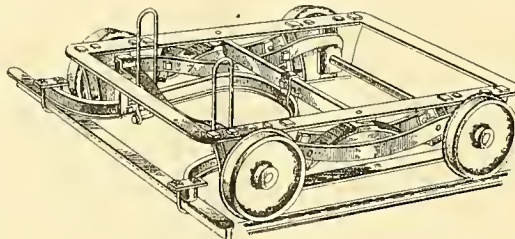
**522,308. Automatic Switch-Closer;** Washington I. Wands, Kirwin, Kan., Assignor of one-fourth to Henry W. Landes, same place. Filed Nov. 21, 1893. In

a switch-closing mechanism, the combination of a switch-bar comprising detachable sections connected respectively to the switch rails and an operating lever, and provided with interlocking jaws, an actuating or return spring connected to the rail section of said switch bar, a trip lever connected to one of the interlocking jaws, and means to be operated by a train for moving said trip lever to disengage the jaws.

**522,349. Rail Joint and Bond for Electric Railways;** Julius Meyer, New York, N. Y. Filed Oct. 21, 1893. The combination, with the rail ends of a base plate provided with a trough and outwardly extending flanges, angle plates connected by bolts to the webs of the rail ends and to the outwardly extending flanges of the base plate, a bond or bonds connecting the base of the rail ends, and a filling of asphaltum or other plastic insulating material run into the trough of the base plate, so as to fully inclose the bond or bonds and serve as a projection for the same

**522,362. Suspension Clip for Trolley Wires;** William F. D. Crane, East Orange, N. J. Assignor to the Johns-Pratt Company, Hartford, Conn. Filed March 10, 1894. In a trolley wire clip, the combination, with a plate sloped backwardly toward the bottom of hooks projected downwardly at the ends of the plate, and tapered toward the plate upon their upper side and upon their inner ends, and a hook projected forwardly and upwardly from the bottom of the plate with a channel upon its upper side, and the under side of the hook being tapered upwardly into a thin edge at each end of the channel. (See illustration.)

**522,365. Safety Attachment for Car Trucks;** Louis F. Fisher, Willow Springs, Mo. Filed Nov. 28, 1893. The combination with a truck of a supporting frame, extending rearward from the front of the truck and located beneath the front axle thereof, and having its sides connected with the equalizing bars of the



No. 522,365.

truck and its rear end pivotally connected with the truck frame, and a transverse bar arranged at the front of the supporting frame. (See illustration.)

**522,370. Distributing Board for Electric Circuits;** Rheinhold Herman, Cratton, Pa. Filed Dec. 14, 1893. A terminal for a distributing board having in combination a body portion provided at one end with a flange or shoulder and threaded at its opposite end, in combination with a nut notched for the reception of a wire to be electrically connected to the terminal, whereby the nut may be locked on the body portion of the terminal. (See illustration.)

**522,374. Electric Railway Supply Conduit;** Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed May 8, 1891. In an electric railway, the combination of two or more parallel or substantially parallel railways, each having a positive and a negative conductor, a central station supplying current to the positive and negative conductors of said railways, one or more transverse railways having positive and negative



No. 522,362.

conductors, and a series of feeding conductors leading from the central station and arranged parallel to the first mentioned railways and positively connected with a conductor of each of the several railways.

**522,388. Electric Railway Switch and Trolley;** Frederick S. Perrin, Lynn, Mass., Assignor of three-fourths to William B. Baldwin, New York, N. Y., George Fink, Jersey City, N. J., and Anthony F. Bochenberger, Brooklyn, N. Y. Filed March 12, 1892. In an electric railway system, the combination with a trolley line or wire, and a branch trolley wire, of a movable switch co-operating with said wires, an electromagneto device actuated by the current from the trolley wire to actuate said trolley wire switch a fixed circuit terminal connected with said electromagneto device, and a contact carried by the trolley arm.

**522,412. Safety Car-Fender;** Daniel Harding, Towson, and William L. Fitzhugh, Baltimore, Assignors, by direct and mesne assignments, to said Harding and John I. Yellott, Towson, Md. Filed April 9, 1894. The combination of a car-axle provided with a clutch and clutch-drum; means to keep the clutch disengaged from the clutch-drum; a jack-screw connected with the brake gear of a car to apply the brakes; and a swinging gate connected with the said means which keeps the said clutch disengaged.

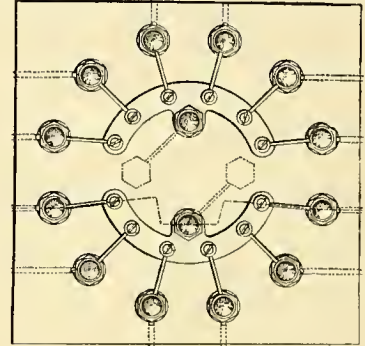
**522,419. Track-crossing;** Malvern W. Hies, Denver, Colo. Filed Oct. 28, 1893. A track crossing having a platform adapted to extend between the rails, inclined approaches adapted to extend out from the outside of the rails, transverse depressions adapted to receive the rails and rail supports at the bottom of the depressions connecting the platform and approaches.

**522,440. Conduit Electric Railway;** John H. Lyrell, New York, N. Y. Filed Jan. 23, 1891. The combination, with the truck frame and the vertical

movable trolley arm, of the oscillating shaft adjacent to the trolley arm, means for raising the arm by the turning of the shaft, slidable brake rods opposite the shaft, brake shoes on the rods to engage the car wheels, plates carried at the inner ends of the rods, and cams on the shaft to engage the plates.

**522,499. Car-Fender.** William V. Cleary, New York, N. Y. Filed Nov. 25th, 1893. The combination with a car, of a safety fender movable up and down in relation to the car, a forwardly projecting arm carried by a support arranged beneath the car, the said arm engaging the fender, an upwardly extending rod pivoted to said arm, a catch for holding the rod in an elevated position, an arm extending rearwardly from said support, and a spring arranged to pull the end of said rearwardly extending arm upward and lower the forwardly extending arm and fender when the catch is released.

**522,460. Electric-Railway Conduit;** Albert T. Fay, Minneapolis, Minn. Filed April 15, 1892. Renewed Nov. 16, 1893. The combination, in an electric conduit,



No. 522,370.

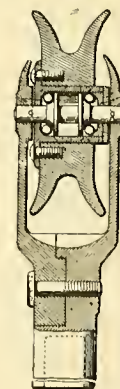
of the cross-ties and the rails thereon, with middle stringers resting upon said ties, surface plates arranged on said stringers, a space being left between the inner edges of said plates, an insulating strip extending parallel with said stringers and secured on the tops of the cross-ties, a conductor wire or rail provided on said strip and a trolley arranged to travel in the conduit formed between said stringers and upon said conductor.

**522,461. Conduit for Trolley Arms;** Albert T. Fay, Minneapolis, Minn. Filed July 26, 1892. Renewed Nov. 16, 1893. The combination with a car, of the track for the same, an underground conduit provided with a surface slot, a trolley arm having the thin flattened portion and the yoke to receive the trolley wheel, and a breakable section of weaker metal arranged between the top of the conduit and the car.

**522,527. Electric Automatic Circuit Breaker;** Carl W. Larson, Lynn, Assignor of one-half to August Langell, Boston, Mass. Filed October 17th, 1893. In an automatic circuit breaker, the combination with fixed contacts, of a sliding rod carrying a bridging contact adapted to connect said fixed contacts, a spring acting to force said bridging contact away from the fixed contacts, an electromagnet arranged in the circuit, a yielding armature carrying a catch, a toggle lever fixed at one end and connected at its other end to the sliding rod, and a hook carried by said toggle lever and adapted to engage said catch.

**522,530. Car Fender and Brake;** Henry Maass, Jersey City, N. J. Filed March 22, 1891. The combination with a movable fender, of a spring actuated brake at each side of the car, a shaft extending transversely across and operatively connected with each brake for moving and holding the same against the pressure of the springs thereof, a lock for said shaft, and a connection between the shaft and the said lock.

**522,550. Trolley Wheel;** Charles E. Bostwick, Du Bois, Pa., Assignor of one half to G. E. Grier, James W. Grier and John C. Grier, same place. Filed March 15, 1891. In a trolley, the combination with a fork of the journal rigidly mounted in said fork, said journal hav-



No. 522,550.

ing collars formed thereon intermediate at its ends, the outer faces of which are concave, a wheel having a central opening, and a cylindrical casing located in said opening and through which the journal passes, said casing being integrally closed at one end and provided with an integral annular flange at said end, a cap for closing the opposite end, the said ends being concave upon their interior faces, anti-friction balls held between said ends and the collars formed on the journal, and the bolts for securing the casing in the wheel. (See illustration.)



# STREET RAILWAY GAZETTE

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**Electric Freight Service.** The gradual extension of freight service for electric railways is a fact worthy of careful attention by all street railway managers who desire to make all possible use of their opportunities for increasing their revenues. A few weeks ago we pointed out that the operation of a local and suburban express business in connection with the street railway systems of all large cities would undoubtedly prove a profitable enterprise for a company organized in such a way that it could command the service of all the street railways of a city, irrespective of ownership, and secure in this way the right to run its express cars to every point in the city and vicinity reached by a street car track. The plan as outlined included the use of delivery wagons at the terminals and intermediate stations to collect and distribute the packages and goods to be transported, while the transportation proper would be done by the more rapid and cheaper cars of the express company, just as is now done by the express companies operating on steam railroads. We are pleased to note that this method is to be adopted on the electric railway between Troy and Albany, where freight cars are to be put in operation on August 1, and wagons are

to be run in conjunction with them from different points along the line to carry freight to its destination. This is a step in the right direction, and it cannot fail to prove a profitable use of the horse and wagon as an accessory to the electric road—a sort of feeder, just as the electric road itself is now coming to be regarded as a valuable feeder for the more elaborate and expensive systems of steam railroads. So far as we are aware, this is the first attempt on the part of any street railway to put this system into practical operation. The results will be awaited with great interest by those whose lines can be utilized in a similar manner.

**Indianapolis Litigation.** The famous Indianapolis franchise case came up in the United States Circuit Court in that city last week. This case has attracted considerable attention from the street railway men who have interests in properties holding their franchises under conditions similar to those of the Indianapolis road. The suit involves the entire property of the operating company, as the claim is made by the opposition that the franchise expired in January, 1894, and that it now has no rights whatever to the occupancy of the streets. The city authorities have granted a sweeping franchise to a new company which is now seeking by the aid of the courts the confiscation of the valuable rights and property of the company now operating its cars over the Indianapolis lines. The financial importance of the litigation is therefore very great, in addition to the vast interests involved in the legal questions at issue not only in Indianapolis, but in other cities where the power of the local authorities is not clearly defined and where there is an apparent conflict between city and State laws governing the rights of corporations. The arguments in the case, which were ably conducted, covered a period of four days. The closing argument for the Citizens' company, of which Mr. Thos. McLean is general manager, and which now operates the Indianapolis lines, was made by ex-President Benjamin Harrison. This has been printed in full in pamphlet form by the Citizens' company, and we can assure any one interested in this litigation that it will repay a careful study. It is certainly a dispassionate and very effective presentation of the legal points involved, and we regret that we have not the space to print it in full in our columns. Elsewhere in this issue we have given a brief abstract of it together with that of the other arguments and a general outline of the case. The court has not yet rendered a decision, and will probably not do so for some little time.

**Mr. Perry's Articles Concluded.** In this issue we publish the concluding article of the series by Nelson W. Perry that has been running in our columns since the first of January. Our object in publishing these articles was to give motormen, inspectors and shop employes an opportunity of securing carefully prepared and reliable information regarding the construction, care and operation of the street car motor. Mr. Perry has preferred to deal with a fundamentally simple motor rather than to explain separately the various types of commercial motors, for the reason that a thorough understanding of a typical machine would place any one possessing this information in a position to comprehend the construction and operation of all modified forms with which he would meet. He has, however, given considerable attention to the details in which the commercial motors differ from the "abstract" type of machine both in construction and in the principles of operation. The closing chapters of Mr. Perry's series have been devoted to the care of car motors, the troubles met with in their daily operation, and the most efficient and simple remedies to be applied in cases of breakdown or failure to operate properly. Carefully compiled rules have been given, applicable to the various systems, for the guidance of superintendents, inspectors and motormen in the care and operation of their motors. We have good evidence

that these articles have been appreciated by all intelligent motormen who have carefully followed them from week to week, and we take pleasure in announcing that arrangements have been made for their publication in handbook form, at an early date. They will be thoroughly revised and corrected wherever necessary to make them more valuable and useful to the men for whom they are intended. The price asked will be placed so low that the book can easily be afforded by every man who cares to inform himself about the motor entrusted to his care, and we hope that this includes each and every one, for the more a man knows about his work and its performance the more valuable are his services and the better are his chances of promotion. The book ought to be in the hands of every electric railway employe, from the superintendent to the motorman, and we feel sure that it will be when its real value is fully appreciated.

**What Strikers May Expect.** That was a suggestive remark made a few days ago by the superintendent of the Brooklyn Elevated road when he said in an interview regarding a rumored strike of employes: "I have applications enough on hand in every department to man the road ten times over at the present rate of wages, and I don't think the employes are foolish enough to try the issue of a strike at such a time as this." No doubt the employes on surface and elevated roads are deserving of sympathy because of the straitened circumstances in which many of them find themselves in times of business depression like that through which we are just now endeavoring to pilot the various enterprises upon which our prosperity has in a large measure depended. But it should be remembered that the labor item is of the greatest importance in the monthly or quarterly statement of the operating expenses of a street railway company, and must therefore be handled in a most conservative way if the balance is to be on the right side of the account. If invested capital is to have no return for its use, it will not be long before it withdraws its support and seeks another and more promising market for the advantages it is able to give. No matter how much a motorman or conductor may desire to keep his wages at a high rate, a reduction is inevitable if the demand for the service that the street railway furnishes decreases to such an extent that the margin of profit for the stockholders is reduced below that which can be obtained from other investments of a similar character. The cold fact that confronts every laborer, whether his service is rendered in the shop, the factory, the counting house, or the office, is that labor is a commodity as much as sugar, or engines, or cars, and as such its price in the open market is governed by the same laws of supply and demand. If the manufacturing trades are paralyzed by tariff tinkering, by Coxey "armies," or the lack of confidence in the ability of the government to maintain its credit, fewer people will find it necessary to travel about on the street cars in the conduct of their various lines of business; fewer men will be needed to operate the cars for the reduced traffic, and the number of positions open to those seeking work decreases while the number of applicants is increased. This is precisely the state of affairs that now exists in the labor market as illustrated in the remark of the superintendent quoted above. The men who are out of employment and who are ready and willing to work consider half a loaf better than no bread, and a general strike can result under such conditions only in an exchange of "positions" by the employed and the unemployed. Sober minded men who are able to earn enough to provide the necessities of life in times like the present should make good use of the ballot box to remove the cause of the existing conditions, where this is possible, rather than to give a second thought to the appeals of the labor agitator.



### THE NEW YORK-PHILADELPHIA TROLLEY LINE.

The electric railway to connect New York and Philadelphia, and pass through many of the cities and large towns between, is gradually assuming definite shape. On July 13 Frank A. Magowan, of Trenton, N. J., paid to State Treasurer George B. Swain \$28,000, the amount required as a deposit under the railroad law of New Jersey, and at the same time filed surveys, routes, and descriptions, and secured a charter for the New York & Philadelphia Traction Company.

Mr. Magowan is president of the company, which is to have a capital of \$10,000,000. Others interested are the Central New Jersey Traction Company, of which Mr. Magowan is president, and of which E. W. Hine, of Newark, is vice president; J. H. Baldwin, of Newark, Secretary; James H. Darrah, of Trenton, treasurer; and Col. D. K. Bayne, of New York; William H. Skirm, of Trenton; Joseph H. Real, of Bloomfield, and J. C. McNaughton, of Philadelphia, are directors.

There will be about 150 miles of electric railway lines. The road will begin at Paterson, where connection will be made with the trolley system of that town. Leaving Paterson, the road will pass through Upper Montclair, Montclair, Bloomfield, Orange, East Orange, West Orange, South Orange, Springfield, Westfield, Fanwood, Netherwood, Plainfield, Dunellen and Bound Brook; thence to Millstone, Princeton, Lawrenceville and Trenton. Below Trenton the new road will pass through the towns along the line of the Pennsylvania Railroad and at Frankford connect with existing lines into Philadelphia.

From Bloomfield a branch line will run to Caldwell and Irvington, connecting at the latter place with the existing lines of the Consolidated Traction Company, making a direct line to Newark. Branch lines will run to Chatham, Madison and Morristown from Bloomfield; and to New Brunswick, Somerville, Raritan, Rahway, Elizabeth, Woodbridge and Perth Amboy.

The projectors of the new system of roads compute that they will acquire the patronage of 5,000,000 travelers, and transport much freight and merchandise. The great enterprise is to be managed by the new company and the Central New Jersey Traction Company. The latter has a capital of half a million dollars. Mr. Magowan says the rights of way have been secured and provision made for all the moneys required.

Work is to be begun at or near Trenton, and will be carried on in both directions. Seventy miles of local lines in different cities are to be merged into the system. The men interested in the enterprise own a valuable water right just below the falls in the Delaware and contemplate using it in the production of the power needed to operate a large portion of the line.

Commenting on this project the Philadelphia *Stockholder* says: "Certain parties believe this scheme is a move on the part of the Pennsylvania Railroad to head off competition from electric lines which might be hostile to the company. Rumors to this effect have been repeatedly denied by Pennsylvania Railroad officials, but those who first formed this theory have not had their views changed by these denials. They point out that the company turned over to a Philadelphia syndicate, headed by John D. Crimmins, all its wide street interests in Jersey City, and it was argued at the time that it would not have done so unless there was some hidden motive or consideration. Whether or not the Pennsylvania Railroad has anything to do with this scheme cannot, in view of the denials, be positively asserted, but the fact remains that the various routes so far proposed will make its lines practically feeders of the Pennsylvania. It is true that it may lose some business at certain points, but, it is said, the company can afford to do so, owing to the new traffic which will come to the lines at other points."

Portland, Ind.—A franchise has been granted for an electric railway between Red Key and Dunkirk.

### PROBABLE CONSOLIDATION AT WILLIAMSPORT, PA.

The Lycoming Improvement Company of New Jersey has obtained a majority of the stock of the Williamsport Passenger Railway Company and the Lycoming Electric Light Company. Judge Metzger has rendered an opinion dissolving the preliminary injunction and permitting the consummation of the deal between the majority stockholders of the Williamsport Passenger Railway Company, the Lycoming Electric Light Company and the Lycoming Improvement Company of New Jersey, whereby the New Jersey corporation secures control of the majority stock of both corporations.

Earnest H. Davis, one of the heads of the Lycoming Improvement Company, is reported as saying that the Lycoming Improvement Company, of New Jersey, would assume control of the Williamsport Passenger Railway and the Lycoming Electric Light company at once, and would also make a proposition to have the Vallamont and East End railroads and the Edison Electric Light Company come in under their management. It is understood that J. Henry Cochran, now president of the Vallamont Railway Company, has been asked to accept the presidency of the consolidated lines and that if the deal is arranged there will be harmony all around, not only between the stockholders of the Williamsport Passenger Railway Company, but among the stockholders of all the local railroad companies.

### AN UNDERGROUND TERMINAL LOOP FOR CHICAGO.

At the meeting of the Board of Aldermen last week an ordinance was presented on behalf of the Chicago Subway, Arcade and Traction Company. This company is seeking permission to construct and maintain and operate a system of subterranean ways or arcades under the streets and alleys and public grounds and under the Chicago River between Twelfth street on the south and Kenzie street on the north, and between Clinton street on the west and Lake Michigan on the east, and to construct and maintain therein a system of dummy railways to be operated by electricity or some improved method that may be devised other than animal or steam power. It is also provided for the construction of a terminal station, with lifts, stairways and approaches, and all necessary loops for the successful operation of the railway under and beneath the tract of land lying between Randolph street on the north, the right of way of the Illinois Central Railway on the east, Monroe street on the south and Michigan avenue on the west, and in consideration therefor the company agrees to pay an annual rental of 5 per cent. of the valuation of said tract, as may be established by three appraisers at the time the work is begun. At convenient intervals shafts and openings may be made in the streets or alleys for the removal of material, but only on the permit of city officials. The material removed is to be used to fill the submerged land between the Illinois Central right of way and a dock line to be established by the United States government for park purposes.

It is provided that the subways, when completed, shall be in the clear not less than 18 feet in width and not less than 13 feet in height, and as near to the surface as may be deemed practicable. Upon the bottom is to be a flooring of concrete of a thickness of three feet, more or less. The subways shall be inclosed on the sides by walls of sufficient strength, the roof to be of steel, which shall form the foundation of the street pavement. Below this is to be an air chamber for conduits wires and pipes. Tunnels under the river are to be of steel and may not interfere with navigation. Plans must be approved by city officials, and work is to be done under their supervision. All damages to abutting property are assumed by the projectors. Water, sewer and gas pipes, telegraph, telephone and electric light wires are not to be unnecessarily

interfered with, and if removed must be relaid at the company's expense.

Lifts or stairways leading from the street to the subways are provided for, stations to be in basements of abutting buildings, as may be leased or purchased. A 2-cent fare is the maximum that may be charged, with transfers on all roads using the subway, policemen, firemen and United States mail carriers in uniform riding free. Two per cent. of the gross earnings are to be paid annually to the city. Work must be commenced within one year from the passage of the ordinance, and must be completed within five years thereafter. The ordinance will not become effective until the company shall execute to the city a bond of \$100,000. Ninety days is given for the acceptance of the measure which the council ordered published.

The idea of providing a down-town terminal for Chicago by tunneling is not new, and its practicability and cost have been examined by the elevated roads. Representatives of the latter and men identified with the Yerkes interest in the North and West Side cable lines, say that the promoters of the Chicago Subway, Arcade and Traction Company are unknown to them.

### SIGNAL SYSTEM ON THE BROADWAY CABLE LINE.

For several weeks the signal system of the Broadway cable railroad installed by the National Electrical Manufacturing Company has been working successfully, and recently it showed its efficiency when a car lost the grip at Fourteenth street. The main office at Houston street was promptly notified, and only 15 minutes elapsed before everything was moving smoothly again. At intervals of two or three blocks and close beside the rails will be noticed a square iron cover. When an accident happens this cover is raised, and a board with a hook and a button is disclosed.

One pull signifies "Stop cable"; two pulls, "Start cable"; three pulls, "Wagon with tools"; four pulls "Fire blocks the line"; five pulls, "Tension off"; six pulls, "Tension on"; seven pulls, "Telephone"; and eight pulls, "Test." The signals are transmitted to the power station and to the president's office at Broadway and Houston street. Every employee of the road is provided with a book of rules, in which are printed the necessary instructions and the location of the signal stations. The construction of this system was begun many months ago, but the Electrical Subway Company brought suit, claiming that it was an infringement on that corporation's franchise. The suit was decided in favor of the railroad company two weeks ago.

### DECISION IN FAVOR OF THE NASSAU COMPANY, BROOKLYN.

"The judgment and discretion of the municipal authorities are not subject to the review of the courts in the absence of the proof of fraud, and that question should not be determined by affidavits, but left to be investigated at the trial."

This broad proposition was made by Justice Brown last week in a decision refusing a temporary injunction to a citizen of Brooklyn who sought to prevent the construction of trolley roads on Union street and other thoroughfares in South Brooklyn. The company that secures the franchise by Justice Brown's decision is the Nassau Electric Railroad Company. A competing corporation, the United Street Railroad Company, bid for the franchise also, but the original award was made, in Mayor Boody's time, to the Nassau company. Then John Adamson, who lives on Union street, sought a temporary injunction to restrain the Nassau company from beginning work, but it was refused by Justice Brown, as stated above.

Holyoke, Mass.—W. S. Loomis asserts that there is no foundation for the statement that the Holyoke Street Railroad Company intends to extend its line to Northampton.



**RAIL WELDING OUTFIT IN BROOKLYN.**

The rail welding outfit, as now in use in the construction of the Nassau Electric Railway Company's lines in Brooklyn, consists of three cars, two of which, ready for operation, are shown in the illustration. The one to the left is the welding car proper, and the one to the right the motor-generator car, where the 500 volt direct current taken from the trolley is transformed into an alternating current. The third car (not shown) is the grinding car. This is a light platform car, carrying a 2½ H. P. motor connected by friction clutch to the car axle for propulsion, and otherwise connected with a flexible shaft, on the end of which is an emery wheel for grinding the rail ends for welding surfaces. This flexible shaft is not connected directly to the motor shaft, but is operated from a pulley at the end of a lever which has a swing through a horizontal arc sufficient to bring the pulley over either rail at will. The electrical connections are such that the flexible shaft is only operative when this pulley is approximately over either rail. At intermediate positions it is inoperative so that whenever the emery wheel is held in position for use it is set into revolution, and when it is pulled away from the rail, as it naturally would be when not required, the motor

car is equipped with two 25-H. P. S. R. G. Westinghouse motors for propulsion purposes.

The alternating current circuit goes by means of flexible conductors to the welding car, where it passes successively through a break switch, reactive coil and the transformer. This current before transformation is about 650 amperes at 300 volts. There is also a 5-H. P. direct current Westinghouse motor on this car, which operates a small pump for cooling the transformer and welder, and which, by means of clutches, moves the welder either horizontally or vertically. On top of the car is a large coil of pipe through which the water circulates to cool after having absorbed heat from the transformer and welder.

The car is driven by a 25-H. P. Westinghouse S. R. G. motor.

**TROLLEY FRANCHISES IN CHICAGO.**

At the meeting of the Chicago City Council last week, no less than six separate franchises were granted, giving permits for the construction of trolley lines on new and existing lines in and near the business section of the city. These included all the horse car lines of the Chicago City Railway Company operating in the southern section of the city, with the exception of the Indiana avenue

these payments shall be made provided the tracks are elevated in five years, as the track elevation ordinance provides.

Mayor Hopkins thinks there is a possibility of a delay in the track elevation which will give the street car company a pretext for refusing to pay at least a part of the \$150,000. In order to overcome this objection, he will offer an amendment, making the payment of the \$150,000 not contingent upon the time within which the railroad companies elevate their tracks. An amendment with this end in view will be accepted by the company, it is said, and there will be no difficulty about its adoption by the council.

The mayor objects also to the ordinance of the North Shore Electric Railroad Company, and will return it to the council with a veto and some amendments. The chief objection is that the compensation clause provides for a payment to the city of a percentage of the net receipts. The mayor thinks the payment of a percentage of net receipts means nothing. He will insist upon a compensation based upon gross receipts.

**OPINION AS TO WHAT CONSTITUTES "FIRST-CLASS CARS."**

A rather interesting legal opinion as to what is meant by a first-class equipment has just been given by the attorney for the District of Columbia in his report to the District Commissioners. In referring the question to the attorney the commissioners desired to know the extent of their power to compel the Columbia Street Railway Company to fulfill the provisions of a certain section of its charter, which provides that the company shall place first-class cars on the road for the comfort and convenience of its passengers. The opinion says:

"The Columbia Railroad Company was chartered by Congress May 24, 1870. The tenth section of its charter requires it to equip its road with first-class cars, and all the modern improvements, for the comfort of its passengers, etc. No remedy is provided by the charter for failure of the railroad company to perform this duty. The duty seems to be imperative, but does not appear to be a continuing one. What is meant by the phrase 'first-class cars with modern improvements'? First-class cars as of 1870, or first-class cars as of 1894? If 1870 is the standard, then we do not want first-class cars of that day. It may be, and indeed the presumption is, the Columbia company did equip its road with cars which were satisfactory to the corporation of Washington in 1870. The resolution in question should be considered, I think, in view of the fact that the Columbia company has availed itself of the privilege of using cable as a motive power. As I understand it, the company has already taken out a permit to lay cable. This change of power will necessitate a change of cars, and, it is hoped, to the first-class, with all modern improvements.

"Proceedings to compel street railway companies to observe their charters may be either by mandamus or quo warranto. Where a railroad company was authorized to construct and operate a street railroad, and the company entered upon the streets and partially laid its tracks, mandamus to compel the grantee of the franchise to complete and operate its road was sustained, but the courts seem to be divided as to the applicability of this remedy. It seems to me the passage of said resolution would not materially improve the situation, since it merely directs the commissioners to carry out Section 10 of the charter. The Commissioners would probably have a right, by proper proceedings, to insist on a compliance by the company with section 10 of its charter, without the resolution, if the duty is a continuing one. If Congress intends to do anything in regard to the matter, it seems to me it should require the railroad company within a limited time to comply with the terms of its charter relative to first class cars with modern improvements, etc., and, in the event of its failure to do so, to forfeit or repeal its charter. The charter of this company having been approved during the lifetime of the late corporation of Washington, there may be some question whether the Commissioners are the successors of that corporation, in the sense that they are authorized without further legislation to institute proceedings against the railroad company to compel a compliance with its charter. On that view of the case such legislation as is proposed would be necessary to authorize the Commissioners to institute judicial proceedings against the company. But in view of the fact that the Columbia company is on the eve of equipping its road with new motive power, and



WELDING TRAIN IN SOUTH BROOKLYN.

is automatically cut out of action. Connection is made with the trolley wire by means of a fishing pole having a hook on the end.

The main feature of the equipment of the dynamo car is the motor-generator, which may be seen in the illustration, for which we are indebted to *Electricity*, in the center of the car. This is a compound wound four-pole machine which runs as a motor from the trolley wire. Its armature has but one winding, but this is connected at diametrically opposite points with collector rings from which alternating currents having 4,400 alternations per minute are delivered; 300 amperes at 500 volts pass normally through this machine. Since the current is usually supplied from some other trolley line upon which there are at times abnormal loads, the welder has to contend with variable electromotive forces which may fall so low occasionally as to cause cessation of work. If the voltage on the line drops below 460, operations are suspended, as there is insufficient energy for the purpose. There is also a circuit breaker, ammeter and rheostat in the direct current circuit, and the

and Clark street lines. Practically no opposition was manifested in the council, but it is reported that the mayor will veto the franchise of the Chicago City Railway Company and return it to the council, with some amendments, which he will ask to have incorporated in the measure.

The principal objection which the mayor brings against the measure as it now stands is that he sees in it a chance for the street-car company to evade its responsibility in the matter of contributing to the cost of track elevation. The clause governing this matter provides that the street car company shall pay \$150,000 into the city treasury in case the Lake Shore & Michigan Southern and Chicago, Rock Island & Pacific elevate their tracks. This sum is to be the city's compensation for providing subways under the elevated tracks deep enough to permit the cars of the cable company to pass through. There are to be thirteen such subways and the street car company is to pay in one-thirteenth of the \$150,000 upon the completion of each of the subways. But the clause here provides—and here the mayor's objection comes in—that



necessarily with new cars, I do not believe it is necessary or wise to attempt to enforce a compliance with the tenth section of its charter. But if the Commissioners should consider that proceedings should be instituted against said company because of failure to use first-class cars, the proceedings should be a mandamus."

#### ELECTRIC RAILWAY MOTORS: THEIR CONSTRUCTION AND OPERATION.

BY NELSON W. PERRY.

(Twenty-eighth Article.)

##### TROLLEY WHEELS.

The life of the trolley wheel depends upon the quality of the metal, the number of miles that it travels and the care that it receives. Remember that its speed is enormous. Take a trolley wheel that is 6 inches in diameter for instance. When the car is running at 8 miles an hour a 36-inch car wheel will make 4,482 revolutions, and we know the necessity of lubrication for this. At the same speed and in the same time a 4-inch trolley wheel will make 126,720 revolutions, and yet we are liable to overlook the necessity for lubrication here. In fact the trolley wheel is subject to something far worse than frictional wear, viz., sparking. Every time a spark occurs on a trolley it means the combustion of so much copper. Oil the trolley wheel in the barn therefore and as often during the day as it is practicable. Instruct your motorman to oil it when he has an opportunity. See that the wheel does not wobble or flash badly. If it does, it requires attention. Sometimes a wheel may be traced in the dark by its continuous sparking. It requires attention then surely, for if it is not attended to at once it will become so bad that it will have to be thrown away.

The trolley wheel is a little thing, you may think, and not very expensive to replace. The sooner you get over excusing yourself for inattention to little things the sooner you will be competent to fill your position. *Be very careful of little things, and there will be no big things to take care of.* This seems like a platitude, but if I can only impress the truth of this statement upon every superintendent I will have accomplished a very great good to the cause of street railroad practice.

The matter of proper tension of the springs at the base of the trolley is one that I am satisfied is not usually given the proper attention. The trolley wheel is, I believe, in nine cases out of ten pushed *too hard against the wire.* It is better to err on the other side, for if the tension be too slight it will make itself manifest, but if it be too great it gives no evidence of the fact until the damage is done. Remember that the resistance of the contact between wheel and wire is not materially increased by increasing the tension of the spring within the allowable limits.

It is a mistaken idea that an extremely high tension will cause the trolley to keep the wire better than a moderate one. On the other hand, the pressure must be sufficient to keep the wheel at its enormous speed from "tapping"—that is, from jumping momentarily from the wire—which it is apt to do if it happens to be a little eccentric or otherwise runs a little unevenly.

In the earlier days, when we did not know so much about these things as we do now, I remember seeing an electric road that was operated by a superintendent who believed there was much to be gained by a stiff pressure; in fact he carried the idea to an extreme even for those days. The result was that his trolley lifted the wire a couple of feet as it passed along and as the car jolted and rocked it set the trolley wire into such violent vibration that the motion imparted by one car to the wire would often actually throw the wire off the trolley wheel of another car some distance either in the rear or in advance. He had, in fact, commenced running with too tight a spring and had sought to correct the difficulty by tightening it still more, which of course only made matters worse. His trolley wheels rapidly wore out and, worse than this, his hangers were knocked to pieces in a very short time, and once when I was in the car, our own

trolley getting off, the pole struck a span wire, not only snapping the trolley pole off, but bringing down the whole overhead structure. This man finally learning his mistake, went to the other extreme, perhaps, but he became a firm convert to the loose spring.

##### INCANDESCENT LAMPS.

Remember that your lamps are in series, and that any defect in one is visited upon all the others. If one lamp breaks, the circuit is broken; or if one be not screwed in sufficiently tight to make connection, none of them will burn. If, therefore, your lamps refuse to burn, examine them individually to discover the fault before condemning your lamp circuit. The situation of the car lamp is an exceedingly trying one to fill. In the first place there is the constant jar of the car, which tends to break the filament, and in the second there is the great variation in E. M. F. to which it is subjected. The line current is apt to vary from 450 volts to 520 or more, which is, we will say, a variation of 15%.

Now, experience has proved that an increase of 3% to the voltage above that for which the lamp was intended will divide its life by two. For instance, if a 100-volt lamp has a life of 1,000 hours when used on a 100-volt circuit, it will only have a life of 500 hours if the pressure is increased to 103 volts.

The illumination given by a lamp varies even more widely with the pressure than does its life. No definite law has as yet been discovered as to this, but we know the temperature increases as the square of the current, and as the current will be proportional to the pressure, we may say that the temperature will increase as the square of the pressure; the illumination will, however, vary more widely than this, its variation being estimated by some as being as the fifth power of the pressure. These statements being true, or approximately true, one sees at once the strain to which a street car lamp is put.

If your lamps are already burning at a very high pressure—that is, at a pressure above that for which they were intended, or in other words, if they are burning with high efficiency, a comparatively small increase in pressure will break them in a short time. The rule is, therefore, in street cars, *not* to use a high efficiency lamp; first, because under the conditions the light it will give will vary too widely, and, second, because its life must necessarily be a very short one. A low efficiency lamp should always be chosen, for then, with the wide variations of pressure to which it is subjected, the variation in light will be less apparent and its life be much longer. Then, again, be careful that all the lamps on a car are of as nearly the same resistance as possible—exactly the same, if that can be arranged, for it is not enough that the five lamps shall in the aggregate absorb 500 volts; they must each absorb the same fraction of this—100 volts. If one lamp absorbs 110 volts and another but 90, the average is maintained, but the one that absorbs 110 volts will burn out much the quicker. Lamps have often been very unjustly condemned simply because, being of high resistance, they have burned out first when put in the same series with other lamps, either of the same make or of another, that were of lower resistance.

##### CONCLUSION.

I cannot better illustrate the part which a competent superintendent can play in the general efficiency of a road or a system than by recalling an incident that occurred some years ago in a western city. Electric railroads were then comparatively new. In this city there were two street railroad companies—one, a large corporation owning nearly all the lines in the city, and the other a small corporation owning but one line, and that a short one not more than 3½ miles long. The large corporation equipped one of its lines with the double trolley system, and the small corporation equipped its line with the single trolley. Both lines were of about the same length, but that of the small corporation abounded in long and steep

grades, one of which reached 13½ per cent. at one point; while the other, although by no means level, was a much easier line to operate.

A spirit of rivalry sprang up between the two lines which was heightened by a lawsuit in which the single trolley road was made the defendant (it was one of the telephone cases), and in which the double trolley, though not a party to the suit, furnished much of the testimony for the plaintiff. The double trolley people were called in to prove that the double trolley was better than the single trolley, and, among other arguments, showed that with the double trolley the car was independent of the condition of the track and could run under circumstances (such as heavy snow) where the single trolley would be unable to get current through its motors. That suit was decided in favor of the parties for whom the double trolley people testified.

Winter came on, and with it a heavy snowfall. The double trolley road had every advantage as to track and system to meet this emergency, but the single trolley road had the more efficient superintendent. There is not a street railroad man in the country who would not know his name if I mentioned it. He kept the snow off his tracks and weathered the storm without stoppage of cars. The double trolley superintendent, less alive to the situation, tried to run on top of the snow, and his whole system was blocked for a day. The fact of the blockade of the double trolley system and the successful weathering of the storm by the single trolley system was telegraphed all over the country, and taken by the masses as evidence of the superiority of the single over the double trolley. For that special emergency, at least, the facts were exactly the reverse. The true significance of the circumstance was that the single trolley road had the better superintendent, but the public did not understand it in that way. So you must do much for which you will receive no credit from the public at large; but if you keep your cars going and keep them from wearing out, and do this at a minimum expense, your employers will know it and give you full credit.

#### TRANSFER REGULATIONS SUSTAINED IN COURT.

An interesting case was recently decided in St. Paul in favor of the street railway company and affirming the right to limit the uses of a transfer. The decision was in the case of Ernest L. Erickson against the St. Paul City Railway Company. Mr. Erickson got on a Rice street car three blocks from the intersection of the Rondo car line, and tendered a transfer slip in payment of his fare. The conductor declined to receive it, and demanded payment in cash. Judge Otis sustains the act of the conductor, and holds that the abandoning of a car at a point other than the intersecting point was an abandonment of a continuous passage, and that the regulation requiring the transfer trip to begin at the intersecting point is reasonable and proper, as without such regulation the street car company would not find it possible to protect itself from fraud and imposition.

#### BOYNTON BICYCLE RAILWAY FROM BOSTON TO LOWELL.

One of the sections of the Boynton bill, which was recently passed by the Massachusetts Legislature, provides that "within 60 days after the passage of this act the directors shall apply either to the Board of Railroad Commissioners or to the governor or council for a certificate that public convenience and necessity require the construction of said railway. If a certificate is granted proceedings may be continued as herein provided. If a certificate is refused no further proceedings shall be had, and this act shall become null and void."

Mr. Boynton recently called, upon the Governor for this certificate, preferring to obtain it from him rather than the Commissioners. The Governor, however, has referred the application to the Commissioners, as he considers that that board was established for the purpose of deciding just such questions as the one contained in this application.



### ARGUMENTS IN THE STREET RAILWAY CASE AT INDIANAPOLIS.

The argument in the famous case of the Citizens' Street Railroad Company vs. the City Railway Company of Indianapolis, was concluded before Judges Woods and Baker in that city early in the week. This hearing is to be the final one in the matter of whether the Citizens' Street Railroad has any right to the streets of Indianapolis since Jan. 18, 1894, at which time the thirty years' franchise granted by the city expired. The Citizens' company was represented by Benjamin Harrison, Miller, Winter & Elam and Philip C. Knox of Pittsburg. The City company was represented by Byron K. Elliott, John M. Butler and A. C. Harris.

The suit referred to was based on a claim by the city that the privileges, rights, etc., which were granted the Citizens' company for thirty years, have expired, and that the company is, therefore, a trespasser, having no claim whatever to the streets. The company, on the other hand, contends that its charter is perpetual under an Indiana statute. The Citizens' company was originally a portion of Congressman Tom Johnson's street railway system, and was sold by him and his associates for \$1,000,000, the franchise being calculated as one-half the total valuation. The present Citizens' company purchased the plant from its Chicago owners last year for \$3,250,000 cash, and at once reorganized it on the basis of \$4,000,000 bonds and \$5,000,000 stock, the capitalization being supplied largely by Philadelphians.

The opening argument was made by Attorney Winter. He said the main question in the case, as the Citizens' company regarded it, and substantially the only question, was one of law, depending upon the construction of the street railroad ordinances of 1864, of 1865, of 1880 and the electric ordinance of 1889; whether or not one construction of those ordinances—the one insisted upon by the defense—has been an attempt on the part of the city to impair the obligation of a contract, which, the Citizens' company says, exists between the State on one hand and the plaintiff company on the other. "The right to occupy the streets of a city with any permanent structure," he said, "to be used for the purpose of collecting a toll by means of its use upon the streets, is a franchise. It has been so defined by the courts of this State and the Supreme Court of the United States." Here he cited other authorities, and called attention to that of the People's Passenger Railroad Company against the Memphis Street Railway Company, the opinion of the case having been given by Justice Clifford. In this case it was held that the right to operate a street railroad in the streets of a city was in itself a franchise; that the power to grant a franchise rested in the State and could not be exercised by a municipality unless there was an express grant to the city from the State. He also called the court's attention to several New York cases, one being the well-known case of the Broadway Street Railroad Company, New York City, of Jacob Sharp. In this case, Mr. Winter said, an attempt was made by the city of New York to grant the right to operate a street railway to Jacob Sharp, and the court held that the ordinance was void for the reason that such a grant was a franchise and could only be conferred by the State, and that a municipality could not confer a franchise unless the power had been conferred upon it expressly or by the necessary implication. In Indiana the question is presented in the case of Echels vs. the Evansville Street Railroad Company, where it was decided that the right to use the streets of a city by a street railway can only be exercised by a grant by the legislature.

In citing the construction of the statutes governing the power of cities to grant franchises, he said that the statutes of 1861, under which the company's franchise was granted, was direct from the State to the company. It was a general statute, authorizing any company to be organized. The company was to be incorporated for the purpose only of operating a street railroad, and articles of association required that it should be specifically stated in what particular town or city it was to be constructed. He said that there was no limitation upon the tenure of property which these companies should acquire. It was well established by the authorities that, where a corporation is created by the State, and given authority, expressly or by implication, without prescribing any limitation to its corporate life, it has perpetual life. "It has the right to exist in perpetuity," he said. "Its franchise is also to be employed in perpetuity, unless there is a provision in the law that limits it to a less period. We stand here holding that all franchises granted in an act of incorporation are only withdrawn when that act is repealed. These incorporated street railways are not given a roving commission to go anywhere in Indiana, but by law they are required in their articles of association expressly to name the particular town or city for which they are incorporated to construct and operate a street railway system. So that if a

street railway company, if incorporated under this law (unless we find in the statute itself the grant to it to operate a street railway system), would be mere nullity, unless we can further find a town or city for which it is granted a franchise."

He further said that the authority to grant a franchise rests with the State; that the State may confer upon a street railroad company the right to go into a city or town without the consent of the municipality, and without any city or town possessing power over it except that of police regulation, and that cities and towns are merely subordinate agencies of the State; that a street railway could enter a town or city without consulting the authorities. He said it was claimed that the ordinance of 1894 has the effect to limit the franchise and the rights of the company to thirty years from Jan. 18, 1864. The city of Indianapolis could not itself have granted a franchise to a street railway company. All the city had to do with it was regulating speed of cars, where the tracks shall be placed, how wide apart the rail must be (the law says not less than three feet nor more than five feet), the radius of curves, the distance the cars shall be kept apart, and other matters.

Judge Elliott opened the argument for the City Company, holding that the act of the legislature, which provided for the organization and incorporation of street railway companies, simply provided a means of bringing them into existence, after which they would have to subject themselves to the local laws of the place where they were situated, while the plaintiff insisted that the act in question went further and provided for the perpetual existence of its creations, until such a time as the general assembly itself might see fit to abolish it. Judge Elliott said in part:

"The term of the plaintiff's license to use the streets of Indianapolis is limited to 30 years, not only because the electric ordinance of 1889 so limits it, but because there has never been a successful extension of the time. There is in this contract no consideration for the rights conferred; not a single new obligation or duty imposed. And there is nothing to show that the company has accepted even so favorable an ordinance."

Judge Woods: "Is there not a presumption of acceptance because the ordinance is favorable to the corporation?"

Judge Elliott: "But the corporation does not support the ordinance. It is everything for the corporation and nothing for the public. There is no consideration whatever for the public benefit."

Judge Baker: "Do you not think there was a consideration in the fact that the company agreed to perform services for an additional term of years?"

Judge Elliott: "I will show that the company has negated that presumption. Besides, there is an express consideration, and where a consideration is expressed no implied consideration can be accepted. The company wanted to issue bonds in order to reduce its interest. It was paying 7 per cent. on its bonds, and found that it could refund them at 6 per cent., and to do so would have to issue them for 20 years. To do this it would be necessary that the time of its franchise be extended, for it was then but 13 years until its original franchise expired. An ordinance was introduced in the city council extending the franchise 15 years, and Tom Johnson, president of the company, made the argument in its favor. The ordinance was passed amended so as to extend the time seven years."

Numerous authorities were here introduced to show that the streets of a city were the sacred trust of the municipality for the inhabitants, and that the municipality had no right to grant the use of the streets to any private corporation except for the benefit of the people. "The only reason," he said, "for the extension of the time of this company's franchise was that it might reduce its interest 1 per cent.—a benefit only to the company, a consideration for which the city had no right to grant the use of the streets."

Judge Elliott closed by reading from an opinion in the case of the city of Detroit vs. the Detroit Street Railroad Company, which was as follows:

"Until within the last two years no one on the part of the city has questioned the validity of the extension which we have found to be invalid. Large sums of money have been expended on the faith of it. Obligations have been enforced by the city against the street railway company which derived their binding character only from the ordinance of 1879. Were the city an individual, its obligation, solemnly entered into, and for more than a decade quietly acquiesced in, might justly be said to be wanting in good faith. Were the case one in which money had been given the city or where work had been done on property which the city held, it might be possible for the court to give the defendant company relief, by requiring the city to disgorge that which it had taken. . . . But it is impossible in this case to apply such a remedy. The investments of the street railway company were not given to the city. They were investments of private funds, in private property, for private purposes, to subserve the public interest. . . .

Where full knowledge of the powers of a corporation be had, the person dealing with it cannot plead estoppel for the reason of a mistake of law. . . . This is especially true where the corporation is a municipal corporation, and is exercising powers in trust for the public."

Ex President Harrison made the closing speech in the four days' argument on Monday of this week. He occupied most of his time on the argument in favor of the interpretation of the statute creating street railway companies as to give such companies perpetual life and perpetual rights in the streets of such city as would give them entrance. "Suppose," he said, "a company having possession of the streets of a city should be required to give up its possession, how is the transfer from company to company to be brought about? The proper way in equity would be for the plant to be appraised by the properly appointed appraisers. There is no such law in the state of Indiana. It looks as if there was to be an attempt to divide the property of one company between another company and the city."

"The negotiations between the City company and the city council bear upon their face the confession of the city that it was dealing with matters with which it had no right to deal. How is this transfer to be brought about, according to the charter which the city has granted to the new company? Have we the right to take up our tracks? Judge Sells, in a New York case similar to this, held that the tracks became a part of the street and could not be removed. The most onerous method to the public of allowing the construction of a street railroad would be under a limited franchise. Realizing that its life was limited, and knowing that no tracks put in the streets could be removed, the company would naturally use that class of material in the construction of its plant that could be put in with the least expense. Knowing that at the end of the term of the franchise everything must be a loss, the company would have to burden the public so that the public would not only have to pay interest on the investment, but contribute enough, annually, to a sinking fund to pay off ultimately the entire cost of construction. I do not believe that the city council ever intended the ordinance to mean that the tracks of the company would ever have to come up or be given away."

"The ordinance granting this franchise to the City company was framed for the purpose of putting the City company in possession of the property of the Citizens' company. But suppose Judge Sells is wrong. We could tear up our tracks and dump the material in a trash heap somewhere. The City company would come to and ask us what this pile of trash would be worth. We set a price and then they say to us that they will give us this amount, less the cost of taking it up. What return have we then for the great expense we had of putting down the tracks?"

"There is manifest injustice in the interpretation of the law adopted by the gentlemen on the other side of this question, as it makes the city the only nominator of the person who shall buy our property. Allowed to dispose of it ourselves we might get up a competition and get a fair price for the outlay of money. But the city steps in and says that we shall sell to the City company, and we are at their mercy and must accept their terms. Our tracks go to them, if Judge Sells is wrong, without consideration; if he is right they get them for a song. We are left with our cars, power-houses, etc., but they are greatly depreciated in value, and we may dispose of them at forced sale if we can. This is the position of the complainant in this suit."

"What is the position of the defendant company? It has no investment except lawyers' fees. They have no expense except for litigation. If this charter shall stand, as a result they get all the tracks for nothing. We are not entitled to remove the tracks, and they can enter without our consent."

"It has been said that the objections I make are not tenable for the reason that we were invited to bid on the new franchise. So we were, but on what terms could we come to that feast. We were under great expense for maintaining our plant and could not afford to give up 15 per cent. of our gross earnings, as could a company which would step into the legacies which the City company had hoped to get by this alleged legal confiscation."

"The franchise which is claimed by the City company was granted them in April, 1893, nine months before ours expired. I say expired, taking their own side of it, and admitting that the ordinance of 1864 was the only correct one and that our franchise expired January 18, 1894. This franchise purported to give to this new company, from the day of its acceptance by the company, the right to take our tracks without any consideration. We were even served with a notice that we had no right to occupy any street in the city."

General Harrison here took up a copy of the ordinance and read certain passages and sections of it which bore on the principal point of his argument,



namely, that it was the intention of the city to confer upon the new company the right to occupy the tracks of the old company. Continuing, he said:

"Here is a nice mutual agreement by which the city, the City company and the property owners along the lines are to divide the profits derived from the confiscation of our tracks. We are here with our plant and cannot move our tracks. They are owned by stockholders and mortgaged. We ought to be permitted to pay interest on our bonds and possibly a dividend on stock."

General Harrison closed the argument by a summary of his own remarks, as follows: "We have here a great investment, a great system, serving a public use, which are so necessary for the common comfort of the city that a stoppage for a period of twenty-four hours is a calamity. We have a corporation endowed by the State with power to continuously serve that use. We have here a statute which gives to that corporation a perpetual existence. Any life shorter than that is shorter than the purpose for which it was created. We have here a proposition to cut off that life suddenly and effectually and to turn over the property of the corporation to strangers. We have here an attempt on the part of the city to legislate. To insert the word 'operate' in the statute granting the city its powers regarding the street railway company is to legislate. 'Location, survey and construction' cannot be construed to mean operation."

#### ELECTRIC FREIGHT SERVICE AT WILMERDING, PA.

The rolling stock of the McKeesport & Wilmerding (Pa.) road consists of three 18-foot passenger cars of the ordinary type, built by the New Castle Car Company, New Castle, Pa. They are supplied with McGuire trucks, each equipped with two 30 H. P. single reduction Westinghouse motors of the No. 3 type. In addition there are two open cars reserved for summer use, which are similarly equipped. As might be expected, the traffic is not exclusively passenger transportation, the entire mail, freight and express exchange between the two cities passing over the electric road. For the handling of express and freight, the



ELECTRIC FREIGHT CAR AT WILMERDING.

company has a special baggage car, shown in the illustration, for which we are indebted to the *Electrical Engineer*. It is of the same general dimensions as the passenger cars, but equipped with two 40 H. P. Westinghouse motors of the new No. 10 type with No. 14 controllers. All the cars are supplied with special rail brakes, which were found necessary to insure safety on the very heavy grades encountered in the construction of this road. The brakes consist of two heavy iron shoes on each side of the track between the forward and the rear wheels. A lever on the car platform enables the motorman to force the shoes down against the track, lifting, in part, the weight of the car from the axles. These brakes are only supplementary to the ordinary car brakes, which, except in freezing weather, are sufficient for perfect control of the car.

Newark, N. J.—The Consolidated Traction Company sold 599 more horses last week, at the Belleville Avenue stables, and these were advertised as being "well seasoned."

#### OLD CAR STABLES SOLD IN NEW YORK CITY.

After repeated adjournments, the first of which was taken on March 15, 1893, the sale of the car stables of the Twenty-eighth & Twenty-ninth Street Railway Company, New York City, took place last week. This company, of which Jonathan H. Crane is president, laid a cross-town line of car tracks in Twenty-eighth and Twenty-ninth streets half a dozen years ago, but has never put the proposed road in operation. It is said that the charter was obtained and the tracks laid very largely for the purpose of crowding out an operative line, and efforts have long been made by the city to compel the company to tear up its unused tracks. The stables have, of course, never been utilized. They are on East Thirty-third street, and consist of a six-story brick building, on plot 75 by 98 9 feet.

The sale was made under a judgment in foreclosure for \$42,870 against George W. Vultee, who built the stables for the company under the impression that the road would materialize. The property was offered free and clear. The first bid was \$5,000—less than the value of one of the lots. This was raised to \$10,000, and slowly went up to \$25,000, at which figure the property was knocked down to the plaintiff in foreclosure, the New York Security and Trust Company. Here is a deficiency under the judgment of \$17,870; but the property is probably available for factory purposes at a valuation equal to the judgment.

#### NO CONNECTION BETWEEN THE MEIGS PROJECT AND THE WEST END COMPANY IN BOSTON.

It has been quite widely rumored that the West End Street Railway Company had a large share in the plans of the syndicate that obtained the passage of the Meigs rapid transit bill in Boston, and that aside from this the West End had some well

developed plans of its own. This is now emphatically denied by President Little, of the West End, who says:

"I don't know of anything that we have done to warrant the impression that we have any scheme on foot of any kind. We have made no attempt to raise any money except for necessary expenses of the company for repairs, small improvements here and there, and numerous other things which call for funds.

"I can tell you firmly that the West End has no connection with any scheme of any kind relative to rapid transit in Boston. We have no interest or connection with the elevated road of any kind, and we have no interest in any subway of any character, nor do we expect to have. We are not making any preparations for any such possibility. We are simply going along managing our road of street car lines, attending to our service and minding our own business strictly. We do not contemplate any departures of any kind, and we do not intend to take any part in any development of anything only in our regular line which the road is now operating. All additions or improvements made are to be simply extension under our present line of policy. We have no interest with any scheme.

"As far as that issue of stock to holders of West

End land goes the West End Street Railway has no connection with that deal, as the offer was made by the land company to dispose of railway stock in the land company's treasury. The West End Street Railway Company had no part in that.

"The announcement that we were not going to construct the East Boston power station ourselves, as we have the others, is a little premature. We have not yet fully decided what we shall do. We have had some plans made, and shall have some of the plans made in our own engineer's office, but it is quite probable that we shall let the work of construction of the station out on contract."

#### EARNINGS OF THE BUFFALO RAILWAY COMPANY.

Another instance of the good business street railway companies are doing is afforded by the statement of the Buffalo Railway Company for the month of June as well as for the six months ended June 30, 1894. During the former period net earnings increased \$2,445.38; during the latter they increased \$67,593.30, as per tables below.

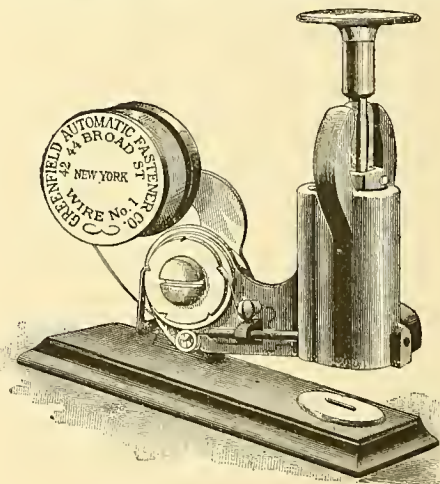
Items.	1894.	1893.	Difference.
Gross earnings....	\$133,486.15	133,133.28	Increase 352.87
Operating expn's....	73,054.33	76,146.81	Decrease 2,092.51
Net earnings....	\$59,431.82	\$56,985.41	Increase 2,445.38

For the six months ended June 30, 1894.

	1894.	1893.	Difference.
Gross earnings....	\$727,167.01	\$687,652.77	Increase \$39,504.24
Operating expn's....	425,131.13	453,223.19	Decrease 28,089.06
Net earnings....	\$302,035.88	\$234,429.58	Increase \$67,593.30

#### THE GREENFIELD AUTOMATIC FASTENER.

The accompanying illustration shows the new automatic fastener for vouchers. Its adaptability is shown by the rapidity with which it can be used for the fastening of papers vouchers and all kinds of light binding. Among the claims made for the



Greenfield's Automatic Fastener.

fastener over all other methods and appliances for the fastening of legal documents, vouchers, bills, papers and the like now in use, are that it is the only automatic portable machine capable of doing this work; that its work is stronger, neater, more uniform and more durable than any present method of fastening; that it is many times more rapid in its execution; that it does away with the use of pins, and that it is many times cheaper.

The simplicity of the machine, the rapidity with which it does its work, the strength of its fastenings, the neatness of its execution, recommend it. It is made strong and durable, being manufactured of the best material, and is so simple in its parts that there is nothing to get out of order. With one operation of the hand the wire is rolled from the spool, placed in position, measured, and cut the required length, staple made, driven through the paper or material to be fastened, and neatly and securely clinched. The machine is manufactured by the Greenfield Automatic Fastener Company, of 42 and 44 Broad street, New York City.



### COMMENTS AND VIEWS OF CONTEMPORARIES.

**A PESSIMISTIC VIEW IN DETROIT.**—If Detroit's street railway system is not to be quipped with electricity, mules should be substituted for horses. Mules can stand such rough campaigning a good deal better and a matter of an hour or two on a round trip is not of vital importance. Some of the cities in Mexico talk of introducing electric street cars. They can probably dispose of some of their old traps and calamities in Detroit.—*Detroit Free Press*.

**EXPANSION OF THE RESIDENCE QUARTER.**—In other leading cities, especially in St. Louis, the change now taking place is greatly for the better, and it is hard for those who see every day what is being done to realize the rapidity of the improvement. The residence quarter has expanded under improved transit to almost double what it was a few years ago, when business men were so often obliged to get out and help a lazy and overworked mule get the car over the grade.—*St. Louis Republic*.

**VESTIBULE LAW.**—The motorman must stand in one place and practically in one position all the working day, which means for him twelve to fourteen hours. For his arduous labors and the immense responsibility for human life placed upon him he is never too well and rarely adequately paid. The requirement of vestibules to protect him from the elements is the least that can be done for him.—*Indianapolis Sentinel*.

**UNDERGROUND RAILWAY FOR NEW YORK.**—Why should we be so blind to this object lesson as to find it necessary to go through, on our own account, the long process of learning by sad and costly experience? Why should we obstruct and darken our principal streets with defacing structures of various kinds only to find, after they have been put up and the annoyance has firmly established itself, that the advantages granted are not what we desire or all that we might have, and that other and further improvements must be made—which might just as well have been undertaken at first—if rapid transit in its true sense is to be secured? The lesson taught in New York is the same lesson that might be learned by the experience of London, Paris and Berlin, that in the densely settled section of a city a tunnel line is the only method by which rapid transit is possible for any length of time, because it is the only method by means of which as many lines can be built as are warranted by the demands of traffic.—*New York World*.

**ELECTROLYSIS.**—English engineers have taken warning by experience with electrolysis on this side of the water and the Board of Trade has laid down various requirements for the control of the circuits of electric street railways. In the course of the discussion before the Board of Trade during the drawing of the regulations, the question arose whether the wandering earth current from an electric railway might not reach the track circuit of a block-signal system on a steam railway line, set the signal at safety when it should be at danger, and thereby cause a serious accident. In ordinary signaling practice, the semaphore drops by gravity to the danger position and is raised by an electric current to safety. When it is remembered that the wandering earth current of electric railways is sufficiently powerful to work electric bells and telegraph instruments, and has even, in some cases, we believe, been made use of for incandescent lighting, the possibility that, under proper conditions, such a current might cause a semaphore to show a wrong indication would seem to be by no means remote. It is true that no instance of this sort has thus far been made public; but it is to be remembered that electric railways are still a novelty and little used outside of the United States, and that only a fair beginning has been made in the equipment of this country's railways with block signals. Besides this, many things occur in railway service which are long in being made public, and because no instance of the turning of a semaphore in the manner described is on record, it does not, therefore, follow that none has occurred or may not occur in future.—*Engineering News*.

**STREET RAILWAY EMPLOYEES.**—No amount of care can wholly guard against accidents from the electric cars. The surest precaution, however, seems to consist in securing the services of the best, the safest and most experienced men that can be obtained. Two employes may be equally experienced. They may apparently be equally attentive to their duties, and yet to a careful observer of human nature it is clear that one may be trusted to perform duties that involve human safety, while the other may not. Hence an experienced and careful manager of the operation of the street railways must exercise much discretion in the selection and retention of his subordinates. He must be guided by the knowledge they display of their duties, and he must go farther. He should call to his aid the wisdom he has obtained in his long observation of human nature, as

shown in his contact with thousands of other employers, and apply this test to discover if his men possess these fine qualifications of head and heart which make them conscientious and considerate of human life. There are few street car employers who would not ride the service of unreliable and unsafe men who have slight regard for human life and safety. They should remember that the management, in making discharges that sometimes seem inexplicable, act upon sacred obligations of duty to the public.—*Toledo Commercial*.

**MOTORMEN'S EYESIGHT.**—There is no position in which perfect sight is more necessary than in a motorman's. It is as much needed as the capacity for distinguishing colors is in a locomotive engineer, and many will remember how defective the eyesight of many railroad men was discovered to be twelve or fifteen years ago, when the question of color-blindness was agitated and some State legislatures passed laws on the subject. The motorman on an electric car needs not only a clear but a trained vision, constantly crossing, as he does, numerous crowded streets, the sidewalks and roadway of which are filled with people and teams eager to pass before the car. He should be able to measure distances accurately and also the customary speed of pedestrians and horses, so as to calculate whether they will be able to cross the track before the car reaches them.—*Philadelphia Press*.

**PROSPECTS OF RAPID TRANSIT IN NEW YORK.**—With three of the old members again in the places that have known them so very, very long; with Mayor Gilroy in the Board, an opponent of some of the leading objects for which the new commission was created; with Comptroller Fitch present and having associations with Tammany Hall, an organization opposed to any anti-Manhattan system, the outlook, to some persons, is not encouraging.—*New York Herald*.

**BIG MONEY FROM PHILADELPHIA.**—While it is impossible to say just how much new capital this city has raised so far this year, it is certain the amount exceeds \$15,000,000. About \$13,000,000 of this can be accounted for thus: The Finance Company of Pennsylvania raised \$5,000,000 for the Reading on its coal trust certificates; stockholders of the Philadelphia Traction Company have paid into its treasury so far this year \$1,650,000; \$2,500,000 more came from stockholders of the Electric Traction Company, and \$2,080,000 from those of the People's Traction Company; while bondholders of the Frankford Railroad Company raised \$300,000 for the Reading to complete the Frankford branch, and \$1,284,400 was secured for the Hestonville Passenger Railway Company. This makes a total of \$12,844,400 of new capital that has been provided since Jan. 1 last.—*Philadelphia Stockholder*.

**EYESIGHT AND ACCIDENTS.**—Safety of the public demands that the gripmen and motormen of our street car lines shall have good eyesight and that they shall be good judges of both speed and distance. Every man who operates a motor or grip car in St. Louis knows the importance of this matter. At street crossings he often has to calculate the speed of an approaching wagon and its distance from the track. He must be able to tell how far away he is himself from the point at which the wagon is to cross, and regulate the speed of his car so as to avoid a collision. Many of the accidents at crossings are due to the operator's misjudgment in these things. He miscalculates the speed or distance, or both, and runs into the wagon. A good many of the rear-end collisions arise from the same cause.—*St. Louis Republic*.

**NEED OF A FENDER.**—Certainly the railway companies owe it to themselves, as well as to the public, that every effort should be made to perfect a fender which shall serve the good purpose of saving the lives of those who may fall by accident before the cars.—*Baltimore Herald*.

**SPARE THE MOTORMAN.**—Did you ever notice that some people, mostly men and boys, take a sort of interest in crossing in front of a street car so as to miss being struck by the guard as narrowly as possible? If you haven't, you'll be surprised at the extent of the prevalence of this pastime. That is really what it amounts to. If one of those people can get across in front of a car which is almost upon him without accelerating his speed, his mission on earth seems to him apparently to have been accomplished. If these people only knew the anxiety this practice causes some motormen (for some of them are conscientious, despite tradition to the contrary), and if they have any of the milk of human kindness in them, they would deny themselves the pleasure they seem to find in it. While they themselves have perfect confidence in their ability to gauge the relative speed of themselves and the approaching car, and to "cross just in time," yet the motorman is kept on pins and needles with fears of such possibilities as the adventurer's stumbling, falling in a faint or dropping dead on the track to be instantly mutilated by the car, with the probability of the motorman being blamed for it.—*Buffalo Express*.

### FINANCIAL DEPARTMENT.

#### Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

**A DULL MARKET.**—The street railway stock and bond market still continues to suffer from the lack of speculative interest marking all markets for securities; and all stocks and bonds, excepting one or two cases where special causes have developed to influence quotations, have been absolutely featureless. This lack of demand is not due to any specific boycotting of street railway securities, as brokers in all kinds of securities are agreed in reporting a total absence of demand. The threatening aspect of the recent labor troubles has proved a real bugbear to the investing public which still refuses to believe that any danger to vested rights from lawless demonstrations is over, and that money placed in good street railway properties is as sure of security as ever. With no orders from outside circles, brokers are obliged to do nothing, as, without having any regular authority as to quotations, they can indulge in no professional speculation in street railway shares.

**THE MOST ACTIVE STOCK** has been Dry Dock, which has dropped from 140 to 135. It seems that the dividend promised at this period is not to be distributed after all. It had been promised that there would be a resumption at an early date of the distribution of profits, and that stockholders, after a half-year's lapse, would again be allowed to share in the road's renewed prosperity. It looks, however, that they will be doomed to disappointment. The management, while admitting that the dividend has been earned, believes it best in view of past experiences to accumulate a little surplus, and with this end in view will pass the dividend now. They have determined, they say, not to resume dividends until uninterrupted payments at the rate of 8 per cent. per annum are assured.

**OTHER LOCALLY ACTIVE STOCKS** have been Third Avenue Cable and Second Avenue. Third Avenue is lower somewhat on the liquidation of some holdings for an estate account, but the present earnings, what with the tremendous excursion business, are said to be at the rate of 20 per cent. per annum on the stock. Second Avenue has been regarded with some interest by reason of a renewal of the reports relating to the transfer of control treated of before in these letters. A "slight difference of opinion"—so it is explained—between influential parties is said to be the only thing preventing a consummation of the deal. But it is expected that this question of "S and C"—such it really is—will soon be amicably arranged, and then Second Avenue will be turned over, in all probability, to the Metropolitan Traction Company.

**SUCH TRACTION STOCKS** as are dealt in on the exchanges are all quiet. The opposition of the Brooklyn City Railroad to an assessment of personality of \$1,000,000 has led to the publication of some interesting figures concerning this portion of the big Long Island Traction Company. At the hearing before the Board of Assessors, Secretary Swin made a statement showing that the value of the property was \$12,169,343. The road has really cost \$17,354,539, but there has been such a depreciation of its real estate and other property that it is worth to-day over \$4,000,000 less. President Lewis, of the Long Island Traction Company, which leases the Brooklyn City through the Brooklyn Heights road, which it owns, stated that the Brooklyn City road's gross earnings for the past year were over \$4,200,000. He declined, however, to make operating expenses or net earnings public. In answer to a question as to whether the contract to pay 10 per cent. dividends had been fulfilled out of the earnings, President Lewis replied, "Not necessarily."

**METROPOLITAN TRACTION** is again on the upward tack. It seems to be getting everything it wants in this city, as it has just secured permission to build a new bit of track on South Fifth Avenue that will greatly facilitate its downtown service, and, what is, perhaps, the greatest advantage of all, this extension gives it the right to build a crosstown line through Broome, Sullivan, and Watts streets direct to Desbrosses street ferry.

**PHILADELPHIA TRADERS** have again given their attention to street railway shares when interest died out in the railroad list, and the traction list is, with the exception of Baltimore traction, all higher. Experts say these stocks were never in better demand.

#### Financial Notes.

**Baltimore, Md.**—The Baltimore City Passenger Railway Company has paid its part tax for the quarter ending June 30, amounting to \$22,887, indicating that the gross receipts have been \$254,301 for the quarter. The receipts were: April, \$70,773; May, \$83,841, and June, \$94,687. The returns show that during these three months the number of passengers carried was 5,086,020, an average of about 10 rides for every inhabitant of Baltimore.



During the month of June the company carried 1,893,740 passengers.

**Chattanooga, Tenn.**—The court has removed W. T. Adams, who has for some time been temporary receiver of the Chattanooga Street Railway Company, and in his place has appointed S. W. Devine as permanent receiver. The St. Louis Trust Company made the application upon which this appointment was made. It is stated that the majority of the bondholders have raised the money necessary to pay the interest on the consolidated bonds and that a reorganization will soon be effected which will take the road out of the hands of the receiver.

**Dallas, Tex.**—A committee of the first mortgage bondholders of the Dallas Street Railway Company is to ask the Farmers' Loan and Trust Company, of New York, trustee for the mortgage, to apply for a receiver for the road. This committee was appointed two years ago, when the road defaulted on its second mortgage bonds. The road has now defaulted on its first mortgage bonds, which amount to \$250,000. The bonds are largely held in Baltimore.

**Brooklyn, N. Y.**—The Flushing & College Point Electric Railroad Company has been placed in the hands of a receiver. The court has appointed William H. Browne, upon the application of the Westinghouse Electric and Manufacturing Company, to which the concern is indebted, to the extent of \$37,000. All of this except \$1,000 was in the shape of bonds, the interest upon which was not paid on July 1.

**Leavenworth, Kan.**—The Leavenworth Electric Railway Company has filed a mortgage for \$300,000 to the Atlantic Trust Company, of New York City, to secure an issue of that amount of 6 per cent. bonds. The necessary papers have been filed, changing the name from "Railway" to "Railroad" company. J. B. Edrington is secretary of the company.

**Dividend Passed Again.**—The dividend period on General Electric preferred has been passed for the second time, but if earnings continue to develop as at present, action looking to the resumption of dividends on this accumulative preferred stock, says the *Boston News Bureau*, should be taken before next July.

**Duluth, Minn.**—A one-fifth interest in the stock of the Duluth Street Railway Company has been sold to Mr. Douglass, of Philadelphia. Considerable money has been raised by the issue of bonds and this will be used to pay off the floating indebtedness of the company and to refund certain outstanding bonds.

**Detroit, Mich.**—A mortgage on the Grand River Avenue street car plant, given to W. C. McMillan and George H. Hendrie, as trustees, was filed in the city clerk's office last week. The mortgage was given in 1891 to secure \$250,000 worth of bonds, but this has now been reduced to \$150,000.

**West End Earnings.**—June gross earnings of the West End, Boston, were \$643,000, against \$618,000 in 1893 and \$598,000 in 1892. The net gain in June was about \$50,000.

**Cincinnati, O.**—The Mount Adam & Eden Park Street Railway Company has declared its regular quarterly dividend of 1½%, payable on and after July 10.

**Dividend.**—The Worcester Traction Company, of Worcester, Mass., has declared a dividend of 3 per cent. on its preferred stock payable Aug. 1.

#### NEWS OF THE WEEK.

**Chicago.**—The Central Rapid Transit Company of which A. G. Goodman is president and Z. C. Cornell secretary, has asked for a franchise over the following route, with "the right to connect with other street railroad tracks":

Beginning at the intersection of Kedzie avenue and Eighty-seventh street, running north on Kedzie avenue, east on Thirty-first, north on Troy, east on Twenty-sixth street, north on Rockwell street, east on Twenty-fifth street, north on Oakley avenue, east on Twenty-third street, north on Lincoln street, east on Thirteenth street, west on Twenty-sixth street from Troy to Hamlin avenue, north on Hamlin avenue to Sixteenth street, west on Sixteenth street to Forty-first street, north on Forty-first street to Harrison street, west on Harrison to Forty-eighth, west on Seventy-first from Kedzie to Hyman avenue; also beginning at the corners of Kedzie and Columbus avenues, running south-west on Columbus avenue to Eighty-third street, west on Eighty-third street to Crawford avenue, south on Crawford avenue to Eighty-seventh.

It is proposed that that the cars be operated by electric storage batteries, caloric, or hydraulic power, and the company may from time to time change its means of locomotion to more modern methods or may operate the same by such other motive power as the mayor and commissioner of public works may approve, it being understood that the company shall not at any time use overhead wires. Cars are to be running in one year. A \$50 license fee is offered.

**North Woburn, Mass.**—In regard to the existing strike, steps were taken last week to bring about a

settlement. W. H. Sharpe, of Lynn, representing the employees of the North Woburn Street Railway Company, and Amos F. Breed, president of the road, met in conference at the rooms of the State Board of Arbitration, in Boston. The conference was held in the presence of the board, and lasted several hours. Mr. Sharpe explained the case of the strikers, and set forth their claims for better wages, more regular employment and union recognition on the part of their employers. No specific agreement was reached, and it was thought that the difficulties could not be settled without the assistance of the board of arbitration. President Breed was quite satisfied to let the board arbitrate the matter and to abide by its decision. Mr. Sharpe, while not opposed to this method of settlement, could not consent to it without the approval of the men. The conductors and motormen of the North Woburn road have been paid \$1.75 per day during the four summer months and \$1.57 for the other eight months. The men are now demanding \$2 per day. About 40 motormen and conductors are employed on the road.

**St. Louis, Mo.**—The Southern Electric Railway Company has applied for the appointment of commissioners to determine the amount to be paid other companies whose tracks it will be necessary to use. A portion of the tracks to be used by the Southern Railway Company belong to the Missouri Railway Company and lie between Sixth and Fourth streets on Market. As the latter company operates its old lines under a State charter antedating the city ordinance allowing one company to use another's tracks, an interesting question is likely to be precipitated. The *St. Louis Republic* says: "It is reported that the Missouri Railroad Company will not permit the use of its lines, alleging exemption from the regulations of the municipal ordinance, and will not recognize the right of the Southern Railway Company to apply for commissioners.

**Washington, D. C.**—At the recent hearing on Senator McMillan's Senate bill, providing for a general transfer of passengers on the railroads of the District of Columbia, the representatives of the companies objected to the proposed system on the ground that the roads were already losing money. It was claimed that the Belt line receipts fell short of its expenses \$35,000 last year, and the Eckington & Soldiers' Home line \$22,000. President Griswold, of the Anacostia line, said that in 1892 they carried 1,192,646 passengers, the receipts being \$60,840. The next year they arranged a system of transfers with the Belt line, and, while they in that year carried 1,849,223 passengers, the receipts amounted to but \$57,574, showing a loss under the transfer system of over \$3,000.

**Yonkers, N. Y.**—Several of the prominent citizens of Yonkers have organized the North and South Electric Railway Company, for the purpose of operating a street railway through the principal streets from the north to the south of the city. They will ultimately connect with a road being built north of Mount Vernon, at or near Tuckahoe, and run to White Plains. The company has been incorporated with the following directors: Francis T. Holder, president; William D. Baldwin, treasurer; Theodore H. Silkman, secretary; Samuel T. Hubbard, Richard B. Kelly, John C. Shotts, John J. Devitt, James S. Fitch and Leslie M. Saunders. The capital stock of the company is \$50,000. It has just applied for a franchise, and will commence work as soon as it gets it.

**Marinette, Wis.**—A franchise has been asked for by J. I. Scott, Louis Leisen, W. A. Curry and Andrew Matison. Mr. Leisen is a business man in Menominee, Mich. He says that if the franchise is given very soon, work will be commenced right away. The intention is to lay the line to the Bay Shore and operate it as a horse car line. Three or four cars are to be bought and one or two of these will run on week days and the whole number on Sunday. The equipment for the new line will be purchased second hand. It will be distinctively a summer line and will be run for the traffic out to the Bay Shore Park. The franchise for the new line gives two years' time in which to commence the work. The entire cost of the new line will not be over \$3,000.

**Indianapolis, Ind.**—The Citizens' Street Railway Company announced last week an increase in the wages of motormen and street railway conductors to 16 cents per trip, being a raise of one cent. The order announced that this was done in accordance with the promise of the company, when the cut was made, namely, that when the receipts showed an increase warranting the higher wages, a restoration of the old rate would be made. It was promised that another increase would be given when the business again made it possible. The street railway employees in Indianapolis are not organized; but the American Railway Union has been trying to induce them to join their organization.

The St. Louis Railway Company, of St. Louis, Mo., has placed the order for its new car barn with the Berlin Iron Bridge Company, of East Berlin, Conn.

The building will be 64 feet in width and 185 feet in length, with brick walls, the roof being of iron covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron roof covering. It is the intention of the railroad company to make this station absolutely fireproof, and thereby save insurance. There will be no wood-work used in the construction of the building, and it will not be necessary to carry any insurance whatever, as the danger from fire is entirely eliminated.

**Troy, N. Y.**—It is said that Congressman Charles D. Haines, of Kinderhook, is backing the project for an electric railroad between Troy and Sand Lake. Mr. Haines is reported as saying that he was willing to undertake the construction of a road from Albia to Averill Park, as a part of the proposed line at once, and that later the line will be extended to make a connection with the Kinderhook & Hudson railroad at Niverville, provided that road is acquired by him, under negotiations now pending. This offer is made on the condition that the Troy & New England road will issue \$100,000 each of its stock and bonds, Mr. Haines and his friends taking one-half of this amount.

**Warren, O.**—The assessment of the Trumbull electric road for taxation, as agreed upon by the Warren, Niles and Trumbull county boards of equalization is \$2,500 per mile inside town corporations, \$1,500 per mile in country, \$500 per car and \$1,000 for power station. This valuation is considerably higher than returned by the company, and representatives of the road were cited to appear and show cause why the increased assessment should not stand. The company's representatives claim that the assessment is in excess of other towns, and asked time to investigate the valuation of electric roads in cities of similar size.

**Cleveland, O.**—The "Big" Consolidated has secured an exclusive franchise for twenty-five years, giving it the right to operate street car tracks in South Brooklyn from the end of the bridge to the state road, south of the main business portion of the town. The company is required to lay double tracks and pave between the outside rails. As planned at present, the proposed Akron electric road will enter Cleveland by way of South Brooklyn, and it is thought that this franchise may interfere with the prospects of that line.

**Camden, N. J.**—The Camden Horse Railroad Company has started, with a large force of workmen, to make the track connection on Kaighn avenue, at Broadway, Sixth and Eighth streets. When the work is completed, a line of cars will be run from Kaighn's Point Ferry to Liberty Park and Evergreen Cemetery, with exchange to Collingswood. The work is expected to be finished in a week. The Broadway cars for the present, however, will continue to run to Collingswood.

**Pittsburgh, Pa.**—The Pennsylvania Railroad is reported as negotiating for an entrance into McKeesport. The route will be over the tracks of the McKeesport and Wilmerding electric railway. An offer has been made to the electric railway company for its property. McKeesport is one of the best paying railroad passenger stations in the vicinity, and the Pennsylvania Railroad desires to get a portion of the business now controlled by the Baltimore & Ohio.

**Jersey City, N. J.**—A test was made on Thursday of this week, at the car shops of the Consolidated Traction Company, of a new car-fender, invented by James W. McKinnon. A dummy figure was used and struck a number of times while the car was going at the rate of 7 to 15 miles an hour. Each time the figure was caught up and deposited on the fender without injury. A number of street car officials from various places were present.

**Kansas City, Mo.**—Receiver Robert Gillham, of the Northeast Electric road, applied recently to Judge Henry for leave to issue receiver's certificates with which to pay for 10 new car bodies. His attorneys reported that the present cars are unfit for use. Judge Henry granted the application and limited the issue of certificates to \$8,000. Mr. Gillham will purchase new bodies for the cars, but will use the old trucks.

**New York City, N. Y.**—The court has made an additional allowance of \$1,250 each to the rapid transit commissioners for their services. This makes the total expense of the old commission foot up in round numbers \$145,000. The commissioners have received \$6,250 each. About \$50,000 was expended for engineering service and the remainder has been devoted to the legal advice furnished the commissioners and for clerical work.

**Brooklyn, N. Y.**—Highway Commissioner Horton has given consent to the Coney Island, Fort Hamilton & Brooklyn Railroad to construct and operate a line on and along a number of streets in New Utrecht. Either horse or electric power is specified. All the streets asked for are included in the franchise with the exception of one which had already been given to the Brooklyn City Railroad Company.



**Chicago, Ill.**—The West Chicago Street Railroad Company will soon let contracts for an electric power house at the intersection of California Avenue and Roscoe Boulevard, to furnish power for the trolley line company that is to operate in connection with the Milwaukee Avenue cable system. The structure will be one story and one-half high, and the ground space covered will be 100 by 125 feet.

**Newark, N. J.**—The new car house of the Consolidated Traction Company, near the Passaic Bridge, is making rapid progress. The building is 250 by 80 feet and has a capacity for 56 cars. The tracks are elevated, so that workmen can go about underneath the cars. The second story has been fitted up for the comfort of the men and is furnished with sleeping-rooms, bathrooms, waiting-rooms, etc.

**New York City, N. Y.**—A driver of one of the Ninth Avenue horse cars made a complaint this week against the driver of an undertaker's wagon, for getting in front of the horse car with his wagon and obstinately refusing to leave the track until he reached the side street at which he intended to turn, thus delaying the car, it was alleged, ten minutes. The driver of the wagon was fined \$2.

**Harrisburg, Pa.**—The Harrisburg & Mechanicsburg Electric Railway Company's officers have been elected from the official staff of the Cumberland Valley Traction Company, which purchased the franchise. O. H. Ormsley, of Pittsburgh, is President; S. M. Skyles, of Martinsburg, Pa., is secretary, and W. H. Wigton, of Altoona, is treasurer.

**Bloomfield, N. J.**—A petition from the North Jersey Street Railway Company has been presented to the township committee asking for a franchise to run electric cars from the present terminus of the Newark Passenger Railroad Company on Bloomfield avenue to the Montclair line. The petition was referred to the law and franchise committee.

**Annual Report Issued.**—Secretary Richardson, of the Street Railway Association of the State of New York, has issued a report of the eleventh annual meeting, held in Rochester, last September. The report is a pamphlet of 60 pages, and includes, besides a verbatim report of the proceedings, the constitution and by-laws of the association.

**Galesburg, Ill.**—The street railway company has elected the following officers: President, Robert Chappell; vice president, O. F. Price; treasurer, W. Seacord; secretary, Henry Arnold; directors, Robert Chappell, W. Seacord, B. F. Arnold, Fred Seacord, J. K. Mitchell, E. A. Bancroft, O. F. Price, P. M. Johnson, Josiah Babcock.

**Bradford, Pa.**—The city council has passed an ordinance granting the Bradford Electric Street Railway Company the exclusive right to construct and operate a street car line along the various streets for a period of fifty years. No date for commencing the work is specified, although the time for completing it is two years.

**Dixon, Ill.**—The City Council has granted a franchise to the electric railway company for laying and operating a street car line through the city. This line will be a part of the Rock River Electric Railway, projected between Rockford and Dixon. The right of way has already been secured.

**Leavenworth, Kan.**—Judge Foster has confirmed the sale of the Leavenworth electric street railway, subject to the payment in full of claims held by the court some time ago. Efforts were made by an attorney for the bondholders to have their claims satisfied, but they were ruled out of court.

**Buffalo, N. Y.**—The North Main Street & Tonawanda Electric Railroad Company has elected the following directors: L. F. W. Arend, J. H. Pardee, C. H. Timmerman, Moses Foltz, B. A. Cook, Edward Rutherford, E. C. Hoag, Elias Hoag, Geo. S. Hoag, Edward C. Mason and C. M. Graves.

**Buffalo, N. Y.**—The Buffalo Railway Company has won its long suit over the Allen Street line. The referee decides that the resolution of the counsel authorizing the construction of the double tracks was valid, and further that the company has the right to operate the line by electricity.

**Newark, N. J.**—Three suits were brought against the New Jersey and Consolidated Traction companies last week. One of these was for \$10,000 damages for the killing of a five year old boy; another for \$15,000 as the result of a collision, and the third is for \$15,000 for the killing of a young man.

**Rochester, N. Y.**—A report that the Rochester Railway Company had purchased the Rochester & Irondequoit road and that the management of the two roads had been merged into one has been emphatically denied by John N. Beckley, president of the Rochester Railway Company.

**Hartford, Conn.**—The directors of the Hartford, Manchester & Rockville Tramway Company held a meeting last week and voted to build the line of the entire length proposed and have the cars running before the last of the year. The company will advertise for bids in a few days.

**Portland, Ore.**—S. Z. Mitchell offers for sale the electric rolling stock, line equipment, steel rails and steam plant of an electric railway, in lots to suit the buyer. Information may also be obtained from W. J. Grambs, Seattle, Wash., or J. R. Mason, Port Townsend, Wash.

**Harrisburg, Pa.**—A test was made last week on the lines of the Citizens' Passenger Railway Company, of a new switch patented by Messrs. Murray & Hatfield Brothers. This switch is operated by the motorman, by the manipulation of an attachment at the front end of the car.

**Montreal, Canada.**—The Street Railway Company is making a trial of operating smoking cars upon its lines. One car has been placed on the Windsor street route as an experiment. If it proves to be a paying investment for the company, similar cars will be placed on all the lines.

**Irvington, N. J.**—The village board of trustees has refused to grant a franchise to the Consolidated Traction Company, unless that company shall guarantee a five-cent fare between Newark and Irvington, and that transfers shall be given as is now the practice in Newark.

**Easton, Pa.**—The Tamaqua-Lansford electric railroad began building an electric line between these two points this week, with a force of over 100 men. It is stated that another company, composed of Philadelphia capitalists, wants to build a line over the same route.

**Pittsburg, Pa.**—The Pennsylvania General Electric Company has entered suit against the Citizens' Passenger Railway Company, of McKeesport, to recover \$13,356.22. The amount is claimed to be due for electrical appliances sold and delivered to the defendant company.

**San Francisco, Cal.**—Judge Seawell has ordered the wages of some one hundred and twenty laborers in the employ of the defunct San Francisco & San Mateo electric railroad paid. This covers a period of about two months and aggregates about \$9,000.

**Washington, Pa.**—The Rock Creek Railway desires to extend its lines, and a bill authorizing it to do so has been introduced in the House of Representatives. According to this bill either cable or electric power may be used, but the overhead trolley is expressly forbidden.

**Middletown, Conn.**—The work of equipping the Horse Railroad Company's lines with electricity has been delayed, owing to the inability of the company to secure rails. This is due partly to the strike in the coke regions and various other labor disturbances.

**Hartford, Conn.**—The New Haven Union is authority for the statement that the electric railway between Hartford and Rockville before next winter is assured, and that Manchester will be connected with Hartford by an electric line by October 1.

**Rome, Ga.**—The Rome Electric Street Railroad has been sold to Capt. John J. Seay for \$31,000. Outside parties, including some Atlanta men, are interested with him. It is said that Captain Seay will take charge as president of the road.

**Cincinnati, O.**—An ordinance recently passed provides that the street railway companies of the city shall pay 5% of their gross revenue, in addition to a tax of \$4 per foot, inside measurement, on each car operated, in return for their franchise.

**Philadelphia, Pa.**—Cars are now running over the Ridge avenue branch of the Traction Company's lines. The run of two miles over the new line is made in eleven minutes. The extension is to be pushed rapidly to Green Lane.

**Messrs. B. W. Payne & Sons,** of No. 41 Dey street, New York, have recently added to the plant of the Middletown-Goshen Traction Company a 100-H. P. Payne-Corliss engine and a 125-H. P. horizontal tubular boiler.

**Dubuque, Ia.**—It is reported that J. A. Rhomberg, president of the Dubuque Street Railway Company, proposes to extend the company's lines to Sageville, where a summer resort will be established.

**Bridgeport, Conn.**—Thomas Murray, of New Brunswick, N. J., has taken the contract for building certain parts of the new electric road at Bridgeport. The cost of his part of the work will be \$150,000.

#### PERSONAL.

**L. W. Collins,** of Chicago, has formed a partnership, under the name of Lee & Collins, with C. E. Lee, of the same city. The firm will handle a number of specialties in the supply line, with headquarters at 257 Fifth avenue, Chicago. Mr. Collins is well known among the trade, as he has been for a number of years representing electrical trade papers both in New York and Chicago, and we trust that his wide acquaintance may result in

building up a substantial business for the new firm.

**W. P. Rosborough,** late superintendent of the Rochester (N. Y.) Street Railway, has been appointed general-manager of the Norfolk (Va.) City Railway Company.

**Chas. E. Newton,** secretary of the Jewell Belt- ing Company, of Hartford, Conn., was in New York this week.

#### TRADE NOTES.

**The International Register Company,** 197 South Canal street, Chicago, reports a decided improvement in business. It has secured a number of good contracts recently, the most notable of which is one from the Kansas City Cable Railway Company, of Kansas City, Mo., for 100 portable machines for equipping the Grand avenue division of the Consolidated system. This is an exceptionally strong endorsement of their portable machine. The Kansas City Cable has had a very extensive experience with various registers, and after giving the International a thorough test for nearly a year decided to adopt it as their standard. The International register is daily becoming more and more recognized as a strictly high grade standard machine, and they are being operated by some of the best street railways in the country. The number of roads that have adopted these registers, and the quantity of machines used every day, comprise a record of which the manufacturers may well be proud.

**The Card Electric Co.,** of Mansfield, O., is building double motor equipments as well as single. The claim is made that on small level roads it is useless to weigh down a car with double equipments, and for this reason the company advocates the single motor equipment. For roads on which there is heavy traffic, trailers have to be hauled and heavy grades encountered, they recommend double motors as large as the case may require. These motors are made of open hearth steel, but the Card company has not eliminated the mechanical strength of their motor in order to save weight. The series parallel controller very much resembles the controller for single equipments recently illustrated, and consists simply of a series of break switches. Motors are built for high speed for interurban business, and of a medium speed for ordinary traffic.

**The Mason Electric Company,** Chicago, has found it necessary to take larger and more convenient quarters at 7 Adams street, directly opposite the Pullman Building. This is two doors from the store where Mr. W. R. Mason, the general manager, started the pioneer house in electric railway supplies. The company reports a very satisfactory business in general supplies, which is not surprising, as they carry in stock everything for the complete equipment and maintenance of electric roads. The strike has interfered seriously with shipping, but the company, with characteristic enterprise, has helped out its trade as far as possible by making express shipments.

**Beardsley Manufacturing Company,** Chicago, reports a constantly increasing demand for the oil paper and oil cloth which it manufactures for insulating purposes in winding armatures, etc. The company makes strong claims for the superiority of its goods and reports that several street railway companies have adopted them in their repair departments. This company also operates a foundry for the manufacture of small bronze, copper, brass, aluminum and alloy castings, such as trolley wheels, harps and such as is used in electrical work generally.

**The Mather Electric Company,** of Manchester, Conn., is making a specialty of direct connected generators for railway work. Until recently people preferred to use belted machines, but now the direct connected type has been thoroughly tried. The Mather company builds direct connected machines for both Corliss and high speed engines, from 100 H. P. up. Their new type of railway machine has proved very satisfactory, and a good business is being done by this company in the railway field.

**The Meaker Manufacturing Company,** Chicago, manufacturer of the well-known Meaker fare register, says that its business compares very favorably with that of former years. The company has thus far kept its full force employed, and is preparing for a much larger business than ever before.

**The Buckeye Electric Company** has appointed the Manhattan General Construction Company, 50 Broadway, New York City, its present agents for New York and vicinity, the exclusive agents for Massachusetts, Rhode Island and Connecticut, in addition to the territory already covered.

**The United States Light, Heat and Power Company,** of New York City, is putting up a new switchboard building which will be covered with an iron roof and the Berlin Iron Bridge Company's patent anti-condensation corrugated iron roof covering.



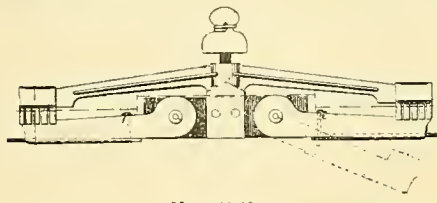
# RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued July 10, 1894.

**522,579. Gear Casing for Railway Motors;** Norman C. Bassett, Lynn, Mass., Assignor to the Thomson-Houston Electric Company, of Connecticut. Filed March 20th, 1891. A gear case pivoted on the rear wheel shaft, and having a small removable section joined to the casing on lines passing through the gear and pinion shafts and between the pinion and gear, whereby when said section is removed the rest of the casing can be swung away from the pinion to permit it to be removed from its shaft.

**522,581. Controllor for Electric Motors;** John B. Blood, Lynn Mass., Assignor to the General Electric Company, Boston, Mass. Filed December 18th, 1893. A switch or controllor for two or more electric motors comprising a number of contacts adapted to vary the motor relations when connected in successive combinations by a moving switch member from series to parallel with current flowing in one direction, and a number of other contacts corresponding thereto and adapted to connect the motors in series with current flowing in the reverse direction when bridged by said moving member.

**522,621. Combined Hanger and Automatic Switch for Trolley Wires;** Rupert Scheffbauer, Paterson, N. J. Filed July 15th, 1893. In a trolley wire support, the combination with a body of insulating material, of two levers attached to the same at opposite ends, to which levers the trolley wires are directly fas-

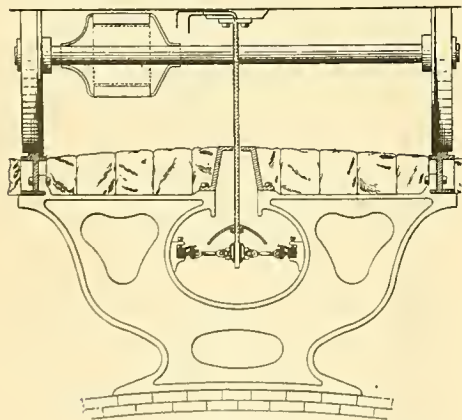


No. 522,621.

tened, a hanger from which the insulating body is suspended, and two sets of contact jaws on said hanger, one set of jaws serving for each lever, and which jaws are in metallic connection with each other. (See illustration.)

**522,633. Method of Making Composite Car Wheels;** Nathan Washburn, Boston, Mass. Original application filed Jan. 28, 1893. Divided in this application filed Oct. 11, 1893. The method of manufacturing a composite car wheel composed of a cast iron center or body and a chilled rim or tread integral therewith and converted into steel, which consists in subjecting a cast iron wheel having a chilled rim or tread to the direct action of a flame produced by the combustion of a hydrocarbon.

**522,648. Roller Bearing;** Frank S. Church, Detroit, Mich., Assignor of one-half to W. Fitz-Hugh Edwards, same place. Filed Aug. 26, 1893. A roller bearing comprising a fixed shaft, a hub apertured to surround the shaft, an enlargement on the shaft within the hub, interposed rollers consisting of an outer series bearing against the hub, an inner series bearing against the fixed shaft, and an intermediate series of hollow spacing rollers between the inner and outer series of rollers, a ring-frame located at opposite ends of the intermediate rollers, shafts connecting the rings of the frame and passing through the intermediate rollers, and



No. 522,656.

bearings between the shafts and intermediate rollers. (See illustration.)

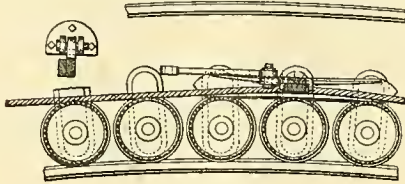
**522,655. Contact Railway Trolley;** John L. Cleveland, Auburn, N. Y. Filed Aug. 5, 1891. An electric trolley, consisting of a depending plate in combination with the trolleys supported on either side thereof respectively by a pair of pivoted arms. (See illustration.)

**522,665. Car Brake;** George W. Kramer, Peoria, Ill. Filed Nov. 6, 1893. As a means of applying the brakes of cars, a friction clutch cone mounted upon and rotating with a shaft, supported by the car, in such manner as to be longitudinally movable on said shaft, a cup shaped bowl loosely mounted upon the same shaft, adapted to be engaged by said cone; and means for moving the cone longitudinally to engage said bowl; in combination with means for imparting the rotation of the car axle to the clutch cone and means for transmitting the rotation of the clutch cone to the brake stem.

**522,670. Danger Signal for Railway Crossings;** Myron W. Parrish, Detroit, Mich. Filed Oct. 30, 1893. In a railroad crossing signal for electric railway, the combination with the trolley wire of the electric railway, of two electro-magnets in normally open circuits between the trolley wire and the ground or return

circuit, circuit closing mechanism on opposite sides of the crossing, whereby the passage of a train successively closes and opens the circuit of one magnet and then of the other, an armature common to both magnets and adapted to be moved in opposite direction by said magnets, and a danger signal actuated by said armature and adapted to guard the approaches of the electric railway on either side of the crossing.

**522,709. Contact Shoe for Electric Locomotives;** John J. Green, Boonton, N. J., Assignor to the



No. 522,713.

Universal Electric Company, New York, N. Y. Filed July 3, 1893. A contact shoe for electric railways consisting of an elongated centrally yielding or flexible portion and an elongated flexible side contact plate carried thereby, the two being connected at or near the ends by loose or sliding connections, and rigidly connected at or near the middle portions of the plate, the plate between the ends and the middle being out of contact with the central portion of the shoe.

**522,710. Contact Bar for Electric Locomotives;** John J. Green, Boonton, N. J., Assignor to the Universal Electric Company, New York, N. Y. Filed Oct. 9, 1893. A contact shoe for electric railways, consisting of two flexible side strips, an insulating suspending bar at one end of each, sliding connections between the suspending bar of each strip and the adjacent end of the other strip, a central insulating spacing block to which the strips at their middle parts are rigidly connected, in combination with an electric motor car, bearing or supporting brackets carried thereby, an electric conduit and contact boxes arranged within the conduit at intervals.

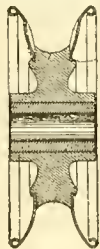
**522,711. Supply System for Electric Railways;** John J. Green, Boonton, N. J., Assignor to the Conduit Construction Company, New York, N. Y. Filed Oct. 9, 1893. A shoe for electric railways, consisting of contact strips arranged in or about the same vertical plane, plates or blocks of insulating material secured to the ends of the strips, suspending bars secured to the insulating material, plates or blocks of insulating material secured to the central part of the strips, and rollers at the end and center of the shoe adapted to work in the slot of a conduit.

**522,713. Cable Railway;** Charles W. Hunt, West New Brighton, N. Y. Filed April 27, 1891. The combination with the grip shoe and its stem, of a brace connected with the stem near the grip shoe, the car frame with which the other end of the brace is connected, a clamp bar adjacent to and connected with the stem of the grip shoe, a screw acting between the clamp bar and the stem of the grip shoe in clamping or releasing the cable, a connection between the frame of the car and the stem of the grip shoe, and a handle upon the stem of the grip shoe. (See illustration.)

**522,834. Electric Locomotive;** Edward Hopkinson, Manchester, England. Filed July 21, 1891. In electric vehicles and the like, the combination with the driving axle, of a motor for propelling the same, the armature of said motor being built upon said driving axle, and the magnets and pole pieces supported therefrom by journals which allow freedom of angular motion around the axle, rigid stops or guides fixed to the framework and springs interposed between said stops or guides and the frame of the magnet, whereby the angular motion of the latter is limited.

**522,844. Trolley Car;** Charles A. Lieb, New York, N. Y., Assignor to the General Electric Company, Boston, Mass. Filed April 12, 1891. This is an improved trolley car, comprising a sheet metal part, an upwardly extending fin or fold, a cast metal bolt portion and rivets, etc., securing the sheet metal part to the cast metal part.

**522,845. Trolley Wheel;** Charles A. Lieb, New York, N. Y., Assignor to the General Electric Company, Boston, Mass. Filed April 12, 1891. As a new article of manufacture, a trolley wheel comprising a core of



No. 522,845.

good conducting metal, as copper or bronze, and sheet metal flanges having stiffened edges and secured in place by a lip turned over from the core, such wheel provided with a central busbing around the bearing. (See illustration.)

**522,852. Substructure for Bracing and Supporting Railroad Road-beds;** James M. Price, Philadelphia, Pa., Assignor to the Price Railway Appliance Company of Pennsylvania. Filed July 12, 1893. The combination of a horizontal plate of metal with a vertical plate reaching above and below it and to be spiked below to the side of a wooden tie, to the top of which the horizontal plate is also to be spiked, while a prolongation upward of the vertical plate is shaped into a brace for a railway rail, as part of a substructure for railway uses. (See illustration.)

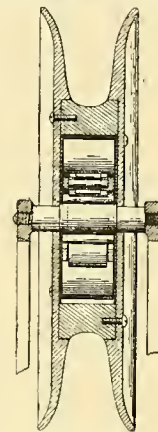
**522,859. Insulated Armature Coil;** John H. Shug, Boston Mass., Assignor to the General Electric Company, of New York. Filed April 21, 1891. A coil for the armature of a dynamo electric machine or

motor, the wires of which are bound together with tape, and insulated with a layer of oiled linen and an outside wrapping of tape impregnated with an insulating varnish.

**522,891. Closed Conduit for Electric Railways;** Charles I. Greer, Washington, D. C., Assignor of one-half to Charles B. Pierce, same place. Filed April 16, 1891. A slot cover for electric conduits, consisting of a series of rigid covering-plates adapted to overlap and extend beyond the edges of the slot and having central depending webs projecting at one end beyond the ends of the covering-plates, and gained to overlap the gained ends of the adjacent webs to which they are connected by a stud on one engaging an elongated opening in the other.

**522,898. Track Cleaner and Switch Thrower;** Isaac W. Hewit, Akron, O. Filed March 3, 1891. The combination of a truck frame, a bar pivotally secured thereto and a means for raising and lowering it, a bar supported by and above said first-named bar, a switch-throwing arm supported by said frame and having a crook at its upper end and a shoe at its lower end, an operating shaft on the car platform, and a connection between the same and the switch-throwing arm.

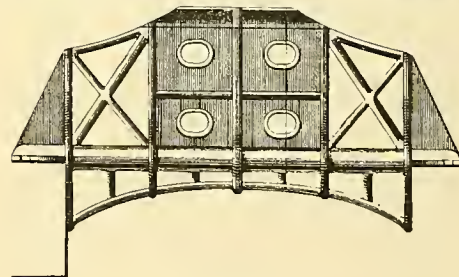
**522,905. Car Fender;** Lucius Q. C. Lamar, Oxford Mass. Filed March 31, 1891. In a car fender, the combination with a readily breakable fending member projecting below other parts of the device but normally a little above the rails, means for lowering said member



No. 522,648.

at will, means for holding it when lowered, means for releasing it, and means for returning it to its normal position.

**522,914. Street Railway Switch;** William E. Murray, Daniel W. Hatfield and George W. Hatfield, Harrisburg, Pa. Filed March 30, 1891. In railway switch devices, the combination with a movable switch rail, of a vertically-movable rod or bolt projecting above the track rail and adapted to be depressed by a car wheel, a vertically-movable rod or bolt arranged between the track rails, a rock shaft extending transversely of the latter, a crank arm on said shaft to which said second rod or bolt is pivotally connected, a second crank arm on said shaft, a rod pivotally connected to the same and to the switch rail, a third crank arm on the said shaft, a rod pivotally connected to the said latter arm, a bent lever pivotally connected to the latter rod and adapted to be operated upon by the first vertically-movable bolt to cause the switch rail to be turned in



No. 522,852.

the manner described, and a rod carried by a car and adapted to depress the second vertically-movable rod to operate the switch rail.

**522,915. Trolley Pole;** Alexander S. McBean, Montreal, Canada. Filed April 10, 1891. A trolley wheel support composed of a metal section rigidly secured to the trolley pole, an adjusting platform and a frame piece, the latter carrying the trolley wheel or runner, with a swiveling connection between the adjusting platform and the frame piece.

**522,929. Anti-Oscillating Attachment for Street Cars;** Benjamin F. Chollar, Fort Worth, Tex., Assignor of one-half to George B. Hendricks, same place. Filed Jan. 4, 1891. The combination of a car truck, bars pivotally secured between their ends thereto and connected at their adjacent ends, bolts depending from the car which pass through the bars, springs held by said bolts both above and below the bars, and pockets for confining the ends of the springs, each pocket consisting of a plate perforated to pass said bolt and provided with a flange extending in the direction of the spring being held.

**522,932. Pilot for Cars;** Robert A. Crawford, Allegheny, Assignor of one-half to Samuel D. Warmcastle, Pittsburg, Pa. Filed Dec. 2, 1893. In a pilot or guard for cars the combination with the car body, of a U-shaped spring arm secured thereto, the upper end of said arm projecting therefrom and supporting the upper end of said pilot or guard, rods on a said pilot or guard passing back through openings formed in the lower end of said U-shaped arm, and stops on said rods.



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**Rapid Transit in Boston.** The citizens of Boston voted during the week upon the Meigs elevated railroad bill, which was recently passed by the State Legislature, and which contained a clause providing for a popular vote upon the question before it became a law. The result of the vote was that less than 30,000 votes were cast, a small majority sustaining the bill. The number of votes in favor of the bill was 15,492, as against 14,214 in opposition to it. There has been a very bitter discussion carried on through the press of the city between the advocates and opponents of the bill and the system of rapid transit for which it provides. It will now be possible for the company to proceed, if it desires to do so, with the work of constructing a rapid transit system for the city of Boston and its suburbs.

**Double Trolley and Electrolysis.** We call attention to an important paper in another place by Mr. Nelson W. Perry on the subject of electrolysis. We do not remember of having seen this subject handled from the same standpoint before, but Mr. Perry's arguments seem to be sound in every particular, although he seems to take a somewhat pessimistic view of the situation and to find nothing but the double trolley as a radical remedy; but those who are thoughtful and who read Mr. Perry's article carefully will see that there are good grounds for his conclusions. As to the facts concerning the double trolley system, we presume that no one can speak with higher au-

thority than Mr. Perry, for he hails from the double trolley city, and while living there was employed by one of the parties to an important lawsuit to investigate both systems. Mr. Perry does not agree with Mr. Farnham as to the remedy for electrolysis, and states distinctly why he does not. He, however, gives that gentleman the credit of having produced the most important paper thus far written on this subject. What surprises us most is his statement that an official of the West End Railway Company has flatly contradicted one of the statements of Mr. Farnham. But it must be remembered that Mr. Farnham was probably a passive agent in all that was done in Boston, and may for that reason not have known so intimately the results obtained. Mr. Perry's informant, on the other hand, was an active agent in all that was done by the West End company, and certainly knew whereof he spoke.

**Rail Welding.** Every street railway man will feel an interest in the experiments now being tried in electrical rail welding. Aside from the supposed advantage which it will give as against electrolysis, which, by the way, Mr. Perry disputes, it will have inherent advantages of no mean import. Could we have a continuous rail the item charged to depreciation on the books of the company would certainly be divided by half. The comfort of the passengers would be increased twofold, and the traffic would on this account be largely increased. Greater speeds would be possible with the same factor of safety and a lower factor of expense. The first company to realize all these benefits to their fullest extent will undoubtedly be the Nassau Street Railway Company of South Brooklyn, whose operations in the rail welding line were illustrated and described in a recent issue of the STREET RAILWAY GAZETTE. It is contemplated to weld something over 30 miles of track—all in Kings County, and over the whole of which one may ride for a single fare. The Nassau company evidently means business as it is sparing no expense to make their roadbed the best that can be made. Among other extraordinary expenses that they are putting themselves to is the rail welding, which we understand costs them \$3 per weld for the welding alone. Now, at \$3 per weld the extra expense for this alone will amount to over \$10,000 per mile. However, if the welded rail proves a success this will be money well invested, and will pay for itself over and over again in a few years in the lessened wear and tear of rolling stock and track.

**Low Fares at Savannah.** During the last two or three weeks street railway fares in Savannah, Ga., have been reduced to one cent on some of the lines and to three cents on others. This has been brought about by a sharp competition between opposing lines that are making an effort to secure the bulk of the traffic. Just why this sharp competition exists we are not informed. One of the daily papers states that it is due to the carelessness of the city authorities in giving permission to any one who desired a franchise to construct lines through the city streets. There is considerable common-sense in its statement of the consequences of such a condition of affairs to the citizens of Savannah. It says: "There is no more room for three or four competing street railroad lines in Savannah than there is in Springfield (Mass.) and not business enough to support them. As a consequence the later built lines went to work, by the usual process of cutting fares, to compel the older companies to buy them. All the lines are being run at a loss, and sooner or later one or more of the companies must surrender and be driven out of the business or gobbled up by others. In the end the people of Savannah will find that they have paid dearly for their brief enjoyment of low fares, for the loss caused by the abandonment of one or more of the competing lines will more than offset any gain from a few weeks' cheap travel." An interesting feature of the case is the statement that a

company has actually taken in more money during the last two months than during the corresponding months of 1893. The increase in travel has been very nearly double. It is stated that the people are much more likely to ride now than formerly, and that even for the shortest distances. Thus those who formerly walked now pay their one or three cents for a street car ride.

**Street Car Mail Boxes.** As we have often pointed out there are many advantages to be secured, both to the street railway companies and the citizens, through the use of street cars for the collection and distribution of mail. It is a matter for congratulation that such a use for existing rapid transit facilities is rapidly extending. Its adoption in the city of Buffalo is now under consideration, as well as in other large cities. One method adopted in the city of Brooklyn which has been in use for some time, while not benefiting the street railway company so far as revenue is concerned, has proved very satisfactory to the people, and shows that the electric railway, against which much misdirected opposition has been manifested, is in many indirect ways a benefit to the general public. It has for some time been the custom to effect an interchange of mails between the sub-stations and the general office in Brooklyn five times each day by the use of the excellent facilities afforded by the electric cars. Formerly a letter posted in one district, even if its destination was only a few blocks away, had to go to the main office before it could be transferred to the district for which it was intended. Now, however, messengers from all the stations meet at a central point five times a day and exchange pouches. They all start on schedule time, meeting at a given hour, and immediately return to their respective stations with the pouches brought from all the other sub-stations. In this way letters have been posted at 4:15 P. M. intended for delivery at a point seven or eight miles away, and have been known to be delivered at 6:30 on the same day. Such service as this would not be possible with any other system of transportation, and it is certainly a great advantage to the people of Brooklyn to thus secure such excellent postal facilities.

**Trolley Riding in Summer.** One of the most striking features of the traffic on electric trolley lines at this season of the year is the large number of excursion parties and other pleasure riders who are making use of the open summer cars for obtaining a cool and invigorating trip into the country on the suburban lines that are now so numerous in the vicinity of most of the large cities. The newspapers throughout the country have commented on this feature of electric railway traffic, both because of its advantages to the people, who are thus enabled to enjoy a cool summer evening, and on account of the increased revenue thereby secured by the railway companies. Indeed, this latter feature is one in which many of the companies are deeply interested, since very often it is this increased traffic which makes it possible to pay dividends on capital invested in the plant. As the development of suburban lines goes forward and their advantages for pleasure riding become better appreciated, this class of traffic will, doubtless, be very much augmented, and revenues from it may be depended upon for even larger returns than are now obtained. In this connection, it may be pointed out that this kind of street railway traffic is very largely dependent upon the facilities offered by the company for a pleasant ride, such as open cars of the latest pattern, and some sort of pleasure resort at the end of the line, where people can spend some time before making the return trip. There are already many instances where traffic has been developed to an astonishing degree by a careful and judicious expenditure of funds in providing attractions along the line and in advertising these features in such a way as to bring them prominently before the public.



### CERTIFICATES OF STOCK NOT LIABLE TO TAXATION.

Justice Gaynor, of the Supreme Court, Brooklyn, N. Y., has handed down a decision in which he grants a writ requiring the Board of Assessors of Brooklyn to review its assessment of the property of the Brooklyn Traction Company. This company owns a valuable franchise. It also holds all of the stock of the Atlantic Avenue Railroad Company, amounting to about \$9,000,000. The assessors tax the real estate and other property of the Atlantic Avenue Company. They also tax the stock of the company under the head of "personal taxes," as held by the Brooklyn Traction Company.

The Board of Assessors claim that if the Brooklyn Traction Company escapes this taxation they will virtually escape all taxation. It will mean a loss to the city of about \$50,000. In his decision Justice Gaynor says, in substance:

All bonds and personal property, whether owned by corporations or individuals, are alike liable to taxation. The property of a corporation is its capital. Capital of corporations and individuals is alike subject to the same taxation.

It is not the paper certificates of shares of capital in a corporation that are taxed. It is what they represent that is taxed. To tax the property and then the paper certificates representing it, would be to tax the same property twice. It would be the same as taxing the land and then taxing the deeds.

The Brooklyn Traction Company is owner of shares of stock in the Atlantic Avenue Railroad Company. It may no more be taxed upon those shares than any other owner of shares in the said company may be taxed upon his shares.

The double taxation which he condemns is the law in Illinois. If a man has \$10,000 which he loans to a person who builds a house or factory, or improves some land with it, the house or factory is assessed and taxed, and thus the \$10,000 has to contribute to the expenses of government. But the law directs the assessor also to hunt up the man who holds the trust deed which promises repayment of the \$10,000, so that the promise may be taxed as well as the improvement which the money made. The law directs double taxation of property in these cases. The effect of the law is a bad one. The man who loans the money, not knowing but what the assessor will catch him, charges a higher rate of interest in order to insure himself against the possibility of this unjust double taxation.

### MUNICIPAL REVENUE FROM STREET CAR LINES IN NEW YORK CITY.

Comptroller Fitch has prepared a statement of the amounts paid by street railway companies to the city of New York since 1880. He says that there is no uniform rule concerning the amount the companies must pay. Some companies are bound by stipulations entered into upon the granting to them of additional privileges; others are subject to the municipal ordinances providing for car license fees, and the very recently incorporated companies come under the provisions of the general railroad law of the State. The amounts paid are as follows:

Broadway and Seventh Avenue and Broadway Surface Railroad—From 1885 to 1890 this company paid the city 3 per cent. of its gross receipts and \$50 per annum license fee for each car. From 1890 to 1893 it paid 5 per cent. of gross receipts, \$50 per car, and \$40,000 per annum, stipulated sum. From 1893 it paid 5 per cent. of gross receipts, not to be less than \$150,000 per annum, and \$50 per car.

Sixth Avenue Railroad Company—Fifty dollars per car per annum since 1889.

Chambers and Grand Street Ferry Railroad—Three per cent. from 1887 to 1891, and 5 per cent. with \$50 car fee since 1891.

Central Crosstown Railway Company—Three per cent. of its gross receipts from 1887 to 1893.

Central Park, North and East River Railroad Company—Fifty dollars per car per annum since 1886.

Ninth Avenue Railroad Company—Fifty dollars per car since 1889.

Second Avenue Railroad—Five per cent. of gross receipts from 1890, and one-third of 1 per cent. on certain extensions.

Third Avenue Railroad.—Twenty dollar car fee from 1886 to 1893.

Twenty-third Street Railroad—Five per cent. of gross receipts from 1890.

Twenty-third Street Railway—One per cent. of gross receipts from 1891, and \$50 for large cars, \$25 for small cars.

North and East River Railroad Company—Sold at auction for 38 per cent. of gross receipts; unable to make payments; now operated by contractor.

Hudson River Railroad Company—Dummies, \$50 per year each.

New York Elevated Railroad—Five per cent. of net proceeds; has paid nothing since 1890. The Court of Appeals has decided that the city can recover 5 per cent. of the net income only on passenger traffic on the Ninth avenue line from Greenwich to Sixty-first street, and 2½ per cent. from Sixty-first to Eighty-third street.

Christopher and Tenth Street Railroad—Three per cent. of gross receipts since 1888.

Dry Dock, East Broadway & Battery Railroad | Five per cent. of net proceeds, \$50 each for large cars, \$25 for small cars since 1888.

Eighth Avenue Railroad—Fifty dollars per car per year since 1892.

Forty-second Street & Grand Street Ferry Railroad—Fifty dollars per car since 1888.

Forty-second Street & Manhattanville & St. Nicholas Avenue Railroad—Three per cent. of gross receipts from 1885 to 1891, and 5 per cent. from 1891.

Houston, West Street & Pavonia Ferry Railroad—One thousand dollars per annum stipulated sum and \$50 for each car.

New York & Harlem Railroad—Three per cent. on gross receipts of extensions from 1885 to 1893.

Twenty-eighth & Twenty-ninth Street Railroad Company—Not completed. To pay 3 per cent. on gross receipts the first five years and 5 per cent. thereafter, to which add 20.2 per cent. bid at time of sale.

Metropolitan Cross-Town Line—Six per cent. on gross receipt and \$50 per car from 1891.

Union Railway Company—One per cent. of gross receipts when the average reaches \$1,700 per day. Had paid nothing in two years.

### HEAVY TRAFFIC IN ST. LOUIS.

City Register Pocock has received the following statement of street railway business during the second quarter of this year. The comparisons with last year are also given:

	Trips.	Passengers.
Baden & St. Louis.....	5,520	69,233
Cass & Fair Grounds.....	171,288	2,477,947
Citizens'.....	141,718	1,907,287
Jefferson Avenue.....	22,694	363,554
Lindell.....	314,818	4,465,553
Missouri.....	285,482	3,688,242
People.....	49,686	1,432,051
St. Louis.....	175,696	2,730,126
St. Louis & Suburban.....	32,500	2,083,361
Southern.....	78,260	1,169,245
Union Depot.....	155,683	1,787,032
Totals.....	1,433,421	21,773,660
Second quarter, 1893.....	1,625,799	26,186,745
Third quarter, 1893.....	1,518,566	25,043,049
Fourth quarter, 1893.....	1,373,920	22,913,702
First quarter, 1894.....	1,313,949	20,953,831

### HOW BROOKLYN BOYS ANNOY THE MOTORMAN.

The street urchins who spend their days around Eleventh and Twelfth streets and Third avenue, Brooklyn, looking for the mischief the father of all evil is supposed to supply for "idle hands to do" have found a new amusement, and some of the motormen on the Third avenue trolley line are on the verge of nervous prostration, says the New York Times.

The boys beg, borrow or steal old clothes until they have succeeded in getting together a very complete man's outfit. The next thing is a dummy, life size, which is well dressed, even to hat and shoes. A dozen or more conspirators, es-

corting this semblance of a man, stroll carelessly on to the track in front of an advancing car, talking busily.

The bell is rung loudly, the boys scatter, and the dummy falls across the track. Then the jokers discover their histrionic talent. They rush back, apparently in terror, and make futile efforts to get the man out of danger.

In the mean time the motorman, who is not the bloodthirsty wretch driving the car of Juggernaut that he is popularly supposed to be, is in an agony of horror. His hair fairly stands on end, and the veins stand out on his forehead as he uses all his muscle on the brake. If he succeeds in stopping before the car goes over the prostrate form, it is pulled off the track and sent flying into the car with wild shouts.

The feelings of the unfortunate man at the brake are too vehement for utterance when he discovers the trick. The scheme is very successful just about dark, and whichever way it goes it is great fun for the boys.

### NEW ISSUE OF BONDS FOR THE LAKE STREET ELEVATED, CHICAGO.

The Lake Street Elevated Railroad Company, which recently passed into the control of Mr. Yerkes and his friends, who formerly controlled the Northwestern Elevated, in that city, will soon make a new issue of bonds. The floating debt of the company, which amounts to \$1,200,000, in spite of various denials, will be taken care of by this additional bond issue. The Humboldt Park extension will also require a further issue. Construction has been commenced on that extension within the last few days.

"There is to be vigorous management of both the Lake Street and the Northwestern Elevated railroads," said Mr. Louderback in a recent interview. "I have just given orders for the purchase of \$150,000 worth of property along the right of way of the Northwestern Elevated line. I think all doubt about the building of this road has by this time been dispelled. We are finding property owners along the line of the road pretty generally ready to come to an agreement without going into court. We are dealing with them generously and are acquiring the right of way rapidly. The arrangement between the two elevated roads will be close. Both roads will be managed for the best interests of all the securities. I want to emphasize that point. When I say all the securities I mean just that. There will be no arrangement which will benefit one road against the interests of the other or which will benefit bonds rather than stock. The management is to be for the best interests of both of the properties, but it will be so harmonious that one road may run in over the terminal of the other. All the Lake street obligations will be taken care of. There will be a further issue of bonds. The Humboldt Park extension is to be built immediately. We started work on it last week." Mr. Louderback declined to say whether or not the Northwestern company had given up the plan of tunneling through the buildings in the downtown district.

### TROLLEY AND STEAM RAILROAD COMPETITION.

"There is no use in our trying to compete with the trolley lines," said a railroad man the other day to a reporter of the *Philadelphia Record*, as he glanced ruefully over some figures, which showed a decrease of \$40 a day in his company's receipts from suburban travel on a branch line since the opening of a trolley road. "We have to give too much to our patrons," he continued. "We provide handsome terminals, fine suburban stations, heat, water, light and a seat for every passenger. While the trolley lines furnish almost nothing but transportation. They furnish no stations, crowd the passengers in so that many have no seat, and in that way manage to make money. We can't do things that way, and so I see no money for us in trying to compete with the



trolleys. Of course, they can't touch us on long distance traveling, but in the near future I expect to see them absorb a large amount of our suburban travel."

### SHALL WE COME TO THE DOUBLE TROLLEY AT LAST?

BY NELSON W. PERRY, E. M.

Much has been said and written of the damage done to underground conduits by electrolytic corrosion and many have been the remedies proposed. Without doubt the most important paper on this subject thus far has been that by Mr. I. H. Farnham, read before the American Institute of Electrical Engineers. Certainly the damage that has been done by this agency has been far more extensive than appears at present, for in most cases it has only been discovered when it has become so extensive as to require the digging up of the pipes where they have been almost totally corroded through. It was years before this corrosion was discovered at all, and it may yet be years before its full extent will be realized in the almost total destruction of our water and gas mains. No one, I take it, will assume that this insidious enemy has confined its operations to the localities where its work has been discovered, nor will any one probably believe that its mere discovery has stopped its work. It is certainly going on now, for instance, all over Brooklyn, though its action has been so slow or the time so short that little damage has as yet been disclosed.

The remedies that have been suggested from time to time, though they seem to have worked well in some cases, have signally failed in others, and even when a success has been claimed it has not infrequently happened that the claimant was mistaken and that a failure was recorded instead of a success. Mr. Farnham, in his very exhaustive and carefully prepared paper, for instance, claimed that the method adopted in Boston, that man's nest of experiments, the evil had been practically remedied, and he was certainly honest in his claims and his reasoning appealed to his audience as logical. The writer, however, has had a long interview with a former employee of high rank, of the West End road, who views the situation through entirely different spectacles. This gentleman was certainly qualified to speak, as he was one of those connected with the attempt of his company to control the earth currents from its lines. His statement was to the effect that whatever remedy was tried seemed merely temporary and local, the effect being to drive the demon elsewhere. He estimated that the West End road had probably put quite as much copper underground as it had overhead and still the trouble continued. Of course, if the electrolytic action were practically stopped at one point and removed to another or distributed over a greater area, it might take years to make itself manifest in those new areas, but the conclusion he comes to is that at best the trouble is only mitigated.

Now here is the testimony of two reputable men who contradict each other. That does not imply dishonesty on the part of either, for we well know that two reputable witnesses of the same event often contradict each other on material points.

Much faith is pinned to the welded rail as a panacea for the evil of electrolysis, but it has not been proved that the welded rail is practicable. There are strong hopes that it will prove so, but in the only extensive experiments thus far tried, viz., those in Johnstown and Boston, the rails have failed to withstand the contractions due to the rigors of winter. In both cases the rails stretched and stretched until they could stretch no longer and then they broke. In Boston the breaks numbered about 6 per cent. of the welds. That is to say that when winter had come on there were about 10½ breaks to the mile—absolute breaks which were worse than a faulty bond. Other experiments are now under way on a very large scale, but both of these have yet to stand the win-

ter, and if they withstand the stretching of 4 or 5 feet to the mile, which would be due to the average decrease of temperature, they will still have to withstand the following summer heat, which may mean buckling and warping to such an extent as to require the relaying of the track. The question of whether or not the continuous rail is practicable cannot be definitely settled until more than a year from this date, but supposing, as I sincerely hope, it will pass both ordeals safely, the trouble from electrolysis is still not settled. Its evils would doubtless be mitigated, but not eradicated. We are too apt to think, and the statement has frequently been carelessly made, that electricity will follow the easiest path. This is not true. It will divide itself up among all the paths to which it has access in proportion to the conductivity of those paths.

A 70-pound rail has about the same conductivity as a copper conductor of 1,000,000 cir. mils, and the two rails will be the equivalent of 2,000,000 cir. mils, probably a far greater carrying capacity than the combined feeders to the trolley wire. They could, therefore, easily carry far more current than the feeders, and would at first sight seem to be ample for the return, and so they would be if they were insulated, but they are not and cannot be. Supposing we should lay alongside of these another conductor of equal capacity, the rails would part with half their current, and this would still be true if the conductivity of the rail were tenfold what it was, providing that the parallel conductor were increased tenfold also. Now the gas and water mains, especially the latter, have a much greater conductivity usually than even the heaviest rails that are laid, and the resistance of the earth between two parallel conductors continuing parallel for such distances as the track and pipes often do, becomes almost negligible so that the two must necessarily divide the current between them, and notwithstanding every precaution of bonding or welding of the rails, the pipes may still carry even the greater portion of the current.

This course of reasoning, and it is correct electrically, would seem to indicate that all attempts to prevent electrolysis while the rail is used as a return must be abortive.

The only alternative left seems to be to keep the current away from the rails entirely—to use the double trolley. There is a popular prejudice against the double trolley which it does not wholly deserve, for in fact in many respects it is superior to the single trolley, and it certainly does not cost any more than the latter when the earth return is properly provided for.

The double trolley is scarcely known outside of Cincinnati—in fact I do not know of a single instance of a road thus equipped in any other city, but there it reigns almost supreme. With something like 200 miles of road electrically equipped there is but one road, consisting of about four miles of double track, that uses the single trolley system. Probably part of the prejudice against the double trolley originated in the early experience in Cincinnati. In the first place the manufacturers discouraged it, knowing that it would be more difficult to get consents of property holders to the stringing of two wires over a track than one. In this they were right, and they feared to let it get a foothold, lest in its being insisted upon in subsequent franchises their own business would be injured. It cost about ¼ more than the single trolley as roads were constructed then. They wanted to make about 200% profit on their equipments, and if they put up the double trolley the cost would be prohibitive if they still insisted upon the usual profit. So for this and other reasons no electrical company could be found, except the Daft, which was then on its last legs, that would erect a double trolley equipment at any price. They would sell the apparatus, however, and let the railroad company put it up as it chose.

The Cincinnati Street Railway Company being closely allied through its stockholders with the local telephone company, decided upon the double

trolley as a protection to the telephone service. They therefore bought apparatus from the Thomson-Houston company, and erected it themselves on about 3½ miles of their road. Having started with the double trolley, all extensions were of necessity constructed in the same way, and so with the connecting lines crossing the river to Covington and Newport.

The first double trolley consisted of a single mast arm forked at the top having a trolley wheel on the end of each fork. The wires were stretched 18 inches apart, and this trolley worked particularly badly going around curves on account of the different radii of the curves that had to be described by the two wheels. In fact it worked badly everywhere, and gave the double trolley a black eye at once.

Two distinct masts, each similar to those now used on the single trolley roads, were substituted, and with this change and some change in the overhead structure, the system worked well, and works well to-day.

During a lawsuit brought by the telephone company against the single trolley road to compel it to cease interfering with its service, the single trolley road attempted to prove that it could not operate with the double trolley. The double trolley road was called in to prove that it was really the better system. Among other questions that arose was the relative expense of operating by the single and double trolleys, and both companies were obliged to bring their books into court. A comparison showed that the double trolley was operated at less expense than the single trolley, the reason being, as we know now, that the former had at all times as good a return circuit as the outgoing, while with the single trolley the ground return was a very uncertain quantity.

The greatest objection to the double trolley lies in the complications in the switches and cross-overs. This trouble is both mechanical and electrical. When two roads cross each other there is difficulty in insulating the positive from the negative, since in this system they must necessarily cross each other, whereas in the single trolley the two crossing wires are both positive and presumably at the same potential. In the double trolley, too, at a crossing there are four intersections, whereas in the single trolley there is but one. It is also evidently more difficult to insulate the positive and negative sides of the circuit when they are but 12 or 13 inches apart, as in the double trolley, than when they are so far separated, as in the single trolley; but as an offset to this the cars on the double trolley are entirely independent of the condition of the track, since it form no part of the circuit. As a result of all this the double trolley in suburban districts where it does not intersect other wires has proved itself superior to the single trolley, but in centers where many lines cross and radiate it is at a great disadvantage, both on account of the mechanical and of the electrical difficulties attendant upon the many intersections. These difficulties are not insuperable, however, as in Cincinnati there is one center—the intersection of two streets—Fifth and Broadway, where two lines run east and west, two run north and south, and there are four curves connecting these four lines together, and on Fountain Square the situation is even still more complicated, yet these are the busiest car centers in the city. The complication of wires—trolley wires, span wires and pull-off wires—at these points is most unsightly and greatly to be deplored. A perfect stream of cars, however, is continually passing these points, and doing it apparently without trouble. But the water and gas mains are safe, and I believe this is the only way to make them so. There may be other partial remedies which will postpone the day of reckoning, but this seems to be the only radical cure.

Brooklyn, N. Y.—The Atlantic Avenue Railroad Company protested against the assessed valuation of \$770,000 made on its personal property. It has been reduced to \$490,000.



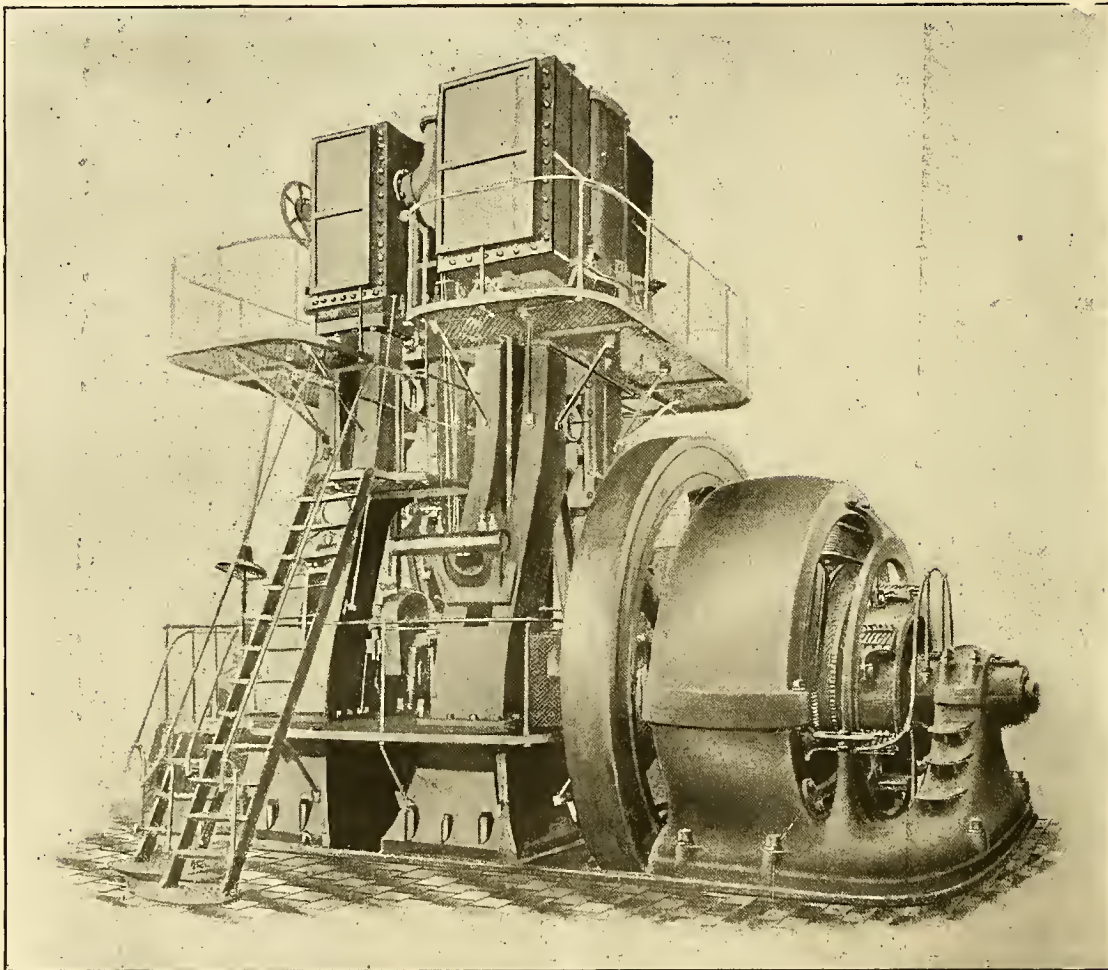
**WALKER MANUFACTURING COMPANY'S  
STREET RAILWAY GENERATORS.**

Only a few years ago the state of electrical engineering in general and of dynamo design in particular was such that any and all apparatus designed for commercial use was universally looked upon with suspicion as being something untried and experimental. And this was so with good reason, since electric and magnetic phenomena were little understood, and in consequence the design of machinery based thereon depended upon the use of empirical rules and formulae deduced from imperfect theories and experiments. Progress, however, has been very rapid, and to day the magnetic and electrical principles underlying the construction of electrical machinery, particularly of the direct current type, are so well understood that apparatus of this class can now be turned out with an even greater degree of precision than is possible in many other much older lines of engineering.

cent., it is claimed, without the least injury or sparking, for as long a time as the emergencies of railway practice would ever be likely to demand. It is of the iron and drum type, built up of the best quality of annealed armature iron. The plates are again annealed after being punched, and then insulated with a thin coating of enamel. They are compressed into a solid core under a hydraulic pressure of about 100 tons. The Foucault and hysteresis losses are reduced to a very small amount.

In the smaller machines the windings consist of heavy copper wires so arranged that no wires cross within an inch of one another, and there are no joints except at the commutator bars. In the larger generators flat bars are used, but here again they are bent to shape before being applied in such manner that there are no joints except at the commutator end. The resistance being very low, the heat loss is small and the armature runs cool under all conditions. The winding is the two-path type,

The magnets are of the well-known iron-clad type. The coils are machine wound, the shunt and series being made up in separate independent bobbins, and incased in the same manner as the motor coils with a moisture-proof covering. This method renders the insulation especially effective and durable, as there are no metallic washers or spools, which, being very difficult to insulate properly, have consequently often given trouble in machines of other makes through the grounding of the coils. The coils are held firmly in position by means of brackets bolted to the pole pieces. Their inside dimensions are such that a space between coil and pole on all sides allows of a good circulation of air. By this means in these machines a low running temperature with a given amount of copper is attained. The poles are made of soft laminated iron cast into the yoke. With this laminated form of construction, together with the particular form given the armature tooth and the special shape of the polar face adopted after much experimenting



WALKER MFG. CO.'S DIRECT CONNECTED GENERATOR.

In placing upon the market a line of direct current generators especially designed with a view to the very exacting requirements of railway work, it has been the aim of the Walker Manufacturing Company to avoid as fully as possible the introduction of novelties and untried features, and to produce a type of machine which should combine all the long tried and well proven elements of dynamo electric machinery that the best engineering experience could suggest. It is confidently believed by the engineers of the company that this aim has been accomplished and embodied in the apparatus now being put upon the market.

In general these machines are notable for their beauty and strength of design and their high commercial efficiency. The frames, excepting the largest sizes, are cast in only two pieces—the upper half of yoke and poles, and the lower half of same with the standards for the bearings.

The armature is proportionally of large diameter, is of very low resistance, with ample cooling surface, and will stand an overload of 50 per

cent. and the pole shoes and armature teeth are so shaped that there is said to be absolutely no sparking at any load and no shifting of the brushes required.

The insulation is most thorough, and it is claimed will readily stand ten times the normal pressure. The insulating material is a combination of mica, with a fibrous material of great toughness and durability, and it is everywhere tested to 5,000 volts alternating. This type of winding lends itself admirably to the most perfect insulation. The armature body is strongly keyed to a heavy cast center, and is so constructed that when running both it and the armature have a strong current of air circulating through them. The teeth are of such shape that they effectively hold the windings in place, and no binding wires are required or used.

The shaft is heavier than is customary in usual practice, and its journals are exceptionally long and large in diameter, thus, at the same time, both reducing the pressure per square inch and providing a larger cooling surface.

as being the most effective, all heating of the poles from eddy currents in the iron, and all sparking and shifting of the neutral point, it is claimed, have been entirely overcome. On all sides of generators the magnet yoke is cast in two pieces and the top half can be readily lifted off when it is desired to remove the armature.

These railway generators are compound wound and can be made to over-compound any amount desired up to 20 per cent. They are provided with a hand regulator for adjusting the shunt coil, this regulator being of the well-known enamel type, occupying a very small amount of space on the switchboard.

The bearings are of the ball and socket self-oiling type. The frame being cast in one piece and all the boring being done in one setting, the armature is always necessarily concentric with the field bore. The oil rings are made to run in the opposite direction to the shaft. By this means a more efficient deposition of the oil is obtained. The boxes are lined with the best quality of babbit

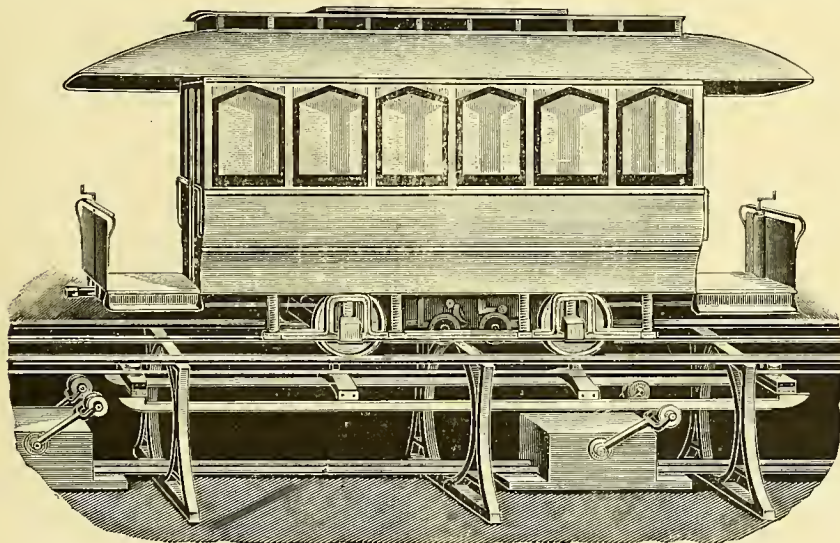


metal, and where a good quality of oil is used no trouble need be feared from heating. In the smaller machines which have two and three bearings, the oil wells are all connected together by half-inch piping so that in renewing the oil it is all drawn off from one tap, and, in refilling, the filling of one reservoir fills all. Sight gauges indicating the oil level are provided. Special precautions are also taken to prevent any leakage along the shaft.

The subject of brushes and brush-holders has received very careful attention in the design of these machines. The brushes are held against the commutator in a manner that prevents the chattering and singing noise of the carbons, and causes them to wear smoothly and evenly. They may be easily and quickly removed for inspection or dressing. The commutator is large enough to allow of ample brush area, thus permitting the brushes to run with a low current density and with a light tension. Coolness in running is in this way assured, and this feature is also aided by the current of air which constantly circulates through the interior of the commutator shell. The field and armature cables are brought out to heavy, substantial terminal blocks, and massive clamps are provided for the switchboard leads. The pulleys provided for the smaller belt-driven machines are very heavy and strong, and a sub-base is provided with belt tightening mechanism. The standard switchboard is of the panel type, each panel containing all the necessary instruments, switches, etc., corresponding to one generator.

#### BAIRD'S CONDUIT ELECTRIC RAILWAY.

The accompanying illustration shows a new electric railway system invented by G. E. Baird, of Blue Island, Ill., and owned by the Baird Electric Company, recently organized, having its office in Chicago. In this system the cars run upon the usual track rails and over a suitable conduit between the rails, the framework of such a conduit being shown in the cut. Along the bottom of the conduit run two parallel lines of pipe, and boxes



BAIRD'S UNDERGROUND ELECTRIC SYSTEM.

like those shown in the cut are inserted in the lines of pipe at intervals of about 25 feet, the ends of the pipe being screwed into the ends of the boxes so as to form water-tight joints. Each line of pipe with its connecting boxes forms a continuous passage, and in the two parallel passages thus formed are inclosed the supply and return conductors of the system. Each of the wires is thoroughly insulated, except at points within the boxes, where it has contact with one pole of a switch, and over this hangs the other pole of the switch connected to the free ends of the oscillating contact levers supported on a transverse shaft which extends through and is journaled in the inside walls of the boxes. On the ends of the shafts are secured operating levers like those shown in the cut, each lever having a roller set in its free end, as shown. These rollers, or trolley wheels, are thoroughly insulated

from the levers, an insulated wire passing through a chamber in the levers and connecting the rollers with the free end of the switch which connects the trolley with the switch.

One car of each train is provided with a motor and a carriage, or two contact bars, sled shape, lying within the conduit, and supported by arms extending down through the usual slot. The two contacts are of a conducting metal and are in electrical connection with the motor. These are so placed that as they pass over the trolleys of the operating levers the latter are pressed down, thereby closing the circuit through the motor. The carriage or contact bars are of a length slightly greater than the space between the boxes, so at least one set of trolley wheels must be always held in contact with the wires by the carriage of each motor car. The carriage is composed of two contact bars, and each of them is a broad and comparatively thin strip of metal set vertically and having great lateral flexibility, and the ends of each pair of bars are provided with travelers which rest against light guide-rails extending along the conduit. The contact bars are thus held constantly in line with the track, whether straight or curved, and, in fact, they easily and readily follow any curve around which a car can pass. The boxes are hermetically sealed, and the system, it is claimed, is thus thoroughly protected against leakage by reason of water, dirt and many other obstructions that always prove fatal to the bare wire systems. All its parts are readily accessible for repairs or replacements. A working model of the above named system is on exhibition at the McLean Armature Works, 197 Canal street, Chicago.

#### STREET RAILWAY CONDUCTORS.

The common notion that the army of men employed by the street railway companies of this town average low in education, intelligence and skill is hardly true, says the *New York Sun*. The man

place unless he have the memory and the will to observe a host of petty regulations. The man who cannot accept the discipline of such regulations must make some mistake and bring about his own dismissal. Only men who are prompt, sober, patient and polite can hold places as conductors. A man of violent temper, of ill controlled nerves, of easily confused head, is sure to have a short career.

It thus happens that one almost never sees a conductor drunk on duty; that the great mass of conductors keep their wits about them when the cars are crowded; that conductors are rarely impolite to passengers. Men taken at random even from the learned professions could hardly be expected to discharge the duties of a conductor with success. The men show the effects of their discipline in a hundred ways, and it would not be difficult for an observant person to pitch upon newly appointed conductors.

There is for the faithful conductor the prospect of more or less distant promotion. The peculiar qualities of the men are quickly brought out by the stress of the trade, and when a conductor has been thoroughly proved there is a chance for him when a vacancy occurs in the grade immediately above his own.

Education and natural intelligence count much in the matter of promotion. Any man who will take the trouble to have a word with the conductor now and then will soon discover that conductors, as a class, are above the average in education. Their speech is not elegant, but it is usually free from the blunders of the densely ignorant.

Men of more than average intelligence and education are willing to be street car conductors, partly because the work is more agreeable than that of many manual laborers of about the same pay; partly because an efficient and faithful man is sure of his place, and partly because there is some hope of promotion. The permanence of the place is perhaps its chief attraction. Street railways never shut down even in the dullest times.

The force is reduced in times like these, and at certain seasons of the year a small percentage of the cars is taken off, but the majority of conductors are needed the year round, and when dismissals take place the inefficient and inexperienced men are the ones to go. The companies like to keep track of promising men, for there always comes a time when the force must be increased, and the companies prefer men they know.

The situation of drivers, hostlers, and the like is not so fortunate as that of conductors, because these classes of workmen are on the average less intelligent and educated than the conductors. Then, too, these times, when motive power is changing, are hard for men who know horses only. The driver who can not develop into a gripman or trolley man is in a ticklish position.

As to the men above the grade of conductors, they are of many sorts, but most of them are undergoing the discipline of hard work under the watchful eyes of their superiors. Pay is not high, but places are reasonably secure. The man who has risen from the grade of conductor to an executive post must have acquired an unusual faculty of detail, promptitude, alertness and decision. In all these matters the street railway companies are schools where the practical lessons of life are taught by daily iteration.

The result is that each company has a trained army of men, whence the idle, incompetent, and negligent have been weeded out, in order that the company's work may be done with precision and dispatch. No two companies require exactly the same sort of men for those places that bring them in contact with the public, and the character of conductors especially is noticeably differentiated on various lines.

Newark, N. J.—The line of the Suburban Traction Company running to Eagle Rock has been tested, but it has not yet been put in regular service, as the power-house has not yet been fully equipped.

No conductor, therefore, can long retain his



### IRON ARMORED INSULATING CONDUIT.

Few improvements have elicited warmer commendation in the field of electric wiring than the recent addition of iron armored insulating conduit to its long list of apparatus, by the Interior Conduit and Insulation Company. The interior conduit system has from the first enjoyed a unique reputation for its flexibility, but it has now included in its materials those which are not only flexible, but indestructible. The notable tendency



Fig. 2—Coupling for Iron Armored Conduit.

in architecture of late years has been toward larger proportions and the use of the most substantial materials obtainable; and in keeping with the new steel internal structure, the iron conduit is found of the utmost utility and value, and electric wiring, whether in the main conductors or the smallest branches, has been brought to a remarkable degree of perfection.

As in the case of the brass armored conduit, the Interior Conduit and Insulation Company is also the pioneers with insulating iron armored conduit.

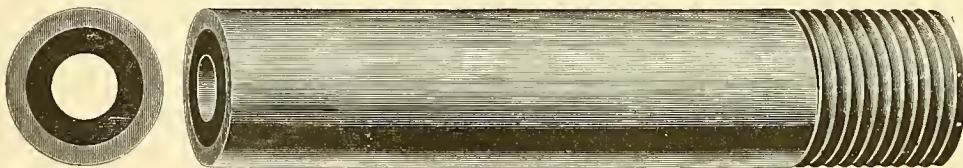


FIG. 1.—INTERIOR CONDUIT & INSULATION COMPANY'S IRON ARMORED INSULATING CONDUIT.

The latter consists essentially of the company's well-known plain insulating tubing placed within a heavy wall of lap-seamed wrought iron pipe, which thus furnishes an armor one-eighth inch in thickness. The intimacy of the union between the inner tube and its iron wall is said to be perfect; they are, in fact, so firmly consolidated and welded together that one seems to be a part of the other, and yet each is integral.

The flexibility of the system is maintained by the use of iron armored insulating junction boxes, elbows, couplings, etc. This conduit possesses all the qualities of gas or water pipe, and by means of the tools furnished for cutting, threading, etc., can be installed with equal ease. It is at once so simple and durable that it can be used under con-

ing a continuous insulation. Fig. 3 shows its application to a junction box and illustrates how the continuity of the insulation of the system can be maintained, if the tube should be too short by inaccuracy of measurement. The nipples can also be applied throughout the system to correct slight mismeasurements.

### STREET RAILWAY ASSESSMENTS IN BROOKLYN.

Brooklyn's Board of Assessors has placed these assessed valuations on the personality of the following corporations for purposes of taxation:

Brooklyn City Railroad Company, \$2,250,000.

Atlantic Avenue Railroad Company, \$190,000.

Coney Island and Brooklyn Railroad Company, \$370,000.

Brooklyn Heights Railroad Company, \$100,000.

Prospect Park and Coney Island Railroad Company, \$20,000.

Brooklyn and Rockaway Beach Railroad Company, \$20,000.

### HIGH INSURANCE RATE ON A BROOKLYN CARHOUSE.

An extraordinarily high rate of insurance has been fixed by the New York Tariff Insurance Association upon the new carhouse of the Brooklyn

City Railroad Company, at Third avenue and Fifty-eighth street. The structure is the largest of its kind in the country, and covers a block 700 by 290 feet. Cars are stored on three floors, and it contains several miles of tracks. The rate fixed for insurance on the building is 6 per cent., and on the contents 5.55 per cent. For the last three years the City Railroad Company has insured its own property, but six weeks ago it was decided to seek insurance from the regular companies. The rate expected was 1.5, which had been what was charged when the company sought insurance before. But the advanced rate was fixed by reason of the danger of fire from the use of electric traction in the building. At the office of the Tariff Association, in New York, it was said

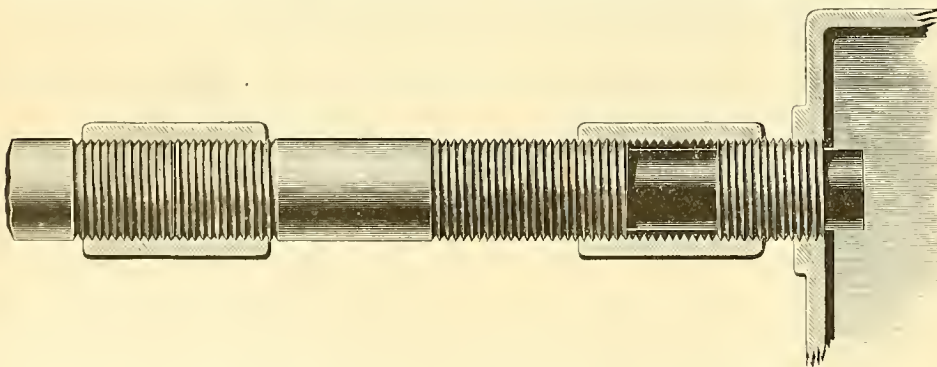


FIG. 3.—APPLICATION OF INSULATING NIPPLE TO JUNCTION BOX.

crete, tiled or mosaic floors, etc., without the precautions necessary with plain or brass armored conduit; and at the same time, a great saving in labor is due to the fact that it can be installed at an early stage in the construction of a new building, without anxiety as to the rough usage it may have to sustain.

We herewith illustrate some of the features of the iron armored insulating conduit. Fig. 1 shows the actual size of three-eighths inch (inside diameter) iron conduit. Fig. 2 shows a coupling one-half size three-eighths inch. The threads are all straight, so that the ends of lengths, etc., shall abut in the center of the coupling, thus maintain-

ing a continuous insulation. Fig. 3 shows its application to a junction box and illustrates how the continuity of the insulation of the system can be maintained, if the tube should be too short by inaccuracy of measurement. The nipples can also be applied throughout the system to correct slight mismeasurements.

that the rate had not been advanced, for there had been no rate for the building until the one recently fixed. It was decided upon from experience with like property in other parts of the country. There had been large losses in the last few years where electricity was used as a motive power. The rate decided upon was no reflection on Brooklyn, but covered the entire metropolitan district, including New York, Brooklyn, Long Island City, Staten Island and Hudson County, N. J., east of the Hackensack River. There was no discrimination against Brooklyn in the matter of rates. It is expected that the City Railroad Company will resume the policy of insuring its own property.

### WAGES REDUCED ON THE BROOKLYN ELEVATED.

The Brooklyn Elevated Railroad Company recently made another reduction in the wages of its employees by cutting down the hours of work. Nearly all the stations are in charge of women agents in the daytime, and they have worked from 5 A. M. to 5 P. M. for \$10 a week. Hereafter they will work from 5 A. M. to 3 P. M. and get \$8.40 a week. The men have worked from 5 P. M. to 5 A. M. for \$14 a week, or \$3 a day. They will now work from 3 P. M. to 1 A. M. and get \$1.67 a day. From 1 A. M. to 5 A. M. the stations will be in charge of the porters, and no tickets will be sold. The conductors will collect fares. In October the men had their pay cut down from \$3.40 a day to \$2, with the understanding that as soon as business picked up there would be an increase. Then a few women were appointed day agents at \$10 a week, and now all the day agents are women. The station porters get \$1 a day.

### HOW RAPID TRANSIT FACILITIES HAVE IMPROVED NEW YORK REAL ESTATE.

The value of transit facilities on Manhattan Island cannot be better illustrated than by a comparison of the increase of real estate values in the Twelfth Ward during the past year. The section, bounded by Third avenue to Fifth avenue and from Eighty-sixth street to the Harlem River, shows an increase of \$2,739,100. The Third Avenue Elevated road makes the best time to City Hall. The Third avenue cable has also been completed this year, and the Lexington avenue cable road is nearing completion.

The section from One Hundred and Tenth street to the Harlem River, and from Fifth to Eighth avenues, shows a gain of \$1,788,290. There is but one downtown rapid transit line in this territory, the elevated road on Eighth avenue.

From Eighty-sixth street and Harlem River, from Eighth to Tenth avenues, there is an elevated and cable road, and property has increased \$2,534,700.

From One Hundred and Fifty-fifth street north to Spuyten Duyvil, containing one of the most beautiful portions of New York, the residents are cut off from quick communication with downtown. In this section the increase was only \$121,614.

### WHO PAYS FOR THE CUTTING OF WIRES IN MOVING BUILDINGS?

At a recent meeting of the Boston Board of Aldermen the following opinion was received from the corporation counsel concerning the authority of the West End Street Railway Company to require individuals and corporations having permits to move buildings across the public streets to pay for the wires which are cut in moving these buildings. The opinion was as follows:

Permits issued by the Board of Aldermen to remove buildings on or across the streets are merely the consent of the board to the grantees occupying and using portions of the public streets for the purpose of moving a building or buildings. The permits do not authorize the building mover to destroy or injure any one's property while removing the building, and if he does injure any property he is answerable in damages to the owner, and his permit would be no defence to the suit. The West End Street Railway Company has had authority given to it by the statutes and your board to put up its poles and wires, and such poles and wires are legally in the streets, and if injured by a building mover while moving a building the mover would be liable to the street railway company for the amount of the damage. I suppose that the West End Street Railway Company prefers to collect its damages in advance, rather than wait until the wires are broken by the building, and that the building movers prefer to arrange the matter amicably with the street railway company rather than run the risk of interrupting the transportation of passengers and consequent litigation with the street railway company.

Rulland, Vt.—The Board of Aldermen has granted a franchise to the Rutland Street Railway Company.



## SOME PRACTICAL HINTS IN DYNAMO DESIGN.\*

BY GILBERT WILKES.

Chief Engineer of the Detroit Electrical Works.

When the matter of this lecture first came up for consideration, I thought I would discuss generally the results in relation to designing drawn from my shop experience. I had not, however, gone far when I realized that this subject would cover a number of lectures, so it was limited to refer to continuous current machines for general purposes. Not only are alternating current machines designed on very different lines from continuous current dynamos, but that large and varied class of machines used for traction purposes and represented principally by the street car motor is, I believe an equally distinct class. The design of street car motors brings in so many points that place in the background the rules for ordinary designing, that the one is little guide to the other.

Street car motor design is (or should be) more the result of reasoning, based on actual personal experience on a car and under it in the pit, than that of hours and days at a desk. The rules for shafts and bearings for stationary machines are of little use here, and some of the most successful street car motors are machines of poor electrical design. One I recall has a magnetic leakage of 35 per cent. The real power for continuous work is never equal to the rating of a street car motor, and the method of control has much to do with the average possible work obtainable without overheating. I have therefore limited my subject to stationary machines—generators and motors for standard work, with special reference to medium sized machines—neither very large nor very small.

The first thing to be considered is, and this really comes before the actual work of designing, what is absolutely necessary in any good dynamo? In order to compete with other machines on the market, a few points are absolutely essential. These points are to influence the design, but no trimming can be allowed upon them, and to them all considerations of economy, weight, size, and appearance, must bend.

The first of these preliminary requisites is mechanical stability, and whether the type is to be the horseshoe or inverted horseshoe, bipolar, or multipolar, ironclad or Manchester, whether the armature is to be smooth or slotted, the same remarks will apply. Let not economy or a bearing of trimmer appearance dictate the use of a small shaft. This is a point in which electrical engineers are systematically criticised by their mechanical brethren. Dynamo shafts are too often on the wrong side of safety. This error is probably an heirloom to us from the time when the generation of electricity itself was so puzzling a conundrum, that all other questions were relegated to the back-ground.

I remember one of the first dynamos that I saw—about eleven or twelve years ago. The dynamo room (which was on board ship, where every square foot is valuable), was large and contained a remarkable tangle of belting and jack shafts, which would be considered ridiculous to-day. The dynamo ran, however, and the lamps gave light, thus answering the most rigorous requirements of the time, until one evening the pulley was wrenched completely off with the end of the shaft. I once heard a complaint from the business side of a company against the large sized shaft of a large new dynamo. The answer was, "Did you ever hear any one complain in buying an engine that the shaft was too heavy?" The machine was a success, and the only comments afterwards made about the shaft (which was 5½ inches for 150 k. w.) were to the effect that it was according to common sense.

Let the shaft run in good solid bearings, supported on a solid base. Whether the machine is mounted on skids or the more expensive sub-base, give it a broad foothold. Do not let the weights

overhang the extreme points of support like the balls on a balancing pole. The side pull of the belt with a high center line of shaft will tend to tip the machine, and the changes in the pull due even to the undulations of the belt will cause a tremor in the machine. You may feel it with the hand and think it a matter of no importance. But each tremor jars the brushes and in weeks the effects may be visible on the commutator, while in months the foundation may be shaken to pieces. Let your work be such that when it is completed and accepted you have heard the last of it. The dynamo is here to stay. It is to-day as reliable as a high grade engine, and not one-tenth of one per cent. as dangerous.

One does not have to look back many years to the time when each new plant was rather expected to turn in reports of burned out armatures or fields; when a new street railway plant might burn out armatures actually by the dozens. But now if an armature is lost in a generator, it is the cause of close inquiry. Not quite so good a record, however, can be shown by most companies in the matter of the armatures of street car motors. A record of 10 per cent. of the armatures burned out on a new street railway line in the first three months is not bad.

After the mechanical features comes absence of spark at the brushes. A dynamo tender has no patience with a machine that sparks, and his disgust is soon transmitted to his employers so that the machine is in disfavor. It is worse than giving a dog a bad name. A large part of the electrical personnel is still migratory, and a machine's reputation travels fast.

It is not too much now to expect absolutely no sparking at the brushes under practically constant load and none under a change either way of 50 per cent. of full load. In fact the best machines will stand sudden changes from no load to full load, and vice versa, without sparking. If you have ever watched a 20 inch belt when opening and closing the snap switch which controls the full load of a 150 k. w. generator you will realize the enormous mechanical and electrical strains a good machine must be made to stand; for exigencies really as severe as this not infrequently occur in the operation of railway plants. However, my remarks are not intended so much in relation to these larger machines as to the smaller sizes. There are few firms manufacturing dynamos of 150 k. w. or greater capacity, and therefore the competition is not so severe, and greater freedom is allowed the designer of the large units.

In a visit to the first Edison central station in Pearl street, New York, one could not look at the hot scored commutators and see the evidence of excessive wearing without being almost forced to the conclusion that the generation of electricity and the destruction of copper went hand in hand. But this was in the days of Edison's "jumbos"—strange to say, these first large generators were direct driven—while every one now knows, in contrast, the beautiful Edison dynamos of later times. In fact, until the last few years, the history of the constant pressure dynamo in this country is largely a record of Edison's great work. Now even his name does not appear on any dynamos that are on the market.

The commutator of a modern stationary machine will last for years, and often will run with a proper arrangement for collecting the current for more than a year without even being turned down.

The brushes and brush-holders must be simple and should be preferably automatic in taking up wear. Opinion is divided as to the proper material for brushes, and the largest makers seem to prefer copper in some form for large current machines. Carbon is, however, much easier on the commutator. Brushes of carbon and their brush-holders can be designed which will take off the current just as well as those of copper, and cost no more. The commutator, however, brings in an additional cost where carbon brushes are used.

Considerable prominence was given last year to

a device for preventing the shifting of the neutral point by a special arrangement of the series field. The particular form of machine which I have seen illustrated was of what is commonly known as the continental type. I did not see the particular machine, but from considerable experience with this type, I believe that the dynamo would, if properly designed, work equally sparkless when built as an ordinary machine. I have designed a full line of these machines from 5 to 45 k. w. The brushes of any member of the series may be rocked fully 30 degrees on each side of the horizontal plane without any sign of sparking, and the lead never changes with the load.

All makers agree in setting about the same limits for heating. The armature is usually not allowed to go above the temperature of boiling water. Occasionally in order to get more money for a given amount of iron and copper combined in a determined form, a company will increase the ratings of its machines; but loss of reputation and a few burned-out armatures usually have the effect of cooling their ardor and later—the machines. Owing to the effect of the large mass of the field, the temperature of the outside of the coils is never that of the hottest part of the wire, as can readily be seen by bridge measurements. It is, therefore, good practice to run the fields about 15 degrees centigrade, as shown by the thermometer, cooler than the armatures. Many formulas are given for determining the armatures and the fields for a given heating and output, and these often do not agree. But I fancy that much of the disagreement lies in the different forms of fields, different ends to the armatures and different methods of heading up. Most of the formulas for field heating take no account of the fact that there may be more cooling by conduction through the iron of the magnet cores than from true radiation. The only safe rule is to learn the constants for a particular type of machine by experiment and make your own empirical standards. Even the heating in different sizes of the same type will vary somewhat from the usual coefficients.

The last point to be considered before commencing upon the specific design of a machine, is the bearings. The leading manufacturers use a ratio of length to diameter of bearing, varying from 3 to 4½, the usual ratio being about the mean of these figures. The English seem to use shorter bearings than we, and, judging from recent articles in English publications, the self-oiling and self-aligning box is rather new with them. In this country a dynamo can not go on the market as a high grade machine without this very desirable feature.

(To be continued.)

## RIGHT TO CHARGE AN EXTRA FARE QUESTIONED.

The charters of the various trolley lines in Brooklyn provide that no more than five-cent fare can be charged within the city limits. The recent annexation of New Utrecht is likely to raise the point whether the City Railroad Company can collect two fares on the trip to Fort Hamilton. On Sunday a passenger refused to pay a second fare after he reached the old city line and was put off the car. He is now going to bring a suit to have the question settled. The companies hold that they could not afford to carry passengers for five cents within the new city limits, and contend that the law cannot be retroactive.

Skowhegan, Me.—The Skowhegan & Norridgewock Street Railway and Power Company completed its organization last week by the election of W. H. Wildes, of Skowhegan, president; I. C. Libby, Waterville, treasurer; A. R. Bixby, Skowhegan, clerk; A. F. Gerald, Fairfield, manager. The capital stock is \$50,000. The building of the road was let to the Worcester Construction Company, of Massachusetts. The work is to be commenced next week and the company expects to have it running early in September. The distance is nearly six miles from Skowhegan to South Norridgewock.

\* A lecture before the students of the College of Mechanics and Engineering, University of Wisconsin.



## FINANCIAL DEPARTMENT.

## Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

THESE IS PRACTICALLY ABSOLUTE STAGNATION in the local market for street railway securities. From other points of the country, from Chicago, Philadelphia and Baltimore, come continued reports of the activity of traction stocks, but New York dealers see nothing of this so-called popular craze for street railway shares. There have been no signs yet of any resumption of that demand for street railway securities generally the result of the effort of the July dividend and interest payments to find profitable investment, which was so rudely interrupted by the Chicago labor troubles and their threatening aspects, and the specialists now agree that the midsummer dullness has fastened on the street railway stock and bond market to stay.

**FUTURE SPECULATION.**—With nothing present to comment upon, the traders are confining their talk to speculation as to the future. The events of the present year's trading so far have been of a nature to argue much for such speculation as is to come. What buying has been done in the past has been found to be well warranted, and the sentiment regarding this class of securities, both on the part of the speculative and investing public, is of the greatest value to the market, and applies with equal force to all surface railway companies. While the shares of steam railroads have deteriorated in favor, street railway stocks have advanced, and at no time have they been regarded with as much as now. One thing, the earning capacity of most roads has not yet been demonstrated, and the class of investors who buy securities for "keeps" and not for a speculative venture in order to sell out at \$10 a share profit, and who are the chief customers of the street railway securities market, will find, what with the introduction of cables, trolleys and other new systems of propulsion, that they are picking up bargains. The many savings made by passenger railways in operating under other than horse power have gotten to be so well understood by the public that it sees that what seems to be a certain increase in dividend rates by those that have been paying dividends and a commencement of payments in the near future by those companies that have been recently organized for providing passenger lines with electrical or other mechanical equipment.

**LOW CONDITION OF BUSINESS.**—Nevertheless, sentiment does not bring about a market, and business is at the lowest possible ebb. Some little demand for Second Avenue shares is noted; it comes from the same sources commented upon in last week's letter. Dry Dock continues weak as a result of the further non-payment of dividends. Inquiries are made concerning Third Avenue, but no sales are reported. In other shares there is practically nothing doing. Bonds are equally quiet. Broadway and Seventh first consolidated 5s sold on the Stock Exchange to-day at 109½, thus showing the steadiness of quotations of good street railway bond issues, but none of the numerous other traction bonds, let alone stocks, was even quoted, sales being unheard of.

**PHILADELPHIA** reports quite a contrary state of affairs. The same craze that a few years ago brought about a big advance in trust company stocks has now resulted in a movement in traction that has put prices higher than ever. People's, Electric, Philadelphia, Metropolitan and other traction issues are all selling at fancy prices considering the returns on the investment, and the movement has assumed phenomenal proportions. As a local writer remarks: "People who are unwilling to buy second grade railroad bonds and stocks whose value is well known by years of trial, are ready to invest in passenger railroad stocks, whose operations are entirely a matter of experiment. Reading general 1s are not wanted at 76, while the traction issues, some of which do not pay dividends, are quoted at double that price."

## Financial Notes.

**Chicago, Ill.**—The bonds of the Englewood and Chicago electric street railroad are being offered for sale. They are first mortgage six per cent. twenty year gold bonds, registered with the Equitable Trust Company. The street railway company is constructing an electric road from Sixty-third Street at the Alley Elevated's Washington Park station west and south to Englewood. There will be lines to Grand Crossing and Washington Heights through Park Manor, Brookline Park, Auburn Park, South Englewood, and Fernwood. Some of the same people who built the Calumet electric system are interested in this new enterprise. The construction of the Englewood line has already commenced. The bonds are being sold with a stock bonus.

**Milwaukee, Wis.**—Vice-President Henry C. Payne of the Milwaukee Street Railway Company was

before the Board of Review last week for two hours trying to get the tax assessment against his company lowered. Mr. Payne stated that the assessment of \$2,800,000 against the company was too heavy. He especially protested against the franchise of the company being assessed for \$1,800,000. He said two years ago he valued them at \$2,500,000, but that his idea had changed, and to-day they are worth nothing. He claimed the property of the company was not worth more than \$600,000. The taxing of the franchise he said would virtually mean the confiscation of the property of the company.

**Albany, N. Y.**—The Herkimer & Mohawk Street Railroad Company has filed its report with the railroad commissioners for the quarter ending June 30, as follows:

	1894.	1893
Gross earnings.....	\$1,737 45	\$2,033 33
Operating expenses.....	1,034 81	927 32
Fixed charges.....	25 00	73 50
Net income.....	677 64	1,032 51

The general balance sheet shows total assets of \$18,134, including \$17,000 cost of road and equipment, and \$1,134 cash on hand. The liabilities are: Seventeen thousand dollars capital stock and \$1,134 profit and loss, surplus.

**Frankfort, N. Y.**—The Frankfort and Ilion Street Railroad Company make the following report for the quarter ending June 30:

	1894.	1893.
Gross earnings.....	\$827.55	\$904.85
Operating expenses.....	616.00	480.30
Other income.....	30.60	6.00
Fixed charges.....	40.75	.....
Net income.....	200.70	437.62

The general balance sheet shows a total of \$21,226, the assets consisting of \$20,766, cost of road and equipment, and \$460 cash on hand. The capital stock is \$14,275, and the profit and loss, surplus, \$6,951.

**Albany, N. Y.**—The Albany *Argus* says: "There has been a big inquiry during the week for Cayudatta Electric Railway 6 per cent. gold bonds. The Cayudatta road runs between Fonda and Johnstown, and its bonds are guaranteed by the Fonda, Johnstown & Gloversville steam road. A sale of \$15,000 Cayudatta bonds at 98½ flat was made here, after which the price advanced to 99½ bid. At the same time a New York house was sending out circulars offering the bonds at 110 and interest. The Cayudatta stock is offered at 25."

**Chicago, Ill.**—The Chicago North Shore electric railroad is doing well and the stock of the company has been quoted as high as 60. Bids of 50 are now made for the stock. The stock was given as a bonus with the bonds, so that the original subscribers have made an excellent profit. In the original subscription the bonds were sold at par with a bonus of some 70 per cent. of stock thrown in. The bonds are now quoted at par.

**Steuenville, O.**—Harvey B. Thompson, the receiver of the Steuenville street railway, has brought suit against the old stockholders to enforce their liabilities as stockholders prior to the sale of the road. Only \$12,375 was realized by the sheriff's sale of the property, and the debts of the concern aggregate \$50,000. He therefore brings suit against the old owners for the balance.

**Memphis, Tenn.**—The Memphis & Raleigh Springs Railroad, a suburban line 11 miles long, has been sold to the Citizen's Street Railway Company, of which A. M. Billings, of Chicago, is the chief owner. The sale includes the springs and hotel at Raleigh. The purchase price is said to be \$110,000.

## NEW INCORPORATIONS.

**Pittsburg, Kas.**—The Pittsburg, Frontenac & Suburban Electric Railway Company has been organized to maintain and operate a system of railroads for the purpose of carrying passengers and freight by steam, electricity, or any mechanical power within Crawford County, Kas., to construct and operate an electric plant for furnishing light, heat and power, etc. The promoters are Albert Simons, West Chester, Pa.; Samuel Barratt, Robert Robyn, A. L. Chaplin, all of Pittsburg, Kas.; L. M. Bodell, E. W. Minturn, Carl J. Simons, Chetopa, Kas. The capital stock is \$75,000.

**Stillwater, Minn.**—The Stillwater Electric Railway Company has filed articles of incorporation with the Secretary of State. The capital stock is \$75,000, and the incorporators, with the exception of the secretary, are Boston people. The incorporators are: Allan Curtis, president; E. P. Motley, vice-president; G. E. Waring, treasurer; John C. Nethaway, of Stillwater, secretary.

**Ft. Worth, Tex.**—The Fort Worth Stock Yards Company has been incorporated with a capital stock of \$1,000,000 for the sale of horses, mules and all stock, and to dispose of real estate; operate and lease railroads, street railroads, electric light and water plants, etc. The promoters are: Wm. O. Johnson, N. P. R. Hatch, Chas. L. Thomas, Chas. M. Cook, Jno. Stirling, Chicago, Ill.

**Atlantic City, N. J.**—The Atlantic City Street Railway Company, with a capital stock of \$100,000, has been organized to construct a street railway in Atlantic City, N. J. The promoters are John J. Gardner, Levi C. Albertson, Clarence C. Cole, Clement J. Adams, Jos. Thompson, Atlantic City, N. J.; Israel G. Adams, Linwood, N. J.; Frank C. Somers, Camden, N. J.

**Steuenville, O.**—The Steuenville Traction Company has been incorporated with a capital stock of \$100,000 for the purchasing, operating and equipping street railroads, to be operated by steam, horse, gas, electric or other motive power. Thos. Barclay, Thos. Johnson, Geo. W. McCook, Robert Sherrard, Wm. Stanton, are the promoters.

**Scranton, Pa.**—The Scranton North End Street Railroad Company has been incorporated with a capital stock of \$20,000, for the purpose of constructing and operating a street railway. The promoters are Lemuel Amerman, Plummer S. Page, Henry H. Archer, Scranton, Pa.

**Washington, Ind.**—The Washington Street Railway Company has been incorporated with a capital stock of \$50,000. The promoters are: Louis C. Fritch, W. W. Peabody, Ira G. Rawn, D. D. Carothers, Cincinnati, O.; Wm. N. McMahan, Wm. R. Gardner, Washington, Ind.

**Pittsburg, Pa.**—The Pitcairn, Wilmerding & Braddock Street Railroad Company, of Braddock township, Pa., has been chartered. The length of road is 3¼ miles, and the route through Braddock township, North Versailles, Greensburg and the Pittsburg turnpike; capital, \$21,000.

**Phillipsburg, Pa.**—With Charles A. Bragg, of Philadelphia, as one of its incorporators, the Clearfield Traction Company, of Phillipsburg, was incorporated last week. Its capital is \$10,000.

## NEWS OF THE WEEK.

**Goshen, Ind.**—Mr. J. J. Burns, of Chicago, has purchased of Hatch & Chadwick the street railway of Goshen, Ind., and franchises in Elkhart County, Ind. Mr. Burns has also purchased the Elkhart street railway of Elkhart, Ind., and organized the Indiana Electric Railway Company, of which he is president and general manager, and to which company he will soon transfer all of the property above named. It is Mr. Burns' intention to complete the now partly constructed line in Goshen and to rebuild and re-equip the Elkhart line. The contract for this work has been let to W. W. Hatch, of Kankakee, Ill., who will commence the work as soon as the material can be gotten on the ground. The rails have already been bought and are now being shipped by the Illinois Steel Company. The track in Goshen, constructed last summer by Hatch & Chadwick, is of the best and most improved kind of electric railway construction. Mr. Burns realizes the importance of first-class construction and the use of the latest and most improved appliances, and it is his intention to make this system one of the best in the State of Indiana.

**Springfield, O.**—A project to build an electric railroad from Columbus to Cincinnati via London, Springfield, Dayton, Miamisburg and Hamilton, is being pushed by a syndicate of Columbus capitalists, headed by Hon. L. D. Hagerty. The right of way has been secured already in Franklin and Madison counties. The projectors say they will have cars running within a year. The road, if built, will come in direct competition with the Midland, a part of the Baltimore and Ohio system, and Panhandle, a part of the Pennsylvania system and the Big Four railroads, both in the freight and passenger traffic. The persons who secured the right of way are Probate Judge L. D. Hagerty, Columbus; Henry B. Moorehead and Dennis Dwyer, Cincinnati, and O. B. Brown, of Dayton. Other counties will be asked to extend the privilege of building the line along the public highways.

**Chicago, Ill.**—Any lingering doubts that may have been felt as to the identity of the purchasers of the control of the Lake Street "L" Road have been removed by the election of Vice-President Furbeck, of the North Chicago cable company, and President Parsons, of the West Chicago cable company, directors in the new Lake Street board. The election of these gentlemen makes it a solid Yerkes directory, with the exception of President John A. Roche and Clarence A. Knight. For all practical purposes the Northwestern and Lake Street "L" companies are one concern and both are under the control of the same men who are managing the North and West Side surface roads.

**Chicago, Ill.**—Since the passage of the ordinance granting the Chicago City Railway Company the right to erect trolley lines on Indiana avenue some of the property holders have produced agreements signed by C. B. Holmes, president of the company, in 1886, stipulating that in return for the privilege of laying double tracks the company agrees "that it will not operate such double tracks upon said avenue between said streets (Eighteenth and Thirty-ninth) by other than animal power except



by the consent of the then owners of a majority of the property upon said avenue between said streets."

**Indianapolis, Ind.**—Dr. R. C. Light of Indianapolis, and R. T. McDonald, of Ft. Wayne, have just secured a fifty years franchise for an electric street car line from Indianapolis to Broad Ripple park, a resort near the capitol. The road would have been completed in July, had not the delivery of material been retarded by the railroad strike. Twenty-five cars, thirteen motors and twelve trailers, have been purchased. Messrs. Light and McDonald have also purchased the Stevenson farm, containing 292 acres, for a consideration of \$70,200 and will convert it into a pleasure park.

**Pittsburg, Pa.**—The work on the survey for an electric railway which will connect Pittsburg with Tarentum, Natrona, Springdale, Freeport and numerous intervening towns up the Allegheny River, was completed last week. The survey extends from Etna borough to Tarentum. The route beyond that point had been previously surveyed. The line will connect with the Pittsburg, Allegheny & Manchester road at Etna. This same company own charters covering a proposed line to Butler, via Etna and Glenshaw, and is said to be interested in other lines as well.

**Buffalo, N. Y.**—The Morton Life and Limb-saving Car Fender Company has been incorporated. J. Francis Morton is the patentee of the fender, from which the company takes its name. It has rubber pneumatic edges; the front works on spiral springs. The fender is only two inches above the track, and is placed in front of the platform of the car. The patentee is willing to place it on any line in the city, and says he will stand in front of the car and allow it to run at a rate of ten or twelve miles per hour against him.

**Attleboro, Mass.**—A press dispatch says that there is a syndicate of Attleboro capitalists ready to buy the Attleboro, North Attleboro & Wrentham street railway when the auction sale is held. The road has been idle for nearly a year, and owing to the trouble among the stockholders and bondholders the company went into insolvency. If the road can be purchased for a fair price, the syndicate above referred to will put it into operation immediately. The United Traction Company of Providence has also made an offer for the road.

**Rutland, Vt.**—A meeting of the stockholders of the new street railway company, to be known as the City Electric Company, was held last week. These directors were elected: E. A. Morse, E. M. Woodruff, J. E. Creed, H. O. Edson, James Carruthers, J. D. Hanrahan and H. M. Bates. The directors afterward met and the following officers were elected: President, E. A. Morse; secretary, James Carruthers; treasurer, H. O. Edson. The capital stock of the company is \$100,000, of which \$50,000 has been subscribed.

**Washington, D. C.**—The annual election for a board of directors of the Metropolitan Railroad Company was held last week, and resulted in the choice of the old board, as follows: John Cammack, Daniel B. Clarke, A. A. Wilson, William B. Gurley, S. Thomas Brown, Robert D. Weaver and William J. Stephenson. The organization of the board resulted in the election of Mr. Stephenson as president; A. A. Wilson, vice-president; Wm. J. Wilson, secretary and treasurer; and William E. Lowry, superintendent.

**Fond du Lac, Wis.**—The Fond du Lac Light, Power and Railway Company shut down its electric railway line on the 18th inst. and discharged all the employees in that department. The company's officers state that lack of patronage and inability to pay expenses forced the step. President De Celle said the equipment, representing an investment of \$40,000, would be sold, and that the sale was nearly consummated. The street railway line was opened Oct. 20, 1893. Since Dec. 1 it has been run at a loss of \$1,970.

**St. Louis, Mo.**—An ordinance has been recently passed by the Municipal Assembly allowing the Southern Electric Company the privilege of running its cars north from the present terminus to Wash street, over the tracks already in operation on Sixth and Seventh streets. For this privilege the Southern Electric Company is to pay into the city treasury the sum of \$10,000 annually in addition to the sum of \$1,000 which it now pays for its own track to Carondelet, a distance of seven and one-half miles.

**New York City, N. Y.**—During the past week 10 more trains were taken off the Third avenue elevated road, and except during the "rush hours," four cars instead of five are now run to a train. It is said that the decline in passenger traffic, compared with the corresponding week of last year, averages 17,000 fares daily. The Manhattan Company's loss is the Cable Company's gain. Trains on the Third avenue elevated road are now run only at seven-minute intervals during the day.

**Woonsocket, R. I.**—At a recent meeting of the Woonsocket Street Railway Company's directors, it was voted to equip the Providence street line

for electric cars. The directors also decided to look into the feasibility of an electric route to Millville, via North Smithfield. The directors voted to raise the wages of the employees to cover the 10 per cent. cut down made last year by a former directorate, and in some cases, notably that of superintendent, exceeded the former figures.

**Wheeling, W. Va.**—A. M. Jolly, general manager of the Wheeling Street Railroad Company, tendered his resignation to the company on the 11th inst., and it was accepted by President A. B. Champion. W. S. Wright has been appointed to fill the position thus vacated. Mr. Wright has been in charge of the power plant since its erection. Mr. Wright is from Cincinnati. Mr. Jolly will return to Beaver Falls, Pa., where he has large interests which require his attention.

**Chicago.**—The City Council of Chicago granted an ordinance on Monday night authorizing the Northern Electric Railway to construct a street railway system in the northwestern part of the city commencing at West 47th and Lake streets, and extending to Craigen and Hanson Park. The road will be about eight miles in length, and will be pushed through to completion at once under forfeit. Paul Dickinson is president. Address 68 Churchill street, Chicago.

**Bloomington, Ill.**—Superintendent Patterson, of the street railway company, has announced a change in the wages scale. He raises the wages of all motormen and conductors ten cents per day, but requires them to do free relief duty on off days, if needed, during meal times. Heretofore a man enjoying his vacation day has been required to help out at meal times, but was paid for that extra time at 15 cents per hour.

**Laurel, Md.**—At a meeting of the City Council last week a franchise was granted to Messrs. Phelps & Shaffer to build and operate a street railway, with either electric or horse power, the road to be completed and in operation within two years. The probability is that the road will be operated by electricity, generated by water power, as the incorporators now own the finest water power on the Patuxent River.

**Hamilton, O.**—Application was made last week to the Franklin County Commissioners for a right of way on the national pike from Columbus to the Madison county line and the franchise was granted on condition that the road is begun by Sept. 1, 1895, and completed by Sept. 1, 1896. The applicants are L. D. Hagerty, H. B. Morehead, Dennis Dwyer, of Dayton, and Orin Brown.

**Lancaster, Pa.**—It is expected that in a very short time the contracts will be awarded for building the new electric road from Lancaster to Lititz, and from Lititz to Manheim, 13 miles; Lancaster to Terre Hille, via Mechanicsburg, Bareville, New Holland and Blue Ball, 17 miles; Mechanicsburg to Ephrata, 8 miles; Lancaster to Strasburg, 7 miles, a total of 45 miles.

**Pasadena, Cal.**—A franchise has been granted to Charles L. Strange for the Los Angeles, Pasadena & Altadena Electric Railway Company, permitting the construction and operation of an electric railway through certain streets of South Pasadena. The franchise had been advertised for sale and the only bid received was that of Mr. Strange, offering \$315.

**New Haven, Conn.**—The Consolidated road has purchased of the Standard Oil Company a plot of land on Hallock Avenue having a frontage of 80 ft. The land has a depth of 300 ft., and runs to the water front. The company also secures all the water privileges. The price paid for the property is said to be between \$4,000 and \$5,000.

**Wheeling, W. Va.**—At a meeting of the Wheeling Railway Company, last week, A. B. Champion was elected a director in place of J. C. Palmer, resigned, and subsequently he was elected president in place of William Erskine, resigned. Mr. Erskine still continues as a director and as president of the Citizens' Company.

**Cincinnati, O.**—All the directors of the Cincinnati Street Railway Company have been re-elected. They are: John Kilgour, Nat. Henchman Davis, Matthew Ryan, George N. Stone, Lewis Seasongood; Frank J. Jones, George Bullock. The net earnings of the company for the past year were \$449,000.

**Boston, Mass.**—Four pieces of land on Eagle street, near Eagle Square, in East Boston, comprising in all 300,000 square feet of land, have been secured by the West End Street Railway Company for the site of a power-house for the electric railway system in East Boston.

**Fredonia, N. Y.**—Negotiations are being perfected whereby the electric railway company will, in connection with the incandescent light plant, put in the Holly underground system of steam heating for the purpose of supplying heat to residences and business places.

**Newark, N. J.**—The Newark Board of Works has ordered that all trolley cars in Newark shall be equipped with life-saving fenders before Oct. 1,

and has passed a resolution imposing a penalty of \$50 a day thereafter for each car unprovided with a fender.

**Warren, O.**—The stockholders of the Mineral Ridge & Niles Electric Street Railway Company have held a meeting and elected the following directors: W. A. Ohl, H. C. White, Grant Webb, C. R. Holeton, J. F. Pearce and Edward Blunt.

**Bradford, Pa.**—Bradford's city council has passed the ordinance granting the Bradford electric street railway a franchise, giving it the right to construct and run a car line from Bradford to East Bradford and operate it for a period of 50 years.

**Allentown, Pa.**—The Allentown and Bethlehem Turnpike Company's directors have appointed a committee to engage counsel to proceed against the Traction company for taking possession of the turnpike.

**Buffalo, N. Y.**—T. B. Sheldon, D. J. Constantine, W. H. Robinson, A. H. Bowen, and Horace Reed have been elected directors of the Union Road and Trolley Land Company for the ensuing year.

**Brooklyn, N. Y.**—The Nassau Electric Railroad Company will erect a one-story brick power house on the wharf between Thirty-ninth and Fortieth streets, 106 by 150 ft., with a corrugated iron roof.

**Galesburg, Ill.**—At a recent meeting of the directors of the street car company, Judd Seacord was elected superintendent and Henry Arnold assistant superintendent.

**George W. Kiely**, a well known and wealthy citizen of Toronto, Ont., died last week of heart failure. He was formerly proprietor of the Toronto street railway.

**Buffalo, N. Y.**—The Buffalo, Kenmore & Tonawanda Street Railway began running its cars last week. It starts out with three cars in service.

**Detroit, Mich.**—The United States Court of Appeals will probably not render a decision in the street railway case until October.

**Syracuse, N. Y.**—Fire recently damaged the barn of the Consolidated Street Railway Company to the extent of \$300.

**Chillicothe, O.**—Chillicothe's electric street railway has been ordered sold by the common pleas court.

**Norfolk, Va.**—Some of the citizens are endeavoring to stop the running of street cars on Sunday.

#### TRADE NOTES.

**A Fireproof Station.**—The Berlin Iron Bridge Company, of East Berlin, Conn., have received the contract for a new electric light and power station for the Bradford Electric Light and Power Company, at Bradford, Pa. The building will be 65 feet wide and 160 feet long, with brick side walls, the roof being of iron, covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron roof covering. When completed, this will be one of the finest and most complete stations in western Pennsylvania, and will be so constructed as to be absolutely fireproof, there being no woodwork about the building to take fire.

**The Western Telephone Construction Company**, Chicago, says its business has been steadily increasing since the strike. During the strike scare it equipped the Metropolitan Railway with its telephone system. The company is now putting in an exchange at Chariton, Ia., with 53 instruments, and is receiving orders from nearly every section of the country. Among other improvements the company is getting out a new switchboard for exchange work.

**The Berlin Iron Bridge Co.**, of East Berlin, Conn., has received the contract from the Delaware, Lackawanna & Western Railroad for one of its patent anti-condensation corrugated iron roofs, to cover the new engine-room at the Auchincloss shaft. This is the third roof of this kind that the Delaware, Lackawanna & Western Railroad people have bought of the Berlin company, showing the positive merits of its system of protecting the corrugated iron on the underside from dripping.

**East Berlin, Conn.**—The Berlin Iron Bridge Company, of East Berlin, Conn., have received the contract from M. C. Henry & Co., of New York, N. Y., to cover their storeyard with an iron roof, and also for a traveling crane. The building will be 50 feet in width and 100 feet in length, constructed entirely of iron, the whole space to be controlled by a traveling crane.

**The Wallace Electric Company**, Chicago, reports a very noticeable improvement in the business, particularly in the street railway department. The demand for Wirt brushes has increased so rapidly that it is evident that the buyers are becoming convinced that they possess all the merits claimed for them by the company.

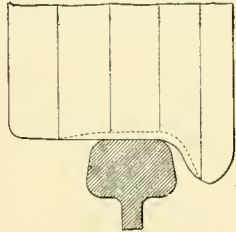
**B. J. Arnold** has removed from Room 436 to Rooms 574-576 the Rookery, Chicago.



# RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued July 17, 1894.

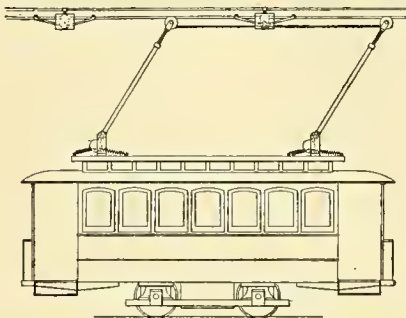
**523,019. Commutator for Dynamo-Electric Machines;** Elihu Thomson, Swampscott, Mass., Assignor to the General Electric Company of New York. Filed Feb. 10, 1891. In a commutator for dynamo-electric machines or motors, a supporting body, sub-segments carried by such supporting body and insulated therefrom, each sub-segment being provided also with a wearing segment mechanically and electrically connected thereto, such wearing segments provided with insulation distinct from that of the sub-segments.



No. 523,019.

**523,039. Car Brake;** Carl Keiser, Vienna, Austria-Hungary. Filed Oct. 23, 1893. In a quick-acting brake the combination of a crank pivoted about a bolt and articulated to a link, the same being articulated in its turn eccentrically to the axis of the pivot.

**523,074. Electric Switch;** Jesse F. Kester, Buffalo, N. Y., assignor to the F. P. Little Electric Construction and Supply Company, same place. Filed Nov. 28, 1893. In an electric switch, the combination with the post and the contact block arranged in the circuit, of a switch lever pivoted at the one end to said post and provided at its opposite end with a socket or recess, a contact plate arranged in said socket and adapted

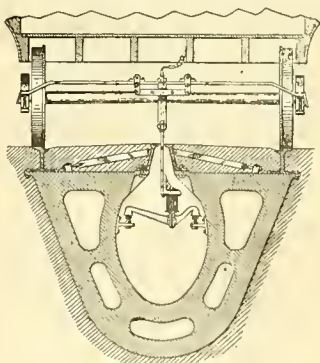


No. 523,104.

to bear against the contact block, and a fastening bolt whereby the contact plate is detachably secured to the switch lever.

**523,084. Brake Shoe;** William D. Sargent, Chicago, Ill. Filed Feb. 26, 1894. A brake shoe having continuous wearing surfaces to bear upon those portions of the wheel which do not make contact with the rail, that portion of the shoe between such continuous wearing surfaces being recessed or cut out so as to leave a reduced and substantially uniform wearing surface over the area of maximum wear of the rail upon the wheel, approximately, and gradually increasing wearing surfaces between said reduced portion and the said continuous wearing surfaces, approximately. (See illustration.)

**523,104. Electric Railway Supply System;** William A. Butler, New York, N. Y., assignor to John Gilmore Boyd, same place. Filed March 16, 1894. In an electric railway system, an overhead conductor surrounded with insulation and having arranged thereon



No. 523,146.

at intervals contact devices supported upon the conductor (the insulation at such points being removed), in combination with an elongated conductor carried by a car, having one or more guide wheels running upon said insulated conductor, and a protecting and insulating shield arranged over each of said contact devices, and open at sides and bottom, to permit the passage of the elongated conductor and its guide wheel or wheels. (See illustration.)

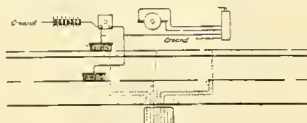
**523,146. Conduit Electric Railway;** Charles D. Jenney, Indianapolis, Ind. Filed March 5, 1894. The combination, in a conduit electric railway system, of a conductor rail situated in a conduit and having a broad substantially flat top, metallic supports extending from said conductor rail, said supports being insu-

lated from the conduit structure, a car structure including the motor, a conductor bar leading from the car structure to the rail and provided with a contact device on its lower end, and a swinging or yielding support for said conductor bar carried by the car structure, whereby contact between the contact device on the lower end of the conductor bar and the upper flat surface of the conductor rail may be maintained notwithstanding the vibrations or oscillations of the car in use. (See illustration.)

**523,154. Switch Points for Street Railways;** Herbert S. Smith, Brooklyn, Assignor to himself and Frank E. Knight, New York, N. Y. Filed Jan. 15, 1894. The combination with the rails, of a switch point having a downward projection with inclines upon its lower edges and a flange to prevent the moving end of the switch point being lifted, two pivoted levers having inclines at one end that act on the inclined surfaces of the projection from the switch point and upward projections at the other ends of the levers to be acted upon by the passing car to move the switch point.

**523,160. Electrical Conductor;** Gilbert H. Blakeley, Bristol, Conn. Filed April 7, 1893. A flexible electrical conductor, consisting of a flat tape, into the edges of which are incorporated the wires or cables for transmitting electricity, and in the center of which are worked, woven, or inserted eyes, or openings, for adjusting, placing, or suspending the conductor along different lines of direction at will.

**523,163. Trolley;** Joseph Guzowski, Chicago, Ill. Filed Jan. 13, 1893. In a trolley, the combination with a frame or bracket having an oil chamber, of a wheel

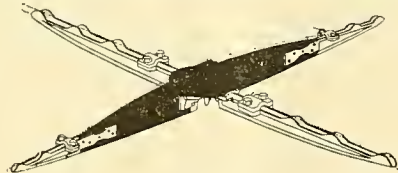


No. 523,161.

journalled in said frame or bracket and having an annular opening in its side and being provided with an independently revoluble bushing having an annular recess opposite said opening, the edges of said annular opening in the side of the wheel extending over the edges of the annular recess in the bushing, a tube projecting into said annular opening, and a wick passing through said tube from the oil chamber and extending into said annular recess.

**523,164. Supply System for Electric Railways;** Edward H. Johnson, New York, and Robert Lundell, Brooklyn, Assignors to the Johnson Subtrolley Company, New York, N. Y. Filed Dec. 19, 1893. In an electric railway system a current feeder or main insulated throughout its length, a series of sectional trolley conductors having circuit connections and electro-magnetic switching devices adapted to connect said sectional trolley conductors to the current feeder or main in sequence; a second set of sectional trolley conductors having circuit connections with the electromagnets of said switching devices, in combination with a leak circuit located between the two sets of sectional trolley conductors whereby a leak from the working circuit can never accidentally operate the switching magnets. (See illustration.)

**523,165. Supply System for Electric Railways;** Edward H. Johnson, New York, and Robert Lundell, Brooklyn, assignors to the Johnson Subtrolley Company, New York, N. Y. Filed Jan. 16, 1894. In an electric



No. 523,172.

railway system an insulated current feeder or main, a series of sectional trolley conductors connected each through a low and a high resistance switch magnet coil and a rheostat all in series relation to earth, in combination with normally open low resistance circuits connected to the feeder and the sectional trolley conductors and circuit connections whereby the switches are first actuated by the high resistance magnets and afterward held closed by the low resistance magnets.

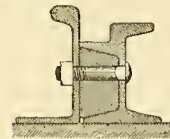
**523,166. Supply System for Electric Railways;** Edward H. Johnson, New York, and Robert Lundell, of Brooklyn, Assignors to the Johnson Subtrolley Company, New York, N. Y. Filed Feb. 10, 1894. An electric railway provided with a current feeder or main, a series of sectional trolley conductors, branch or sub-feeder circuits and electromagnetic switching devices for connecting the trolley conductors with the current feeder or main, the branch or sub-feeder circuit running from each trolley conductor including a low resistance coil on the switch magnet which controls the circuit connections to an adjacent conductor and a low and a high resistance coil on its own switch magnet.

**523,172. Electric Railway Crossing Insulator;** Henry B. Nichols and Frederick H. Lincoln, Philadelphia, Pa. Filed May 9, 1894. An electric railway crossing insulator, comprising an arm of insulating material having channelled metal wings, a seat of insulating material engaging the recessed portion of said arm and supporting channelled metal arms formed with a recessed casting provided with ends engaging the walls of the recessed portion of said arm, and means for supporting and preventing displacement of said wires seated to the channelled members of said device. (See illustration.)

**523,182. Guard Rail for Street Railways;** Gleason F. Starkweather, Chicago, Ill., Assignor to the Paige Iron Works, same place. Filed July 21, 1892. The combination with a track rail, of a guard rail placed at one side of said track rail and comprising an integral piece vertical on one side from top to bottom, a foot or base extending horizontally outward from the

other side of the web, and a head or enlargement also extending outward from the web at the upper part of the same and substantially parallel with the said foot or base, a separate block for entirely filling the space between the track and guard rail, and retaining bolts extending transversely through the guard rail, track rail and filling block. (See illustration.)

**523,219. Car Brake;** Patrick Leen, Cincinnati, Assignor to the Dayton Manufacturing Company, Dayton, O. Filed Feb. 14, 1894. The combination, with a fluted

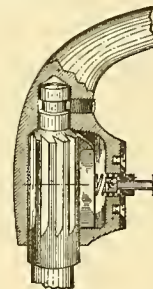


No. 523,182.

brake-shaft and a handle mounted thereon, of a spring-actuated dog located within the handle and adapted to engage with the flutes of the brake-shaft, and means independent of the actuated spring and separate from the dog for causing the latter to engage with said flutes. (See illustration.)

**523,271. Conduit Electric Railway;** John W. Eisenhuth, San Francisco, Cal. Filed March 12, 1894. In an underground system for electric railways the combination of supporting chairs, an insulated conduit mounted thereon, an insulating partition dividing said conduit, conducting wires mounted on each side of said partition in said conduit but insulated therefrom, a trolley adapted to engage said conducting wires, drain pipes connected to said conduit, a cistern into which said pipes discharge, a pump for removing the water from said cistern and a motor fed from the said conduit and actuating said pump.

**523,278. Electric Rail-Bond;** James G. Hallas, Waterbury, Conn. Assignor to the Benedict & Burnham Manufacturing Company, same place. Filed May 1, 1894. A bond for the rails of electric roads consisting of a body of uniform size having one or more coils formed from the metal of the bond, ends 3 adapted to



No. 523,219.

be passed through adjoining rails, angular shoulders formed by bending the metal at a right angle, and which are adapted to be set up against the under side of the rails, and the ends of the bonds to be beaded down on the upper side thereof. (See illustration.)

**523,284. Binding Joint for Electric Railways;** Andrew L. Johnson, Richmond, Va. Filed May 5, 1894. The combination of the rail having a tapered perforation, with a bonding wire, a sleeve fitted to said wire, and adapted to fit snugly in the tapered perforation of the rail and having a flange bearing against one side of the rail, and a nut adapted to bear against the opposite side of the rail, and to draw the tapered sleeve into the opening in the rail, the contact area of the connection being greater than the cross-sectional area of the bonding wire.

**523,306. Electric Railway;** Henry A. Doty, Janesville, Wis., Assignor to Mary E. Doty, same place. Filed March 27, 1894. The combination, with a trolley having an upwardly projecting arm, of a hollow hanger into which the upper end of the trolley arm projects and has guided movement, guide rollers arranged in pairs on opposite sides of the hanger, and arms projecting laterally from the trolley arm, and working between the said rollers.

**523,313. Electric Railway System;** Rudolph M. Hunter, Philadelphia, Pa., Assignor to the Thomson-Houston Electric Company, of Boston, Mass. Original application filed April 28, 1886. Divided and this appli-



No. 523,278.

cation filed March 14, 1889. In an electric railway, the combination of a generator, working conductors and connecting circuits constituting the railway circuits, with electric lamps interposed in said railway circuits and receiving electricity from the same source as the motors, and electrically actuated cut-out devices to cut out one or more of said lamps without interrupting the railway circuit if they should offer an abnormal resistance to insure the continuity of the electric railway circuit.

**523,319. Electrical Conductor for Trolleys;** John W. Eisenhuth, San Francisco, Cal. Filed June 21, 1893. An electric conductor for trolleys, etc. comprising a main conductor, a series of collars thereon, a series of short tubular conductors surrounding the main conductor and connected with the collars, an auxiliary conductor, an insulating bracket supporting the conductors, and electrical connection between the auxiliary conductor and some of the collars.



# STREET RAILWAY GAZETTE

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**Increasing the Revenues.** The contract for heating the post office building at Terre Haute, Ind., by steam has been secured by the electric railway company. A steam pipe will be run from the central power station to the post-office building, and the new method will replace the old one of heating by furnaces. Here is a source of revenue the value of which has not yet been fully appreciated by street railway men. Much surplus heat goes to waste through the exhaust steam; and the capacity of a plant is sometimes far above that called for by the ordinary requirements of the railway service. If this can be turned into revenue without increasing the labor item in the operation of the plant the profit from such service ought to well repay the additional outlay for piping and other necessary apparatus. A number of stations are already finding an advantage to take up the steam heating business on a moderate scale in connection with their regular line of work.

**Fire Alarms in Power Houses.** No well-equipped street railway system of any considerable size will be considered complete without a fire alarm gong at the power house or car barn so

connected that it will sound the alarm of every fire in the city. The superintendent will thus know at once whether the fire is likely to obstruct the street car line, and if it is he can send the emergency wagon to that point at once with the necessary appliances for carrying the line of hose above the car, or bridging the hose so that the car may pass over it. At Terre Haute, Ind., such a provision as that mentioned has been made to avoid delays to the traffic. Whenever an alarm is sent in from any point in the vicinity of the track a special car is sent out with "hose jumpers" to prevent any possible blockade. An emergency wagon would answer the same purpose, and would often be able to get nearer the scene of the trouble, especially if many cars were in operation. We should be glad to publish the experience of any superintendent who has used either of these methods of relieving a blockaded track.

**Newsboys on Street Cars.** It was announced in New York City last week that a company had been organized to sell newspapers, magazines and miscellaneous reading matter on the Broadway cable cars. Some time ago the managers of the Broadway cable line issued an order prohibiting newsboys from selling the daily papers on their cars, as it was claimed that the danger of accident to the boys was so great that the company did not care to assume the risk. Since that time patrons of the line have found it necessary to purchase papers before entering the cars, or make the trip without having one to read. The new company, it was said, proposed, in case the necessary permit could be obtained from the railway managers, to station a newsboy in uniform on every car of the line and to supply him with all the morning and evening newspapers, the weeklies and the monthly magazines. This boy would remain on the front platform and be ready to supply all comers with reading matter. The new company believes that it would get a very large amount of general business in addition to that absolutely lost by keeping the newsboys off the cars. All this sounds well and would doubtless be a great accommodation to the public; but it is very doubtful if it would prove a paying investment for the news company. Why would it not be just as well to put a newstand at every street corner along the line? a plan which would not require any more employees, but would secure the patronage of the pedestrians as well as the street railway passengers.

**Sunday Cars at Toronto.** In the agreement between the city of Toronto and the street railway company there is a provision that "no car shall be run on the Lord's Day until a Sunday service has been approved of by the citizens by a vote taken on the question." On two occasions a popular vote, as provided for in the clause quoted, has been taken and on each occasion the citizens have voted against the Sunday cars. Later legislation makes it impossible to again vote on the question until early in 1896. A recent attempt on the part of the mayor to compel the company to cease operating Sunday cars has led to a wide discussion on the subject. We cannot do better in this connection, since it appears so absurd to settle the question in the way that has been done, than to quote the pointed remarks of the Providence (R. I.) *Journal*. It says: "The very good people of Toronto who voted last year to prohibit the street cars from running on Sundays are deeply distressed over the reprehensible action of the mayor, who was supposed to know that it was the duty of every one, office holder or not, to walk to church and other places. It appears that an omnibus company started a Sunday line for the benefit of the unregenerate, and the mayor, instead of walking to the bus headquarters to expostulate, disgraced himself by hiring a carriage. This was as bad, in the judgment of the over-sanctimonious, as taking a street car or even patronizing the odious bus concern. The mayor was sensible in refusing to walk if the distance was long and the

heat excessive; his mistake was in catering to the cranks who think it sinful to ride to church or to escape city dust and heat by using the most popular of conveyances."

**Electric Railway Mail Service.** We cannot refrain from calling attention once more to the rapidly extending use of the electric railway as a distributor of the United States mail, one instance of which we illustrate this week. Its use for this purpose is very likely to lead the public to place a higher value upon its service than they have done, since it now not only furnishes a means of rapid transit, but makes possible a mail service marvelously better than that which has been heretofore enjoyed, and is thus a distributor of information and intelligence and a great public benefactor, even to those who never ride upon its cars. Commenting upon the subject of suburban postal facilities the New York *Evening Sun* says: "Meanwhile the ubiquitous trolley car is fast pushing its way into the remotest suburban districts and adding to the vast numbers of those who work in New York City and live beyond its boundaries. Unless we are much mistaken the trolley is destined to have an effect in distributing the population of cities over a wider area scarcely inferior to that of the steam railway, which has made the existence of great modern cities possible. And the first indication of what the trolley may accomplish in the collection and distribution of mails is shown by the traveling post-office cars prepared for use, beginning August 1, on the Atlantic avenue and West End system. These will carry letters between Brooklyn, Bath Beach, Bensonhurst and Coney Island. They will have conveniences for sorting letters on the journey, and, in short, will revolutionize the old, easy-going system of two mails a day and nothing between times. If this experiment proves a success it will be gradually extended to wherever the trolley runs, and this will mean pretty much everywhere not more than 15 miles from New York City Hall, within the next five years."

**Strict Rules at Grade Crossings.** A few weeks ago we referred at length to a serious and nearly fatal accident at a grade crossing in Paterson, N. J., where the carelessness of a railroad gateman threw the car conductor off his guard and the electric car was run upon the tracks directly in front of an approaching express train. To avoid, if possible, any trouble from this cause the railroad commissioners of Connecticut, in granting certain rights for grade crossings of steam and electric roads, have prescribed strict regulations to govern the guarding of these crossings. At Bridgeport, for instance, where the Bridgeport Traction Company crosses the tracks of the New York, New Haven & Hartford Railroad the commissioners require the traction company to lay its tracks so that they will in no way interfere with the tracks of the New York, New Haven & Hartford Railroad and to carry its trolley wires over the tracks at a level of not less than twenty-two feet above the steam railroad. They also require that the cars on the line shall be equipped with red signal flags to be used by day and red lanterns to be used by night. All the cars must come to a full stop before crossing the steam railroad tracks, the conductor to go out upon the crossing with a signal. If no train is in sight he will signal the street car to cross, the conductor to remain upon the crossing until the car has crossed over and to signal any approaching train which may come in sight after he has signaled the street car to cross. If at any time a street car shall for any reason stop on the crossings the conductors will send flagmen in each direction a distance of not less than 300 feet to warn the engineers of the obstruction of the crossing by the street car. This is only another indication of the tendency on the part of those in authority to more thoroughly provide for the protection of street railway crossings at grade.



### PENNSYLVANIA STATE STREET RAILWAY ASSOCIATION.

The executive committee of the Street Railway Association of Pennsylvania—consisting of Robert E. Wright, of Allentown; B. K. Meyers, Harrisburg; William Lanneus, York; S. P. Light, Lebanon; and Richmond L. Jones, Reading—met last week and made preliminary arrangements for the meeting of the association at Reading on Sept. 5, 6 and 7. This will be the third annual meeting of the association and is expected to be quite interesting, as nearly every railway company in the State will be represented. The headquarters of the association will be at the Neversink Mountain Hotel, where arrangements have been made for several hundred guests.

It was decided to extend an invitation to all persons dealing in or manufacturing any sort of electric supplies throughout the country to be present and make a display of their wares. This is something that has never been done before, and it is expected that it will be an interesting part of the convention. A day will be set apart for entertainment, when the guests will be shown the different attractions in and about Reading.

The officers of the association are: Vice-president, Robert E. Wright, Allentown, and secretary S. P. Light, of Lebanon. H. K. Rhoads, of Williamsport, who was president, died recently, so that office will remain vacant until the coming meeting.

### IMPROVEMENTS IN CINCINNATI PLANTS.

The Consolidated Street Railway Company is building a large addition to the Walnut Hills driving station, on Gilbert avenue, for the purpose of an electric power house, to furnish the power to the Norwood line and the Crosstown line, now receiving their electricity from the Hunt street plant. The new building is 50 by 70 feet, one story of about 30 feet. The plant will be fitted with two 1,000-H. P. Hamilton-Corliss engines, to run four 500-H. P. electric generators, making a 2,000-H. P. current of electricity on the wires. There will be three additional boilers, with the Jones underfeed stokers. The cost of the building and fittings will reach \$100,000. Here are some of the items and their cost:

Stonework.....	\$3,229
Coping stones.....	556
Stone.....	3,950
Brickwork.....	1,940
Ironwork.....	188
Tin roofing.....	464
Boilers.....	2,000
Engines.....	13,000
Setting engines.....	4,200
Piping.....	5,300
Water heaters.....	1,000
Brickwork.....	3,200
Electric generators.....	40,000

The Eighth street electric plant, to be erected at Depot street, near Eighth, will be erected at a cost of \$200,000. It will have four 1,000-H. P. engines and eight 500-H. P. electric generators, and seven large boilers furnishing 500 H. P. of steam each. The boilers will be heated by forced draft.

### LARGE ELECTRIC RAILWAY PLANTS.

The tendency for very large electric direct coupled generators, especially for railway power plants, has been illustrated again in a contract just closed between the West Chicago Street Railway Company and the Siemens & Halske Electric Company of America, for three 2,000 H. P. and one 1,000 H. P. generators.

The Chicago *Tribune* says: "The station is to be located on the property of the company on Washington boulevard and Western avenue. The company's repair shops and stables are located there, and it is considered that the situation is particularly convenient for an electric power station, because of the central location in the territory which is to be served. The station which will be constructed there is intended to ultimately accommodate five 2,000 H. P. generators and one 1,000 H. P. The station, with its total capacity of 11,000

H. P., will be the second largest in the country, and will be capable of moving 500 cars.

Work is to begin on Van Buren street immediately. The line will have to be entirely rebuilt. About three miles of street will be converted into electric line, the cars being taken at Halsted street and connected with cable. The motor cars will be hitched onto the cable, so there will be no delay in making connections. Mr. Chapman has devised a scheme for disconnecting the electric machinery in the motor car while the train is being drawn by the cable. The bids for the electric machinery, which were opened yesterday, called for the completion of the first dynamo within four months of the award of the contract. The contract calls for the completion of an additional machine every 15 days. The contract for the engines will be let immediately. The West Side power system is ultimately intended to operate electric lines on 60 miles of street, and the West Side company contemplates converting 120 miles horse-car lines into electric lines.

The contracts for the construction of the North Side power house and for the engines and machinery were let Monday. The power-house will be located on the river opposite Sharpshooters' Park, at California avenue and Roscoe boulevard. The station will ultimately take in generators aggregating 6,000 H. P. At present it is only the intention to operate 135 cars from that station, and the contracts which were let Monday called for generators aggregating 2,800 H. P. Contracts for the engines were let to the Fraser-Chalmers company, and for the electrical machinery to the Siemens & Halske Electric Company of America. The generators at the North Side station are intended to operate both North and West Side lines. The territory which will be covered will embrace all the lines of the North Chicago Street Railroad Company, and will also furnish power for all the West Side lines north of North avenue. Power will also be furnished for a new line which is to be constructed on Elston avenue from Chicago avenue northwest. This Elston avenue line is being built by the Chicago Electric Transit Company, a corporation that obtained an ordinance some two years ago. At present there is supposed to be no direct connection between that company and either the North Side or West Side company, but it is intimated that ultimately the West Side company will absorb that property. The entire electrical plants of the two street railroad companies embrace double tracks on 100 miles of street. It is expected that the first electric cars will be in operation early next year, and others will be rapidly equipped after that. The Crosstown lines can be got ready to operate by electricity rapidly, for they will not have to be rebuilt. All lines laid within the last year or two were put down with the intention of changing them from horse to electric, and nothing will be necessary but to string the trolley wires."

The Siemens & Halske Electric Company of America, who for the last two years have been the most prominent advocates of large direct coupled units both for lighting and power service, are to be congratulated on their success. The following list of railway plants erected or under construction speaks for itself: Garden City Construction Company, Chicago, four 620 H. P. generators; West Chicago Street Railway Company, Chicago, three 2,000 H. P. generators, one 1,000 H. P. generator; Johnson & Edwards, contractors for Nassau Electric Railway Company, Brooklyn, N. Y., three 667 H. P. generators; Toronto Street Railway Company, Toronto, two 1,400 H. P. generators; City Railway Company, Dayton, O., three 400 H. P. generators; Ringing Rocks Street Railway Company, Pottstown, Pa., two 135 H. P. generators; Cincinnati Street Railway Company, Cincinnati, O., one 650 H. P. generator; total, 16,400 H. P.

The above gives the rated capacity of these generators only, while those that have been in actual service, it is said, have shown their capacity to stand an overload of 50 per cent. for hours without harm or flashing on the brushes.

### HOW THE ELECTRIC CURRENT PROPELS THE TROLLEY CAR.

BY LIEUT. F. JARVIS PATTEN.

I have often been asked to explain "how the trolley car goes." A friend of mine downtown, who, besides holding some electric railway stock, had also an inquiring turn of mind, asked the question again the other day, and in my effort to make the matter clear to him, I realized that even a general knowledge of the subject was far from common among observing men. How to explain the matter without talking of volts and amperes, how to strip the subject of the apparently meaningless verbiage of electric science, was the difficulty. There must be something wrong about this new electric language, thought I, for it certainly obscures the subject to the ordinary understanding. Any one of fair intelligence can acquire an idea of the steam engine without learning a new language. Most observing people have a fair notion of the locomotive and can explain its action in a general way; this, however, was not the case 40 years ago, and I doubt not that 20 years hence such people will be as familiar with the electric engine as they now are with the steam locomotive.

The electric system seems a little mysterious simply because there is so little to see. We can observe no moving parts, there is no driving piston, no throbbing boiler with its full suggestiveness of power, and whatever apparatus imparts motion to the car is entirely concealed from view.

The car rushes along as if moved by some invisible hand, and only a hint of the power at work is given when the trolley wheel jumps off the wire, and a burst of flame tells the story of the power at work. It is this complete separation of the power from the thing it drives that lends apparent mystery to the case.

There is evident connection of some kind between the car and the power that moves it, for we can see at least that the overhead wire reaches back to the power-house, but the wire is motionless, and gives no hint of what it is doing or how it does its work.

When Chinamen first came to San Francisco and saw the cable cars moving along the streets of that city it seemed to them like magic; it was not clear that an invisible rope beneath the roadway pulled the cars along, and until this explanation was given the simple cable system was not understood. Thus in the cable car we have the first practical illustration of the entire separation of the driving power from the thing it drives, for in this case the power is at the engine-house, and the rope or cable is simply the means of transmitting the power to the distant car. In electric systems the overhead wire serves the same purpose, though it performs its duty in a slightly different way.

This difference I will try to make clear by riding the subject of any appearance of mystery; in fact it is only because the wire does not pull anything that the system looks a little puzzling at first, which after all is simply because we have always been accustomed to see a horse or a rope pull a car, and the human mind, ever determined to go in a rut, always expects everything explained the same way.

A comparatively simple analogy, however, will make the trolley system clear; but to build up the analogy and understand it, we must play inventor for a while and imagine, absurd as it may seem, that we wanted to run street cars by water power.

We will then imagine each car provided with a water wheel, which being driven by a stream of water will by turning impart motion to the car. We must also provide a stream of water for each car ever ready all along the road to be turned on or off at will.

For instance we will build on a high trestle above the track a long trough that goes from one end of the road to the other, and fill it with water. The trough will be built perfectly level and the water it contains will therefore be perfectly at rest without any tendency to flow toward one end or the other.

By the way, while we think of it, we see that the



higher the trough is placed above the track, the better it will be, for we know that a stream of water flowing down from a height will have more power, and do more work, the higher the point or level from which it falls. So we will put the trough up as high as practicable above the roadway, the point of which in the electric system will appear later.

We must now provide means by which the water may be allowed to flow down from the trough above to each car through a separate pipe where the emerging stream can be directed against the water wheel we have supposed each car to be provided with, and which being driven by the water will set the car in motion.

Next, we will imagine a lot of floats on the water in the trough overhead which are free to move along from one end to the other of the trough, and these, one for each car on the road below, will be provided with a piece of fire engine hose that reaches down to a car where the nozzle of the hose can be directed by the motorman upon the water wheel, and who, by turning the water on or off, can set the car in motion or stop it at will. Further, more, it is plain that by turning the water onto one side or the other of the wheel the car could be driven forward or backward as desired. As the car moves along it draws the hose pipe after it, the float following overhead.

We have thus contrived a water power system for driving street cars by means of a sort of portable waterfall that moves with the car along the track. It is a clumsy system, indeed, and we don't like the looks of it very much, but there is one great advantage about it, we can see how it would work, at least for a while, for after a time the water would be all drained away from the overhead trough, and the cars would come to a standstill for want of water to drive them.

The remedy for this difficulty is, however, easy to suggest. We must have a large pump at one end of the road driven by a powerful steam engine which must, of course, be kept constantly at work pumping water up into the trough overhead as fast as it flows down through the different pipes to the cars.

One more important feature must be added to this clumsy piece of engineering to make it fairly complete. The overhead trough must be perfectly level, but we will suppose the roadway to incline down hill one way and the power house with pump and engine will be placed at the lower end of the road. Then we will dig a ditch or lay a conduit along the middle of the track, the entire length of the roadway leading down to a large reservoir under the engine-house so that all the water that comes down from the trough above, after passing the water wheels on the cars and falling into the ditch or conduit, will flow back to the engine-house, where it will be again pumped up to the trough overhead. In this way the same water will be used over and over again as long as the service of the road continues.

Let us now compare our newly invented system with the cable and trolley systems. The water is being constantly pumped up into the trough overhead by the engine at the power-house, and it is just as constantly running down the several hose pipes through the cars to the conduit beneath the track, in which it runs back again to the reservoir beneath the station-house. The water is thus constantly going the rounds of a circuit, just as the rope does in a cable system. In both cases, however, it is manifestly the engine at the power-house that is doing all the work and furnishing all the power, the cable in one case and the water in the other being simply the means of getting the power to a distant point where we want to apply it to a car. Our horizon of view, however, is now somewhat enlarged, for observe that the water in the trough, unlike the cable, don't pull anything. It stands quiescent and passive in the trough overhead, ever ready to do work by falling down through a pipe to a water wheel on the car.

Comparing now the water-power system with the trolley system, we soon discern a strict parallel-

ism between the two throughout, the apparent clumsiness of the water-power system gradually disappears, and in place of its cumbersome and awkward features we will find elements of beauty and simplicity, for every part has its precise equivalent in the electric system.

In the overhead trough, extending from one end of the road to the other, you readily recognize the overhead trolley wire. The float on the water is the trolley wheel, the hose pipe leading down to the car is the wire that leads down the trolley pole and conveys the current from the overhead wire to the electric motor beneath the car, while the water wheel on the car corresponds to this machine which is turned by the electric current rushing through it, the current passing then to the rails of the track, which in electric roads are connected together by bonding wires, thus forming a second wire along the ground by which the electric current can flow back to the power-house in much the same way as the water flowed down the conduit in our supposititious water system to the reservoir in the power-house.

At the power-house we find the analogy none the less complete. There, however, a large steam engine, instead of driving a pump for raising water to a trough overhead that extends out over the road, drives a large dynamo, which is, strictly speaking, a machine for pumping electricity up to the level of an overhead wire (trough), where it is in a position to do work by falling to the lower level of the roadway (rails or ditch), passing on its way through the motor beneath the car, which the electric current causes to turn forward or backward according as the stream is directed upon one side or the other of the wheel. The analogy is complete throughout, but observe how comparatively simple the electric system is, for while we cannot send electricity as so much liquid along a tube or pipe, we can send it along a slender copper wire to a great distance with little friction loss, and by proper precautions it can be kept on the wire until wanted for use.

Thus our clumsy trough and hose-pipes dissolve from view and in their stead, we find, a few flimsy copper wires that serve as well for electric currents as the others did for those of water.

It remains to explain something about the dynamo, or electric pump, at the power-house; and, going back there, we find the steam engine driving a comparatively simple piece of machinery. This is the dynamo. It has only a single moving part, a drum-shaped thing turning on a spindle and surrounded by a number of radial or spoke-like parts that are fixed, and which are at once recognized as so many powerful magnets. The magnets, with their strong attraction, tend to hold the drum part, also fixed, but the engine overcomes this force, and an electric current results from this action. Two pieces of copper, known as "brushes," bear upon opposite sides of the drum. These are collectors of the current: and investigation shows that when the drum of the dynamo is forcibly revolved against the magnetic attraction, an electric current results that tends to flow from one brush, or collector, to the other. For convenience of illustration, we may call one the upper brush and the other the lower, and suppose that, by driving the dynamo, electricity is pumped up to the upper brush, whence it tends to flow back to the lower brush. Now, the overhead trolley wire is connected to the upper brush, and forms simply an extension of this upper brush of the dynamo, reaching out over the road to the end of the track, and the rails of the track (all connected together on the ground) constitute a second wire along the earth, which is connected to the lower brush of the dynamo, and forms really an extension of that brush to the end of the track. It follows, therefore, that the electric current anywhere along the trolley road is always trying to run down from the trolley wire overhead (upper dynamo brush) to the track rails, or earth, below (lower dynamo brush).

The electric current, however, cannot get from the trolley wire overhead down to the rails below except through the means provided, namely, down

the wire on the trolley pole to the electric motor beneath the car and through it to the car wheels on the track. In passing through the motor (which is really a small dynamo) it causes its drum to revolve and thus motion is imparted to the car.

Another important analogy should not be lost sight of. In planning the water-power system it was concluded best to place the trough as high as possible above the track, so as to get more pressure and have a powerful stream of water to direct against the water wheel on the car. This effect corresponds in the electric system to the pressure or strain called voltage which urges the electric current to pass through an interposed resistance from one brush of the dynamo to the other, or, which is the same thing, from the overhead trolley wire to the ground.

If now in the water-power system the trough were placed enormously high we should have great trouble, for we would find the pressure at the lower ends of the hose pipes so great that nothing could be made strong enough to confine it—the water would burst any pipe we could make, and so escape without doing any useful work; thus in the water-power system there would be a limit to the head or pressure of water that could be safely used. Just so in the electric system the voltage or pressure that urges the electric current to leave the trolley wire and rush to the ground through any path it can find, has a limit in practice beyond which we cannot go.

The path provided for the current to flow through the car motor to the rails beneath has inherent regulating properties; and just as the nozzle of the hose pipe in the water system, and the mechanical reaction of the water wheel, serve to check the too rapid flow of water, so the electric motor mechanism on the trolley car checks and regulates the flow of electric current and causes it to work in a perfectly controllable manner. This regulating property of the electric motor, an explanation of which would be beyond the scope of this paper, is the saving feature of trolley systems; and permits the working of any number of cars on the same line entirely independent of each other, as each motor will take only enough current to do its own work. If then the wire overhead is kept constantly supplied with current by the dynamo, which is equivalent to keeping the trough overhead always supplied with water, all the cars will run.

One more comparison remains to be made between the two systems. If by any accident the bottom of the overhead trough in the water system should suddenly fall off, all the water above would come down in a heap and cause destruction. Just so in the trolley system. If the trolley wire should by any accident break and fall down to the rails, or, what is the same thing, to the ground, because the rails are on the ground, it would be equivalent to letting all the water suddenly fall from the overhead trough to the ground—all the power of the currents would thus be let loose without control or regulation, to rush from one side of the system to the other, which result is always accompanied with great danger, and destruction of whatever the current finds for a path.

An electric light or telegraph wire falling across the trolley wire may connect the latter to earth at a distant point and so produce a similar result. These are the necessary, because sometimes unavoidable, accidents that may happen to a very useful but at the same time a very sensitive and delicate system of transmitting power to a distant point.

In the supposititious water-power system, all the parts are plainly visible, and its operation is therefore easy to understand, almost without explanation. In the electric system the same identical parts are all present just the same, but not in a visible or tangible form. We have only to use the eye of the mind to see the different parts as plainly as if they were tangible realities, and when we do this it is no longer difficult to see "how the trolley car goes."



**NEW ELECTRIC MAIL CAR FOR BROOKLYN.**

The Atlantic Avenue Railway Company, of Brooklyn, has recently completed at its shops an electric postal car. The car was designed by the officials of the railway company, assisted by the postal authorities of Brooklyn, and is patterned after the standard type of postal car used on steam railroad lines.

Only half of the car will be used for postal purposes, the other half being a smoking compartment. A plan of the arrangement of the car is given in Fig. 1. The car is of the Accelerator type, and along the side opposite to that where the

ville and Raritan. Retracing, it will touch Bound Brook, Dunellen, Evona, Fanwood, Plainfield, Elizabeth, and by its main stem and branches will reach the following towns: Irvington, Springfield, South Orange, Montclair, Albion, Orange, Bloomfield, Caldwell, Morristown, Newark, Jersey City, Rahway, New Brunswick, South Amboy, Perth Amboy, Metuchen, Connecticut Farm, Cranford, Roselle, Elmora, etc.

**FEEDER WIRE SPLICER.**

This device was brought out last year by the Ohio Brass Company, of Mansfield, Ohio, and, it is said, has met with very general approval from

observe the undesirable features of the various types, which were naturally avoided in the designing of its own. The aim of the designers has been to produce, first of all, a substantial, well built motor of few parts, simple in construction and easily understood, with all parts requiring renewal so made as to have great wearing surface, and replaceable at small cost.

The motor of this company, shown herewith, is claimed to possess not only these desirable features, but to also be high in electrical and mechanical efficiency, and to be the lightest motor per unit of actual horse power delivered to the axle on the market.

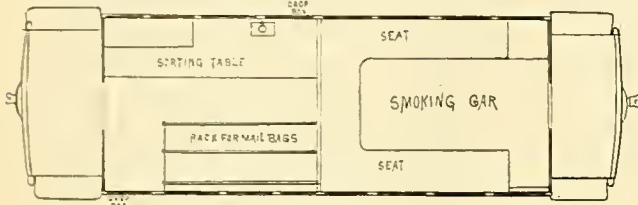


FIG 1.—PLAN OF BROOKLYN MAIL CAR.

door is placed is a shelf, above which are pigeon holes for distributing the mails. The rubber stamps for canceling and postmarking are kept on this shelf. On the opposite side of the car are the pouch racks provided with bars and hooks for holding the mail pouches open. Drop letter boxes are provided at each corner of this compartment, as shown.

The exterior of the car (Fig. 2) presents a very handsome appearance. It is painted white, like the United States mail cars which are run on steam routes. The mail compartment is lettered in goldleaf, "U.S. Mail," the smoking compartment being lettered "Smoking Car." The windows are covered with wire screens. The car is mounted on a Brownell truck.



FEEDER WIRE SPLICER.

construction men. Besides making a practically perfect joint in the feeder wire, it is claimed to save enough time over the ordinary way of splicing to more than pay for its first cost. It can be used as a permanent or temporary connector. In making a splice, the insulation is first removed and the halves of the splicer are placed over the abutting ends of the bare wire. The nuts are then screwed on the tapered ends of the splicer, which is slightly corrugated on the inside, thus securely clamping the wire. Solder can be poured through a slot provided for this purpose. A joint made in

The armature is of the drum type and contain 99 coils wound in slots, the wire being carried well below the surface of the core; ample provision is made for perfect insulation. The fields are wound on metal shells, thoroughly insulated, and by an ingenious arrangement of the pole pieces the armature or either of the fields can be removed independent of the others.

The type "C" controller (Fig. 2), used with this equipment, is designed to have all the advantages of existing types of series parallel controllers, is simple, and provided with a device whereby a

**TROLLEY LINES IN NEW JERSEY.**

The New York & Philadelphia Traction Company, to which attention was called last week, has filed in the Secretary of State's office the route over which the company intends to build its lines. It is



FIG 2.—MAIL CAR FOR BROOKLYN

very comprehensive, and with its various branches will reach almost every town of any importance in the central part of New Jersey.

It starts at Camden and comes up the river, touching Pavonia, Cramer Hill, Fish House, Delclair, West Palmyra, Palmyra, Riverton, Riverside, Delanco, Beverly, Edgewater Park, Burlington, Florence, Kinkora, Bordentown, and thence along the White Horse road from Trenton to Yardville, to the point where the Trenton electric road terminates. The new road will then run through Trenton to Lawrenceville, Princeton, Rocky Hill, East Millstone, Millstone, Hillsboro, Flanders, Somer

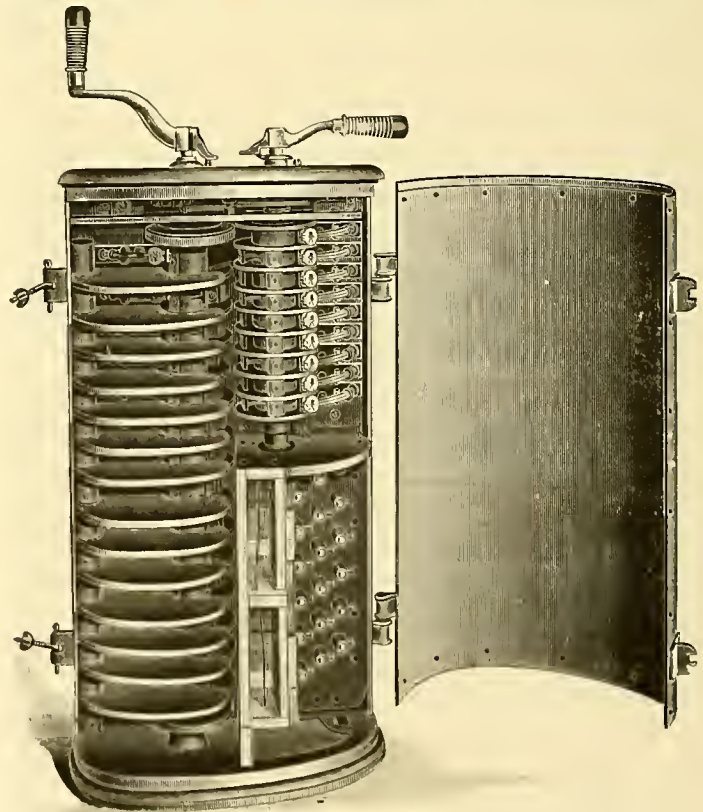
this way is but a trifle larger than the wire, and is of low resistance and great strength. The average electrical resistance is said to be about .02 of an ohm, and the mechanical strength of the joint is greater than that of the wire itself.

**NEW MOTOR AND CONTROLLER.**

The accompanying illustrations show the improved type "C" motor and series parallel controller, manufactured by the Steel Motor Company, of Cleveland, O. This company has been engaged for a number of years in supplying repairs for all types of motors, and is therefore in a position to

single motion of the reversing lever to a point indicated makes it a straight multiple controller. In connection with the double fuse box (contained in the controller), either motor can be cut out in an instant, and without leaving the platform.

In addition to the regular disks separating the contacts, Vulcabeston guards are inserted between them, effectually preventing an arc from forming. These guards are hinged at the side of the controller, so as to be readily thrown back when the jacket is opened. The resistance coil used in starting the car gradually is simple in construction, entirely protected from water, and practically inde-



STEEL MOTOR COMPANY'S RAILWAY CONTROLLER.

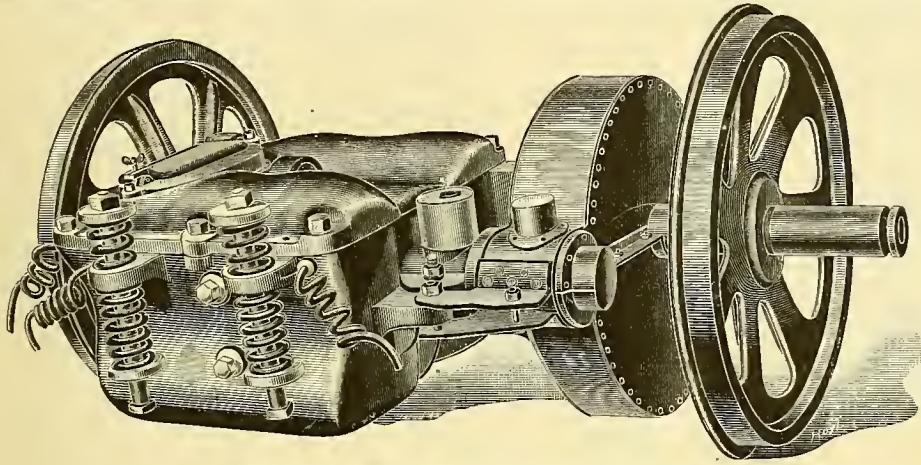


structible in ordinary service. A unique feature of the equipment in the substitution of a very simple and inexpensive device for the cutting out of the loop in the field when the highest speed is desired. The device is isolated from the motor proper, and so arranged in connection with the field that most of the danger of the field burning out by an overcharge of current is eliminated. The manufacturers have not, until recently, pushed this motor to the front, preferring to await the test of actual service before advertising it extensively, but now, after two years' operation under various conditions on some of the most dif-

**A COMBINATION ELECTRIC SNOW PLOW AND SWEEPER.**

The latest addition to the McGuire Manufacturing Company's specialties is an electric combination snow plow and sweeper, which is likely to attract considerable attention. In many important particulars it differs from all the old designs, and it is more in the line of steam railroad apparatus because of its powerful construction. The body is of handsome design and is mounted on a truck specially constructed for the purpose. The brooms are 36 inches in diameter and are made in sections and so arranged that they are all inter-

is a wing plow, the front end of which is attached to the pedestal of the truck by a hinge joint, allowing the back end to be swung out at an angle from the side of the car any distance necessary, from three to five feet, thus effectually preventing the snow which is removed by the plow, or broom, from falling back within the rail under the car. These wings, like all the other parts of the machine, are operated from the inside of the car, and can be moved in or out at will. When not in operation they close back against the side of the truck frame, and lock in that position. The sand boxes are arranged on the inside of the car over each wheel with suitable attachment, so that the sand can be used in front of all the wheels when necessary. On a road having a loop at the terminus, or other combination for turning the car, the machine can be arranged and operated as shown in the accompanying illustration, using the broom at the rear end of the car to remove any snow left by the plow. As these brooms extend the entire width of the car, it is only necessary to operate the front one in ordinary service, although both can be used at the same time, if necessary. Each broom is controlled by a clutch connected to the motor.



STEEL MOTOR COMPANY'S RAILWAY MOTOR.

ficult roads in the country, they offer their equipment for the consideration of the street railway fraternity. Among other equipments this company has filled two orders, aggregating 100 motors, for the Cleveland Electric Railway Company, and has just completed its fourth order for the Allentown & Lehigh Valley Traction Company. The company is now working on 120 motors for the Nassau Electric Company, of Brooklyn, N. Y., as well as on a number of smaller orders for different parts of the country.

**THE FALKENAU ENGINEERING COMPANY.**

Messrs. Arthur Falkenau, Edwin R. Keller, Clayton W. Pike and Elmer G. Willyoung have formed a copartnership under the title of The Falkenau Engineering Company, Ltd., for the purpose of conducting a general business as mechanical and electrical engineers.

This company, whose office will be in the Betz Building, Philadelphia, will devote itself to designing and building light, heat, ventilating and power plants, central stations and electric railways, complete or in part, and to giving expert advice in all matters pertaining to the same. Special attention will also be paid to making expert examinations and tests of existing plants with a view to increasing their capacity or economy of working.

The technical education of the members of this firm, supplemented by an engineering and business experience, covering a period of from five to fifteen years, is a guaranty to their clients that all work intrusted to them will receive competent attention and be performed in a thorough and satisfactory manner.

The Falkenau Engineering Company, Ltd., is prepared to undertake work in any part of the country, and to furnish estimates or bids upon the same.

**Brooklyn, N. Y.**—The Atlantic Avenue Railroad Company of Brooklyn has instructed its counsel, Tracy, Boardman & Platt, to sue the Long Island Railroad Company and compel it to abide by an agreement made when the former company leased it the right of way through Atlantic avenue from Flatbush avenue depot to Jamaica. It was agreed that through trains should be run from Brooklyn. The leasing company says the defendant runs through trains from Long Island City only.

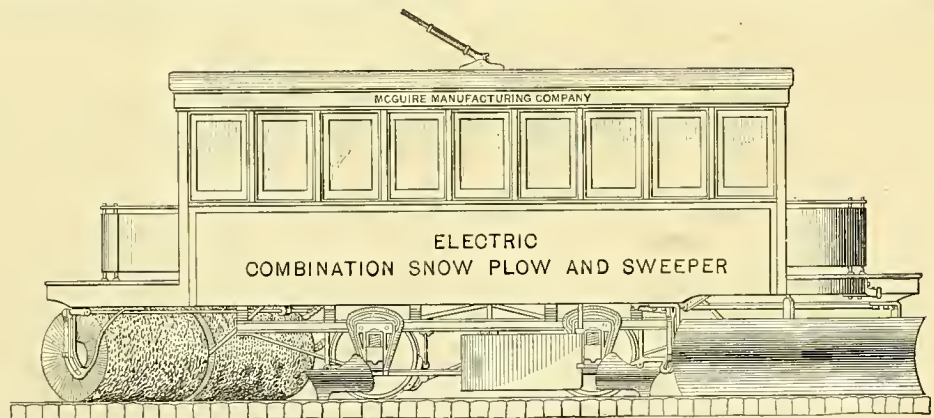
changeable and long enough to clear both rails on the front of the machine, thus insuring a clear rail and good traction. The brooms are operated by an independent motor within the car and are under the control of the operator, who can run one, or both, when desired. They can be raised and lowered at will, and in case the snow is wet and heavy the brooms can be pressed down on the rail with sufficient force to remove it. When unusually heavy snowstorms set in, or where the snow is considered too heavy for brooms, both brooms can be removed and steel plowshares substituted. This change is made by simply disconnecting the sprocket chain, lifting the lever and uncoupling the brooms from the guide bars, then putting the plow into the same connections which hold

**TRAMWAY PERMANENT WAY.\***

BY T. ARNALL, A. M. I. C. E.

It is just two years since I had the honor of reading a paper on this subject before the institute. In that paper was given some account of the three varieties of rail that had been used on the Birmingham tramways, and of the effect of wear and tear upon them. The present short paper may be considered as a continuation of the former one, its object being principally to deal with a few of the points too lightly passed over on previous occasions.

Discussion of this subject naturally divides itself into a consideration of the rails, on the one hand, and, on the other, a consideration of the joints. As to the rails, I exhibited several sections that had been taken from worn rails, showing the effects of wear and tear upon them; the conclusion suggested was that a rail was worn out and required replacing on a straight line of tramway after the passage over it of about three quarters of a million of steam cars. After two years' further experience in the matter, I am inclined to think this number rather too high, and that the rails



MCGUIRE ELECTRIC SNOW PLOW AND SWEEPER.

the broom. In making these changes it is only necessary to remove two bolts and four pins, and this will not take longer than five minutes. The machine is equipped with flanges arranged directly back of the plow or broom, in front of the wheels, the wing extending outward to the line of the plow. The lower part is provided with a steel shoe, or scraper, of the same form as the rail, and is pressed down on the rail hard enough to remove any ice. The flanges are connected together with a cross bar, which is attached to a lever inside the car, for raising or lowering them as required. They are also set at such an angle that in case they are allowed to remain down while passing a crossing or other obstruction, they would be forced up without any damage to the machine. Just back of the flanges

should be renewed after a traffic of about 700,000 cars. No hard-and-fast line can be drawn. The rails vary in hardness among themselves even when coming from the same works, and show corresponding inequalities in their wear. They further vary according to the situation in which they are placed. If they are near a Board of Trade "stop," where the brakes have to be clapped on at every journey, and perhaps the rails also sanded pretty frequently, the rate of wear will be of course increased. If the rails are on a curve the wear is greater proportionately in some way to the degree of curvature. This, of course, arises from the fact that the wheels do not simply roll round on the rails. They also slide, for

\*A paper read before the Tramways Institute, London.



a double reason. In the first place, to get an engine or car with a fixed wheel base round a curve means that the front pair of wheels must be continually acted upon by a lateral pressure sufficient to slide the front of the engine sideways to an amount dependent upon the curvature. In the second place, besides this lateral slip, we have also generally a backward slip in the wheel on the outer rail, and a forward slip in the wheel on the inner rail, inasmuch as both wheels are of the same size (or ought to be) and are both keyed to the axle so that they have to revolve together. This slip means a much greater wear and tear, so much so that on a curve of 40 feet radius the rail has often to be renewed before it has carried the traffic of a quarter of a million cars. On the sharp curves we also have a rapid wearing away of the sides of the groove, which, of course, reduces in some degree the upper surface available for withstanding the wear.

Another influential factor in the life of a rail is the state of the road in which it is laid. If the road has macadamized margins there will always be a supply of grinding material in the shape of dust for spreading over the surface of the rail; in dry, dusty weather this supply will be increased, and the destruction of the rails correspondingly assisted. Where the road is paved all across and the dust reduced to a minimum we have these conditions at their best; where the macadam roadway margin comes close to the rail the conditions are at their worst. I know of a case now, near Birmingham, where the granite margin to the tramway is only 7 inches wide. The line has been in use about nine and a half years, and has had over it about 300,000 cars, and the outer rails are quite worn out; the inner rails are in a much better condition, because, being farther from the macadam margin, they have kept cleaner. Inside the city boundary the granite margin has always been 25 inches wide, and a couple of years ago the street was paved all across. I expect the effect of this to be that we shall be able to get a life of 500,000 or 600,000 cars out of the rails, though they came from the same works and were laid at the same time as the rails which have been worn out by 300,000 cars.

There is a rather awkward question arises here—viz., when is a rail worn out? I have got on the table a number of rails which have been judged to have reached this stage, and have therefore been condemned and taken out. You will see that they are in various stages of ruin. The best of them still show fairly well the original form of the head; but this (No. 3), for instance, has positively no elements left which would enable a tramway palaeontologist of the future to determine what had been its original form. There can be no dispute as to whether or not this is "worn out," but why should all the others also be condemned, seeing that none of them have reached this stage? The following reasons may throw light upon this matter:

A rail has two functions to perform: the one is to carry the tramcars in the same way as a railway rail carries its traffic; the other is to form part of the surface of a road made for ordinary vehicles. If a tramway company did the same as a railway company—viz., bought the land over which their tracks were laid—there would be nothing but the first mentioned function to attend to; but seeing that their tracks are laid along roads intended for other vehicles which ought not to be interfered with, the second function also has to be kept in sight. It is this second matter which in general determines the question as to whether or not a given rail must be declared worn out. So long as ordinary vehicles can use the road without being unduly interfered with by the presence of the rails, the road may be passed as satisfactory; but when the rails are obviously a danger to traffic other than the tramway traffic, the second function is not fulfilled, and the time has come when they must be replaced.

This is not a stage which is reached all at once; the wear is a gradual process, and the danger to the public is a gradually growing one. It depends largely upon the nature of the traffic, and upon

the position of the rail in the road, as well as upon the actual section of the worn rail. The outer rail of a curve is more dangerous, for instance, than the inner one, for equal degrees of wear; in fact, the inner rail of a curve is in general less dangerous for a given degree of wear than either of the rails on a straight line, inasmuch as the curvature helps the wheel of an ordinary vehicle to mount over the obstruction which the projecting flange offers.

The danger which some of the worn rails shown on the diagram offers to the passage of ordinary vehicles cannot be denied. Such rails constitute a public nuisance, and they must be removed. Yet you will see that there is still a heavy mass of metal in the head which ought to be available for further wear. This is quite true, but the trouble does not arise from the part that wears away, but from the part that does not wear away. All the danger arises from the projecting flange of the groove. On a horse line this trouble does not arise, since the ordinary traffic (the effects of corrosion perhaps assisting) causes the projecting flange to wear away about as fast as the head which carries the load. On a steam tramway the case is different, and on tramways where the excessive traffic of the Birmingham lines has to be contended with, the case is altogether different. Here the wear and tear on the head is so rapid that the corrosion has no chance, and the number of cars is so great that the ordinary traffic is in a great degree driven off the lines, so that this also has no chance to wear down the flange and assist in keeping it level with the top of the rail.

It is facts like these which bring into prominent relief the enormous advantages we should have in Birmingham by the adoption of a rail with a central groove, such as the Liverpool rail. Twelve years or so ago, when the Birmingham Corporation were going to commence the construction of an extensive system of tramways, there was a desperate attempt made to induce them to adopt this rail; the Board of Trade held an inquiry at the Council House, but the Corporation had had enough of compound rails, and insisted upon using the girder section, in spite of the advantages which the central groove offered. Subsequent experience has fully justified the decision then arrived at, seeing that the central groove then meant a compound rail, and was certainly unsuitable for the steam traction that was going to be used on the tramways. I know of but one case where the Liverpool rail was used on steam tramways, and that was the line from Dudley to Wolverhampton. I have here a piece of a worn-out rail that has been taken out of this tramway. This rail has had about 12 years' wear—not very heavy wear, certainly—and you will see that so far as ordinary traffic is concerned, the rail is every bit as good as new. They are not being taken out for the reason that always has to determine our action in Birmingham—viz., because they are dangerous to ordinary traffic—but because they break up in pieces through the bolt-holes under the weight of the steam engines.

The girder rail, which is being used on this tramway to replace the Liverpool rail, has the same width on top as our rail, and practically differs from it only in having the groove in the center. The saving that such a rail as that would effect to the Birmingham tramway companies is so great that I don't like to calculate it, and the saving in wear and tear to the citizens' ordinary vehicles, in the danger of driving about the streets, and in the worry and anxiety to the unfortunates who have to direct the repairs, are all beyond expression. Looking at the question solely from the point of view of the public interests, I am strongly of opinion that this is the only form of rail which is suitable for use on a steam tramway in a public street, and can only regret that the difficulties in the way of substituting it for rails of the ordinary section on tramways which have to be kept in use during the "conversion" are so great and obvious.

To turn now to the question of the joints, it may be remembered that in my former paper I de-

scribed two or three forms of joints of which trial had been made. The original form was painfully wanting in all elements of permanence. Assisted by a sole-plate it was vastly improved, but still a long way from perfection. I also described a form of cast iron fishplates, so designed as to largely increase the area available for wear on the top and bottom of the plates. At the date of that paper they had had over them about 250,000 cars, and were still in a fairly satisfactory condition. When the traffic reached about a quarter of a million cars, however, they began to get very troublesome; their tops, which were brought up level with the surface of the rail, did not wear down with it, so that, in passing, the load of an engine was often brought directly to bear upon them, and some of them were broken. The general conclusion arrived at was that they formed a very good joint, and, with a sole plate, the best we had ever tried. They were, however, expensive in first cost, and did not last as long as the rail, and were therefore unsatisfactory. An obvious improvement was before us, either to make them of cast steel or of malleable cast iron; but this would have largely increased the cost, and so the suggested improvements were not adopted. Their excessive rigidity was another objection; we could not bend them on a curve, and special curved castings meant more expense and trouble than could have been undertaken.

It is of course, common knowledge to all using girder rails that the joint always works loose. Now, if the joint in a rail were a permanently supported point, it is not easy to see how the tendency for it to work loose can arise. Since it does work loose, it is quite certain that if it be properly supported in the first instance it does not remain so. If it is not supported it then has to act in some sort of a way under the passing traffic as a girder, the bearing places of which are irregular and shifting points at unknown distances from the actual joint. The problem awaiting solution is therefore altogether different from that of designing a joint in an ordinary girder. It differs from an ordinary girder in many ways. Its points of support, besides being irregular and shifting, will not in general be symmetrically arranged, its actual bearing points being perhaps usually on different sides of the flange on opposite sides of the joint. The consequence of this is important: The passing loads, besides producing a bending action, cause also a twisting or rocking action, which perhaps has the most powerful influence in pulling the joint to pieces.

It may be therefore safely concluded that no form of joint is likely to give permanent satisfaction unless these various disintegrating actions are properly resisted—the twisting and racking tendency, as well as the bending. The most hopeful joint I have yet seen is the one shown on the diagram. The fish plates are 2 feet long and  $\frac{3}{4}$  inch thick, with a thinner horizontal projection to clip the bottom flange of the rail; underneath is a sole-plate  $\frac{1}{2}$  inch thick. There are, of course, six bolts through the web of the rail, and four on each side through the horizontal flanges of the rail, and through both soleplate and horizontal flanges of the fish plates also. We only commenced laying these joints at the beginning of the present year, and it is yet too soon to report upon their merits. Considering our section of rail, however, it appears to be a joint well adapted to withstand vertical flexure, and also that twisting racking action which is caused by unsymmetrical bearing points, and which I believe to be even more influential in pulling a joint to pieces than the plain bending action.

Chicago, Ill.—The plans for the Northwestern extension of the Lake Street L. road have been approved by city authorities, and it is expected work will soon be commenced. The extension branches off the main line at Western and Artesian avenues, and covers a great stretch of territory in the northwestern part of the city.



**NEW MATHER RAILWAY GENERATOR.**

The generator shown in Fig. 1, and which has recently been put on the market by the Mather Electric Company, of Manchester, Conn., is of an entirely new design and contains a number of important features. The railway generators are wound for a nominal voltage of 500, but, having a rheostat in the field circuit, the potential can be raised to 600 volts without undue heating, and even 50 per cent. overloads will be borne for short periods without injury to the machine.

Automatic alignment is secured by the use of ball bearings, which adjust themselves and can never bind on the shaft. The supports for the bearings and the entire bed plate are cast in one piece, a construction which gives great strength and rigidity to the bearings, and secures the greatest possible freedom from vibration. There are four sets of brushes used, each brush being held in an independent holder.

The armature core is built up with thin disks of soft iron which are forced together under pressure and rigidly keyed to the shaft. All washers used are first treated to an improved annealing process, with the result that the armatures when revolving in the most intense magnetic field will only heat up to a few degrees above the surrounding temperature. The greatest care is taken in the insulation of these armatures. Before winding, there is fitted into each slot a carefully made mica duct, through which the wire is wound and nothing but the very best mica and insulating material are used throughout the whole construction.

The winding is of the simplest form possible; the simplicity being particularly noticeable at the ends, where the wires, instead of being overlapped and bunched together, stand out from the core and from each other, thus allowing free circulation of air around every conductor. No wires having a large difference of potential are adjacent to one another.

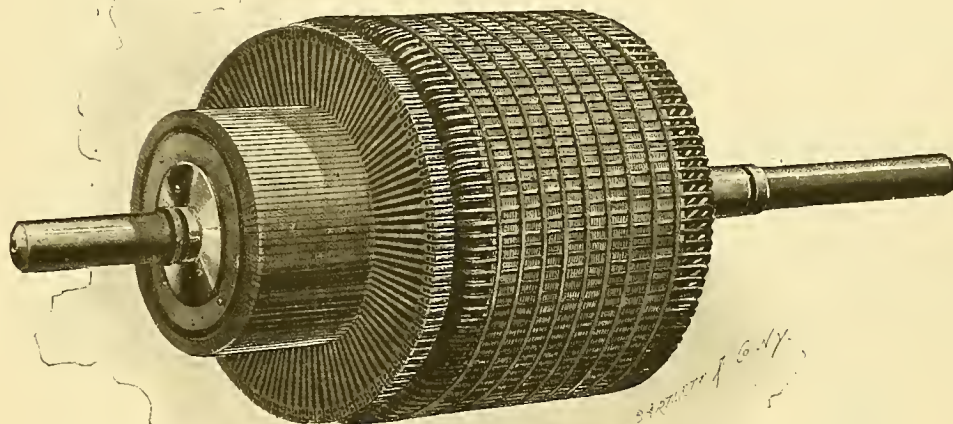
The necessary voltage is secured by revolving a

loosening a few bolts and raising one of the field castings. The winding is so compounded that, as the current supplied to the circuit increases, the voltage rises sufficiently to make up for the loss of drop in the circuit, or for a variation in the speed.

One peculiar feature is the employment of cast steel in the fields, which increases the efficiency and gives nearly double the magnetic field possible

switches, ammeters, voltmeters, lightning arresters and automatic circuit breakers.

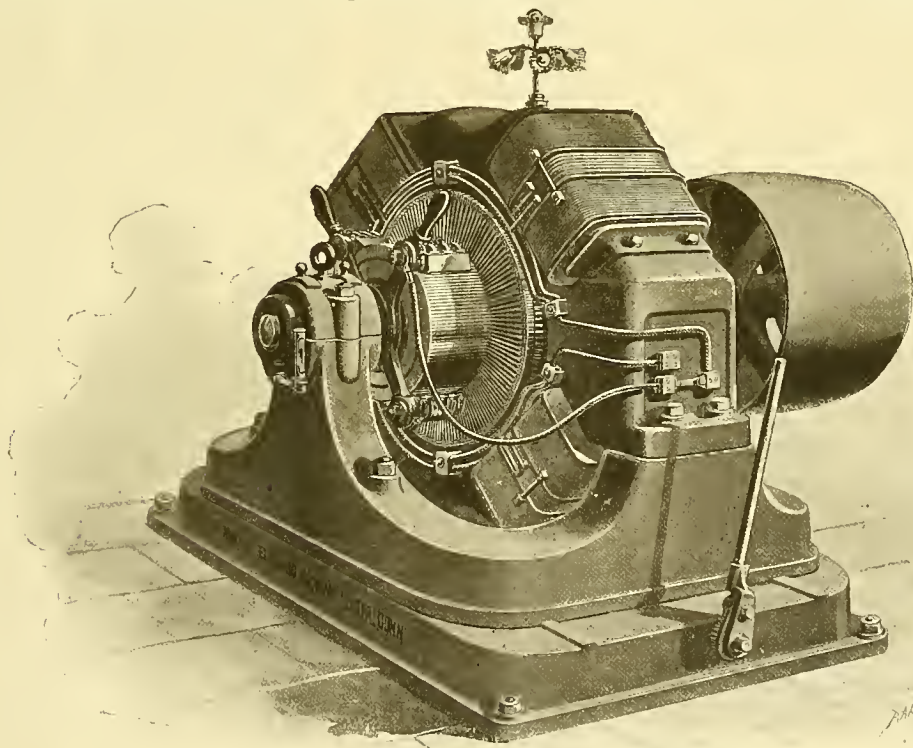
After a series of careful experiments, the company has placed on the market an improved automatic circuit breaker, for which the claims of simplicity and reliability are made. It consists of an electromagnet in series with a double break switch. When the current exceeds a certain predetermined limit, the electromagnet releases a



ARMATURE OF MATHER GENERATOR.

where cast iron is used. Another advantage in the use of cast steel in the fields lies in the fact that the motion of the armature is practically powerless to disturb the lead, and consequently the machine may be operated under full load within the limit of its capacity, and even under a load considerably exceeding its normal capacity, without shifting the brushes and without sparking at the commutator.

trigger or latch, and the switch is opened by a powerful spring. The circuit is not entirely broken at the moment when the contact terminals attached to the lever arm leave the jaws of the switch, two carbon pencils carried by the lever arm still making contact with carbon plates connected to the jaws of the switch. The final break occurs between the carbon pencils and plates, and the metal jaws of the switch are thus protected. Adjustments for



MATHER RAILWAY GENERATOR.

comparatively small number of coils of wire in a powerful magnetic field, rather than by using a large number of coils and weak field, as is the usual practice. The small amount of wire on these armatures results, in great measure, in the absence of sparking at the brushes.

The field consists of four steel castings which are rigidly bolted together, and which, in turn, are bolted to the cast-iron frame or bed plate. The exciting coils are compound wound on metal hobbins, which can be readily slipped on or off by

The commutator is of exceedingly massive and substantial construction. Drop forged, pure lake copper bars and the best mica are used throughout. By a peculiar construction of the commutators, it is an absolute impossibility for any bar to work loose while the commutator is on the shaft.

The Mather company is also prepared to furnish complete station equipments, including marble or slate switchboards and the latest improved station appliances of its own manufacture, such as

different currents are secured very readily with little trouble. These automatic circuit breakers are equally well adapted for use on lighting as well as railway generators, and the company earnestly recommends their use as a reliable safeguard against overloading of machines.

The company is prepared to furnish lightning arresters of improved form, which, in actual practice for a long time, have proved themselves absolutely reliable.

The company's plant, covering a number of acres

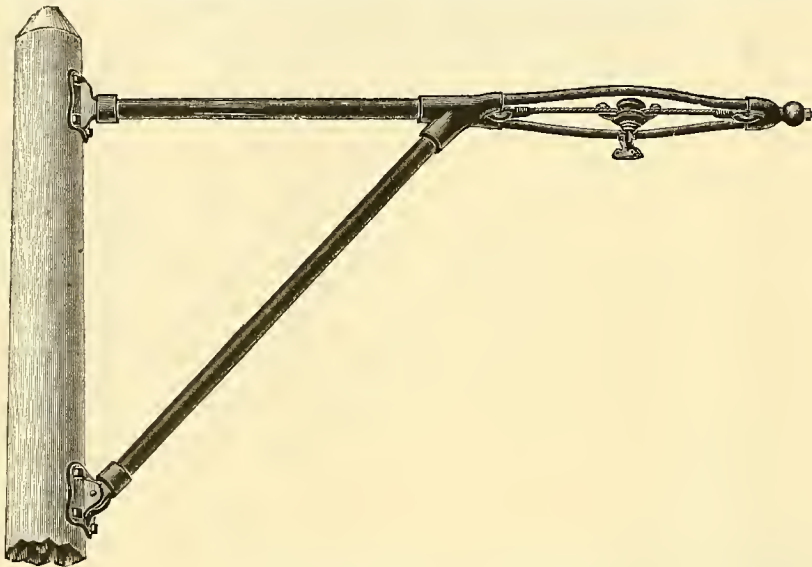


of ground, is situated in Manchester, Conn., on the main line of the New York & New England Railroad, allowing the best of shipping facilities. The company has recently completed an extension to its plant in the form of an iron building 300 x 50 ft., for an erecting shop, constructed by the Berlin Iron Bridge Company, and fitted with an electric traveling crane and extra heavy machinery, especially adapted for expeditious handling of large generators up to 500 k. w. in capacity. The entire plant is operated by electric motors, thus giving an exceedingly satisfactory and practical demonstration of the advantages of this system of power distribution.

#### THE WOODS POLE BRACKET.

The Woods combination pole bracket as herewith illustrated was designed to overcome the bad effects of rigid construction, thereby reducing the liability of breakage to the minimum degree, as the hammering effect of the trolley wheel on the support is entirely overcome.

By reference to the cut it will be noticed that instead of the ordinary bracket hanger a straight line hanger is used for supporting the trolley wire.



WOOD'S COMBINATION POLE BRACKET.

The piece of span wire in the bracket forming the flexible support for the hanger is about three feet long and is readily adjusted by means of the eye bolt at the end of the bracket. The bracket is, of course, suitable for either single or double track work. It is being placed on the market by the Wallace Electric Company, Chicago.

#### COMMENTS AND VIEWS OF CONTEMPORARIES.

**THE FENDER QUESTION.**—Seriously the fender question is taking up a great deal of our time, to the exclusion of other matters that require attention. The question of expense does not present any difficulty; the problem is to get a fender that will do the work without taking up so much space in front of a car as to trip up pedestrians and interfere with passing vehicles. I have a dozen letters, besides blueprints and models, still to be investigated, and it may be that out of the lot the practicable fender may be selected. From the amount of inventive talent that is being concentrated upon the fender question I am convinced that the American people will not have to wait long for the solution of any problem that may arise.—Interview with President Sullivan, of the Electric Traction Company, in the *Philadelphia Enquirer*.

**SUNDAY CAR QUESTION.**—Toronto, Canada, is at present deeply agitated over the question whether street cars shall run in that city on Sunday. It appears that their running on that day is forbidden until a popular vote assents to it, but the companies are running them. Last Sunday the Mayor hired a carriage to go down town to stop this violation of the law, while the authorities never interfere with the running of omnibuses on Sunday, people who can draw such fine lines of distinction as this "could distinguish and divide a hair 'twixt south and southwest side."—*Philadelphia Enquirer*.

**FIGURES COUNT.**—The street car company profits by the renumbering of the houses. People who could easily walk to No. 400 find themselves unable to reach No. 800 without taking the car. Such is the effect of the mind over matter.—*Elgin (Ill.) Dial*.

**IS IT KEELY OR PENNOCK?**—"It isn't a tax on street electric railways that is going to ruin the electric street railway business. A speedier death than that by taxation awaits the whole system of electrical appliance as operated at present," writes Eugene Field, who assumes the role of a prophet for this occasion. "We have information which leads us to believe that within 12 months a new machine capable of use for providing transportation, light and heat will be put before the public; that this machine will controvert the 'principles of electricity' which now obtain; will revolutionize all railway and other transportation systems; will do away with fuel, gas and smoke; will, in short, give humanity undreamed of advantages at a very moderate price. Yes, within the next 12 months we are going to see some very wonderful happenings."—*New York Sun*.

**PROTECT THE MOTORMAN.**—The Supreme Court of Ohio has advanced on the docket the case carried up from the Common Pleas Court of Clark County, which will determine the constitutionality of the law requiring the equipment of electric motor cars with proper vestibules for the safety and comfort of the men who stand on the front platforms in the worst weather of winter. In the

trial court the law was declared unconstitutional, and the street railway companies, which are sometimes managed by narrow and short-sighted men, probably hope that the Supreme Court will confirm the decision rendered by the Court of Common Pleas. Shrewd and prudent street railway managers will be on the other side, and, if the law must fail, they will go right on living up to its requirements. Men of foresight and sound sense do not want a statute which is humane and beneficent killed by the courts. They realize that nothing is worse than popular distrust, if there is any reason behind the feeling, for the machinery of justice. They like to see the welfare of the laboring classes guarded to the utmost limit of the authority of the State. There is no sound reason why the vestibule law should be disliked by the street railway companies.—*Philadelphia Item*.

**THE DIVIDEND PAYERS.**—These corporations have become great purveyors to the public in this regard. The while new branches have been built, and new connections made, along with the systematizing of facilities by absorptions and consolidations, the people have been educated to a frequent use of the cars, and especially in respect of trips for pleasure alone. It is to the stimulus thus imparted to traffic during the summer months that the corporations look for those financial returns which admit of a balance on the right side of the ledger when the figures for the year are all in. Without this revenue, and restricted only to the earnings consequent upon the patronage of people who ride in the course of ordinary travel, the overwhelming majority, if not all, of the railway companies would at present tolls become bankrupt just as surely as night succeeds the day.—*Salem (Mass.) News*.

**OPEN CARS PREFERRED.**—There is big money waiting for the railway company that will equip its lines with plenty of open cars for summer travel. Thousands of people in hot weather, who do not care in what direction they travel, will ride on open cars merely for the pleasure of a cool ride in the people's carriage.—*Exchange*.

#### FINANCIAL DEPARTMENT.

##### Eastern Stock and Bond Market.

(From Our Special Wall Street Correspondent.)

**THE GENERAL OUTLOOK.**—Had it not been for the rude shock to returning confidence given by the labor troubles in the West and the consequent frightening off of all kinds of securities, the month's market for street railway shares and stocks was apparently destined to eclipse all previous months' records in the volume of transactions. The events of the first six months in street railway financial circles, the big returns that were being reported on many securities, the success that had attended speculative movements in many surface passenger railway shares, all had combined to make the bond and share issues of street railway companies more popular than ever among both the investing and speculative public. This popular craze had manifested itself in the tremendous activity of traction stocks on the Philadelphia Stock Exchange, and in the favor which newly listed traction bonds and stocks were regarded on the New York exchanges. It was not hard to understand why the public should take so eagerly to a class of securities whose operations, by reason of the recent introduction of cables and trolleys and other new methods of propulsion, were largely experimental. The value of steam railways had been determined by years of experience, and in most instances they were found wanting. The returns on gilt-edged securities were hardly high enough to warrant the investment of money. In fact all circumstances in the financial situation seemed to help along the demand for traction stocks; and the first of July with disbursements for interest and dividend payments, amounting, in the cities of Boston, New York, Philadelphia, Baltimore and Chicago, to something over \$125,000,000, found the future of the street railway securities' market full of promises of activity and higher quotations.

**THEN CAME THE BUSINESS DEPRESSION** consequent upon the Debs, Howard & Company's play at government. That little game soon ended with disaster to its originators, but it has absolutely killed all financial business. The local street railway stock market is stagnant. Days pass without a trade being reported. A broker who is an authority in the trade says that, where he ordinarily does a business of a few thousand shares a week, he has not had customers' orders for 500 shares for the whole month. Most stocks are not quoted for days at a time, and such trades as are made are sales for liquidation, and consequently at lower prices. For instance Third Avenue, which has been conspicuously active of recent months, has declined half a dozen points, and that in the face of earnings that are steadily increasing and are now understood to be at the rate of 20 per cent. per annum on the increased capital stock.

**THIRD AVENUE.**—What sort of a business the Third Avenue Cable Company is doing, and how it is cutting into the Metropolitan Elevated road's business, are shown by the fact that since June 15 seventeen trains on the City Hall and South Ferry branches of the Third Avenue line have been discontinued. Not since the summer of 1880 has such a reduction in train service been made, the competition of the Third Avenue having decreased the traffic of the east side elevated roads to this extent.

**LOCAL STOCKS** are not doing anything. Second Avenue, Dry Dock, Ninth Avenue, Long Island Traction, Brooklyn City Railroad and other stocks usually prominent in the financial world are not quoted for days at a time. Even the publications of earnings for the June quarter, now being made, do not stimulate activity, though they influence to some extent the bid and asked prices of stocks. Thus Eighth Avenue stock is quoted a couple of points higher because of an increase of earning capacity. In the same way Forty-second Street, Manhattanville & St. Nicholas Avenue railroad stock is held by holders a good many points higher, because in the June, 1894, quarter it earned a surplus of \$12,581 over all charges, whereas, during the same period of 1893, it fell some \$18,800 short of earning fixed charges. Even yet there is a profit and loss deficiency of \$56,821, but the road is now making, and at the present rate the deficit will be wiped out within a twelvemonth. At least official remarks hold out a prospect of such a gratifying end.

With the present midsummer dullness pervading the market, it is hard to prophesy what the future of the street railway stock and bond market holds forth. These securities have acquired popular favor, and should there be any revival of activity near at hand, it seems but natural to expect that they will share in the rejuvenation of business to the great improvement of quotations.

#### Financial Notes.

**New York, N. Y.**—For the quarter ended June 30 last, the Eighth Avenue Railroad Company of this city reports to the State Railroad Commission



as follows: Gross earnings from operation, \$146,138; net earnings, \$61,754; other income, \$415; gross income, \$62,169; fixed charges, \$24,095; net income, \$58,074; cash on hand, \$27,324; profit and loss (surplus) \$16,984. The net income for the same quarter last year was \$46,710.

**Oakland, Cal.**—The sheriff has sold sufficient of the personal property of the Piedmont Cable Company to satisfy the claim of Daniel Dwyer on account of notes given in satisfaction of a claim of \$3,000 for personal injuries. Cable cars sold from \$190 to \$275, and horse cars from \$113 to \$117.

**Cortland, N. Y.**—The Cortland & Homer Traction Company, organized to operate an electric street railway from Cortland to Homer, has given a mortgage to the Farmers' Loan and Trust Company of New York for \$300,000, with which they propose to build and equip the line.

#### NEW INCORPORATIONS.

**Pittsburg, Pa.**—The Pitcairn, Wilmerding & Braddock Street Railway Company has been organized with a capital of \$21,000 to build a line 3½ miles long, beginning in Braddock township, through Versailles township to Second street in the plan of Oak Hill, to the township road, to Greensburg and Pittsburgh pike, to Kline avenue, Wilmerding; along Pine avenue and Mary street to Tristram avenue, Wilmerding; thence along Sprague street and Station street and Caldwell and Commerce streets to Pennsylvania Railroad, to Broadway in Pitcairn, to the foot of the hill at the intersection of Brinton street. W. J. K. Kline, of Greensburg, is president. The directors are W. J. Kline and Amos B. Kline, Greensburg; John S. Stewart, N. Versailles township; George W. Borrichlow, George C. Garber and H. L. Castle, Pittsburg.

**Yonkers, N. Y.**—The Yonkers Electric Railway Company has been incorporated to construct a street surface railroad in Yonkers, to be operated by any power other than steam; capital stock is \$1,000,000, divided into \$100 shares, and the directors are J. Irving Burns, W. Delevan Baldwin, Gelston Affleck, all of Yonkers; B. L. Rice, Charles J. Downing, both of New York City; George S. Forbush, of Brookline, Mass.; George W. Williams, of Bondon, Ore.; W. R. Hurd, of Hartford, Conn., and D. Noble Rowan, of Irvington. Each of the directors subscribes for five shares of the capital except Mr. Rice, who takes 930 shares.

**Athol, Mass.**—The Athol & Orange Street Railway Company has been incorporated at Athol and Orange, Mass., with a capital stock of \$60,000, to locate, construct, operate and maintain street railway to run from Athol to Orange. Length, 7 miles; gauge, 4 ft. 8½. The promoters are: N. Sumner Myrich, Boston, Mass.; E. R. McPherson, Cambridge, Mass.; W. B. Ferguson, Malden, Mass.

#### NEWS OF THE WEEK.

**Brockton, Mass.**—There were meetings in Boston last week of the stockholders of the five projected street railways between Brockton and Stoughton, Bridgewater, East Bridgewater, and between Bridgewater and East Bridgewater. The election of officers resulted in this way: George H. Campbell, president; Alfred A. Glasier, treasurer and clerk; Boston; Charles Tenney and George E. Walker of Stoughton, John P. Morse and Horace B. Rogers of Brockton, Allston Burr, Alfred A. Glasier and George H. Campbell of Boston, directors, Brockton and Stoughton Street Railway, George H. Campbell, president; Alfred A. Glasier, treasurer and clerk; Hosea Kingman and James C. Leach of Bridgewater; John P. Morse, Horace B. Rogers, Allston Burr, Alfred A. Glasier and George H. Campbell, directors, Brockton and Bridgewater Street Railway, George H. Campbell, president; Alfred A. Glasier, treasurer and clerk; Robert O. Harris and Aaron Hobart of East Bridgewater, John P. Morse, Horace B. Rogers, Alfred A. Glasier, George H. Campbell, directors, Brockton and East Bridgewater Street Railway, George H. Campbell, president; Alfred A. Glasier, treasurer and clerk; James C. Leach, R. O. Harris, George H. Campbell, Horace B. Rogers, Alfred A. Glasier, Aaron Hobart, directors, Bridgewater and East Bridgewater Street Railway.

**Chicago, Ill.**—Work is to begin on the Van Buren street line of the West Chicago Street Railway Company immediately. About three miles of the line will be entirely rebuilt, converting the section from Halsted street to Kedzie avenue into an electric line. Cars will be so constructed that they may be attached to the cable line at Halsted street. A scheme has been devised for disconnecting the electric machinery in the motor car while the train is being drawn by the cable. Bids for the construction of the West Side power station have already been opened. The contracts call for three 2,000-H. P. and one 1,000-H. P. generator. The sta-

tion will be located on the property of the company at Washington boulevard and Western avenue. Bids for the electrical machinery call for the completion of the first dynamo within four months of the awarding of the contract, and an additional machine every three days thereafter until the completion of the contract. The station when complete will have a total capacity of 11,000-H. P., and will be capable of moving 500 cars over 60 miles of track. Contracts for the construction of the North Side power house and machinery were let last week. This station will be located on the river at California avenue and Rosecoe boulevard, and will contain machinery of 6,000 H. P. to operate cars over 100 miles of track.

**Lancaster, Pa.**—The contract for the construction of the proposed electric lines to Lititz and Manheim, and branches, was practically awarded last week to a corporation which is largely composed of the members of the Hubley Manufacturing Company. This company is composed of John E. Hubley, Frank H. Steacy, Henry Baumgardner, D. B. Sheek, George N. Reynolds, N. M. Woods and Dr. M. L. Herr, and in the new corporation, formed solely for the purpose of building the new electric lines, there are associated H. E. Crilley, of Allentown, a former member of the State Legislature, and Contractor Mace, of Jersey City, both of whom are represented by Wm. B. Given, Esq., of Columbia.

**Scranton, Pa.**—The contract for the continuation of the line of the Scranton & Pittston Traction Company, from Taylor to Pittston, has been awarded, and the material necessary for beginning operations has been ordered. About six miles of the road will be built, commencing at the Taylor end of the line and connecting with the Wilkes Barre Traction Company at Pittston. This will complete a continuous line of street railway from Forest City to Nanticoke, an aggregate distance of 45 miles. It is owned by the Scranton, Wilkes Barre and Carbondale traction companies. The new road will, however, be operated by the Scranton Traction Company, a lease to that effect having been already signed.

**Atlantic, N. J.**—The Atlantic Street Railway Company organized last week by electing L. C. Albertson president; I. G. Adams, treasurer, and Joseph Thompson, secretary and solicitor. The directors are L. C. Albertson, I. G. Adams, Joseph Thompson, John J. Gardner, Frank C. Somers, C. L. Cole and C. J. Adams. Before another year the company hopes to operate a line of cars from the foot of South Carolina avenue to the Inlet, where extensive improvements will be made along the Gardner Canal.

**Chicago, Ill.**—Fire destroyed almost completely the works of the Siemens-Halske Electric Company this week. The total loss was reported by the press dispatches as \$800,000, well covered by insurance. The patterns and drawings were saved and the company will rebuild at once and be again ready to make deliveries on its contract in 90 days. The works of the Wells-French Co., which had just added a street car department, were also partially destroyed in the same fire.

**Brooklyn, N. Y.**—The State Railroad Commissioners have handed down a decision granting the application of the Coney Island and Brooklyn Railroad Company to operate its cars by the trolley in Ocean, Franklin and Fort Hamilton avenues, alongside of Prospect Park, from Flatbush avenue to Gravesand avenue. The cars are now run by horses from the Willink entrance of Prospect Park to Greenwood Cemetery, and the route crosses two entrances to Prospect Park.

**Brooklyn, N. Y.**—Judge Bartlett, of the Supreme Court, Brooklyn, has rendered a decision denying the application of the Prospect Park and Coney Island Railroad Company to punish President Benjamin Norton, of the Atlantic Avenue Railroad Company, for violating an order of the court compelling him to charge not less than 15 cents for a continuous trip to Coney Island. Judge Bartlett said he was not satisfied that there had been any willful violation of the order.

**Conway, Mass.**—The meeting of the subscribers and incorporators of the Conway Electric Street Railway was held last week and the following directors were chosen: Carlos Batchelder, Emery Brown, A. P. Delabarre, J. B. Packard, Charles Parsons, Franklin Pease, H. D. Pease. The directors elected Carlos Batchelder president, J. B. Laidley as clerk, William G. Avery as treasurer and Arthur M. Cook auditor.

**Racine, Wis.**—The Detroit Electrical Works has begun suit against J. I. Case and the Racine Street Railway Company for \$20,000 damages. It is alleged that the Racine company got low figures from the Detroit company for equipping the Racine line on condition that the Detroit company was also to get the contract for the Green Bay line, which it did not get. Hence the suit for damages.

**Hammond, Ind.**—Messrs. Talford Burnham and Rand, McNally & Co. are the projectors of a new street car line between Hammond and Chicago.

Work will commence early this month. The proposed route is from the Illinois-Indiana line through West Hammond and Burnham, thence connecting with the Calumet electric line at 104th street.

**Newark, N. J.**—The Board of Works unanimously passed an ordinance last week compelling the Consolidated Traction Company to attach a fender to each trolley car by Nov. 1 next under a penalty of \$50 fine for each violation. A second offense will deprive the company of the car license.

**Peoria, Ill.**—Fire last week totally destroyed the West Bluff car barns of the Central Railway Company, together with 29 horse cars and machinery. A number of small buildings close by were destroyed. The total loss was \$10,000, with insurance of \$2,500 on the barns.

**Newark, N. J.**—The Bloomfield car stables of the Consolidated Traction Company, in Bloomfield avenue, Newark, were destroyed by fire last week. The loss is estimated at from \$30,000 to \$40,000. Six horse cars were burned, 30 were saved, and 150 horses were rescued.

**Philadelphia, Pa.**—The Philadelphia, Cheltenham & Willow Grove Electric Railway Company has awarded the contract to build the line from Rising Sun to Jenkintown over the York turnpike, to William Wharton, Jr.

**Milwaukee, Wis.**—The *Evening Wisconsin* says: "The council will pass the ordinance compelling street car companies to cease using cardboard tickets. This is to be done as a sanitary measure."

#### PERSONALS.

**Capt. Allen Tindolph**, of Vincennes, Ind., died last week of inflammatory rheumatism and dropsy. He was ex-postmaster of Vincennes, and at the time of his death was president of the Second National Bank and president of the Vincennes Electric Street Railway Company, of both of which he was the founder. He leaves a large estate.

**Thomas C. Perkins**, vice-president of the Mather Electric Company of Manchester, Conn., is in the city on business, and is stopping at the Imperial Hotel. Mr. Perkins reports business good with his company, and thinks the outlook favorable for its continuance.

**J. J. Coleman**, general manager of the Allentown, Pa., and Lehigh Valley Traction company, has been transferred to the charge of the lines owned by the Messrs. Johnson, in Brooklyn and neighboring towns.

**W. R. Garton**, of the Garton-Daniels Electric Company, of Keokuk, Ia., has accepted the management of the railway department of the Central Electric Company of Chicago.

**Ex-Superintendent Quigg**, of the Western Division of the New York and New England Railroad, has been appointed superintendent of the Newark (N. J.) Traction Company.

**Gen. T. W. Hyde**, of the Bath (Maine) Iron Works, will probably be the president of the Boston Elevated Railroad Company, better known as the Meigs elevated system.

**Thomas M. Sayre**, superintendent of the Consolidated Traction Company in Jersey City, died this week at his home at 45 Glenwood avenue.

**Mason M. Frick**, of Pottsville, Pa., has been appointed chief engineer of the Lansford & Tamaqua Electric Railway now in the course of erection.

**George G. Crocker** has been chosen as one of the Boston subway commissioners. The second commissioner chosen is Mr. Burrage.

**Col. S. L. James**, who took a leading part in the establishment of the street railway lines of New Orleans, died at his home.

#### TRADE NOTES.

The Standard Railway Supply Company, Chicago, well known throughout the United States and Canada as the introducers of the popular street car heater, the "Standard stove," is about to place on the market a new heater known as the Myers self-feed car stove. This heater is so constructed that it may be placed on the car seat without cutting the seat, or it may be placed upon the floor of the car. It is made entirely of cast iron and will hold sufficient coal to operate it from 15 to 20 hours, delivering the same for combustion in the proper quantity that will insure no waste of fuel. The company claims that this heater will heat 25-foot cars satisfactorily at an average cost of 10 cents for 18 hours.

The Crescent Electric Company, Chicago, expert armature winder and repairer of electrical machinery, reports a satisfactory and steadily increasing business in its line of work. With its special facilities, reliability and promptness, the company has been able to build up a good business with electric street railways.

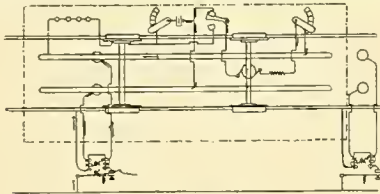


# RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued July 17, 1894.

**523,364. Cableway;** Thomas S. Miller, South Orange, N. J. Filed April 17, 1891. In a cableway in combination with the cable which constitutes the track, two supports whereby the cable is supported when not stretched and a saddle located between said supports below the upwardly curved surface of the unstretched cable as it rests upon the said two supports and in position to be touched by the cable when stretched by the straightening of the cable.

**523,378. Transom for Cars;** Theodore C. Salveter, St. Charles, Mo. Filed Feb. 9, 1894. A transom for cars consisting of a single continuous top plate having a side piece depending from each edge and forming a channel iron, open at its bottom, except at the part adjoining



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the center-plate, such side pieces tapering from the center to the ends thereof, a center plate and side bearings formed on such transom and connecting said side pieces together.

**523,396. Electric Railway System;** Albert C. Crehore, Ithaca, N. Y. Filed July 20, 1893. The combination, in an electric railway system, of a sectional working conductor, electro-magnetic switches for connecting the same to the power line, an auxiliary conductor over which said switch magnets are initially engaged, as the car progresses by current taken from the power circuit, a power circuit through the motor, a storage battery on the car charged in a branch from the power circuit, and connected to the auxiliary conductor, and switch devices for disconnecting said power circuit from the circuit of the auxiliary conductor and connecting it to the return direct, and leaving the storage battery connected to the auxiliary circuit. (See illustration.)

**523,403. Car Coupling;** Jesse T. Lampp, Apopka, Fla., Assignor of one-half to David B. Stewart and Samuel W. Stewart, same place. Filed Nov. 18, 1893. The combination with a drawhead, of a spring buffer slidingly mounted thereon, a spring pressed block receiving motion from said buffer, a link supporter, and means carried by said block operatively connected with said supporter whereby the height of the link may be varied.

**523,427. Car-Fender;** Charles R. Hall, Philadelphia, Pa., Assignor of one-third to Charles E. Jones, same place. Filed May 21, 1894. A fender for railway cars, capable of vertical movements to elevate or depress the same to or from the railway surface, in combination with the helical springs; moving on the side rods; the stop plate, bell crank lever, having elbow and the push rod, provided with the foot. (See illustration.)

**523,435. Railroad Car;** Hosea W. Libbey, Boston, Mass., Assignor of one-half to George H. Kimball and William P. Johnson, Cleveland, O. Filed Jan. 12, 1891. In a railroad car having walls extending from end to end of the same, openings through said walls and steps leading to a ball or entry, traveling curtains for closing said openings, said curtain being constructed with its outer end of solid material for about one-third its length and the remainder of the other two-thirds of slats jointed together and to the solid portion.

**523,436. Car Brake System;** Nathaniel Lombard, Boston, Mass. Filed Dec. 11, 1893. An apparatus for operating brakes consisting of a permanently closed system, or a system which has no communication with the atmosphere, and which is adapted to contain an operating liquid, said system comprising two chambers into one of which the liquid is to be forced under pressure and the other of which is to serve normally as a vacuum chamber, a liquid forcing pump or device, a brake cylinder, connections between said liquid containing or pressure chamber, and said vacuum chamber and said pump and brake cylinder, and a valve which may be turned to connect said liquid containing or pressure chamber with said brake cylinder, or to connect the latter with said vacuum chamber, and which valve also serves as a means for opening a communication be-



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tween said pump and said liquid containing or pressure chamber and said vacuum chamber.

**523,444. Chain Shackles or Couplings;** Robert J. Rice, London, England. Filed Dec. 27, 1893. In a chain shackle or coupling two main parts each provided with a pin and socket adapted to be fitted together with a pin of one part in the socket of the other part and a key having projections engaging in recesses in the said parts and forming a stud for the shackle or coupling.

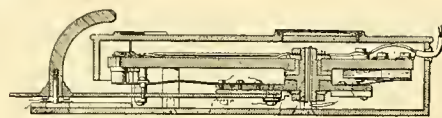
**523,444. Controlling Mechanism for Electric Motors;** Charles H. Richardson, Philadelphia, Pa., Assignor to the S. B. White Dental Manufacturing Company, same place. Filed April 25, 1891. The combination, in controlling mechanism for electric motors, of the carrier composed of the box or casing having the end or front opening, the resistance, the contacts

thereof, reversing contacts, armature short-circuiting contacts, and contact separator all contained within the carrier, and the switch actuating lever mounted within the carrier and provided with the arm projecting therefrom by the end opening and adapted to be actuated by the foot. (See illustration.)

**523,446. Fare Register and Recorder;** Charles S. Sergeant, Winchester, and Louis J. Hirt, Boston, Mass. Filed Nov. 20, 1893. The combination of the movable trip register and actuator therefor with the counting mechanism operated by said actuator and the movable support for the said counting mechanism, said actuator and support being constructed and arranged as described, whereby each when in abnormal position locks the other from movement.

**523,453. Mode of Mounting Dynamos on Car Trucks;** William Biddle, Assignor to the American Railway Electric Light Company, New York, N. Y. Filed October 6th, 1893. The combination with the car axle and a dynamo, of the equalizing bars, a transverse platform connected to and supported by said equalizing bars and carrying the dynamo, a union upon the shaft of the dynamo, and an engaging wheel upon the car axle for operating the dynamo from the rotation of the car axle, and longitudinally inflexible connections from the car axle to one pole piece of the dynamo, whereby a constant relation is maintained between the car axle and dynamo. (See illustration.)

**523,471. Electric Snow Plow;** Louis J. Hirt, Somerville, Mass. Filed Nov. 20, 1893. In an electrically propelled snow plow, the combination of the following instrumentalities, viz.: a metallic truck frame comprising side and end bars mounted on axles having wheels and auxiliary side bars secured to the sides of the truck, a flooring secured to the truck frame and

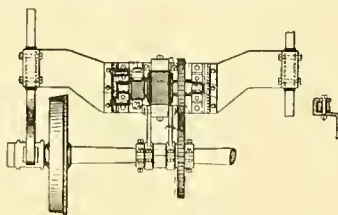


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having side extensions secured to the top of the auxiliary side bars, and a cab or house supported on the flooring to leave front and rear platforms and side platforms.

**523,496. Rail Straightening Machine;** Henry Wick, Jr., Youngstown, O. Filed Feb. 16, 1894. In a machine for straightening bars, rails, etc., the combination of a rotating frame, a series of dies having openings therein conforming approximately to the cross-sectional shape of the article to be straightened, a corresponding series of journal boxes for the dies, so mounted in the frame that alternate dies will have their axes on one side of the axis of motion of the frame and the axes of the intermediate dies on the opposite side of said axis, and means for preventing axial rotation of the dies.

**523,497. Machine for Straightening Bars, Rails, etc.;** Henry Wick, Jr., Youngstown, Ohio. Filed May 9th, 1894. In a machine for straightening bars, rails, etc., the combination of two parallel or approximately parallel shafts, three or more pairs of eccentrics arranged on said shafts, alternate pairs being set one hundred and eighty degrees or approximately so to the intermediate pairs, three or more frames provided at their ends with straps or boxes for the recep-



No. 523,453.

tion of the eccentrics, and having openings therethrough corresponding to the cross-sectional contour of the article to be straightened. (See illustration.)

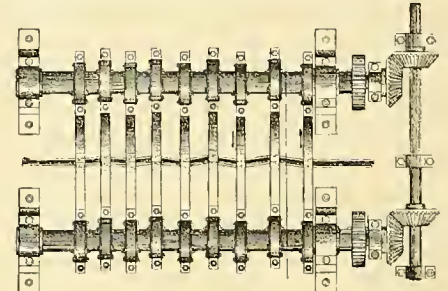
**523,507. Street Car Guard;** Charles A. Barrett, Malden, Mass. Filed April 27, 1894. In a street car the combination of a guard hinged to an attachment on the car, a latch adapted to positively and automatically engage the guard when the latter is raised, a lever connected with the platform, and connections between said lever and the guard and latch, whereby when the lever is moved in one direction the guard is positively raised by said lever, and when the lever is moved in the opposite direction the latch is tripped to release the guard.

**523,526. Car Fender;** Franklin S. Hogg, New York, N. Y., Assignor to himself and Burton P. Higgins, same place. Filed Jan. 19, 1894. The combination, with a support adapted to be attached to the truck of a car, of a fender of substantially angular construction, the vertical member whereof is pivotally connected with said support, and tension devices consisting of spring-controlled rods provided with bearings in which they freely slide and pivotally connected with the fender near its pivot point, nuts on the rods in front and rear of said bearings, and springs on the rods between the rear nuts and the rear sides of the bearings, whereby by adjusting the front nuts the fender may be set at any desired height from the roadbed, and by adjusting the rear nuts the tension of the springs may be regulated.

**523,542. Machine for Placing Truck Torpedoes;** Samuel Myers, Crestline, O. Filed March 26, 1891. In a machine for placing torpedoes upon a track rail, and guiding and supporting rods which extend along the side walls, from end to end thereof; combined with a discharging frame which embraces a transverse portion which engages and has movement along the guiding and supporting rods, a central longitudinal spring arm, for frictionally engaging the body of the torpedo, side arms for thrusting the torpedo along

and beyond the guiding and supporting rods, and an operating handle for moving the discharging frame along the base.

**523,551. Car Fender;** Eldridge J. Smith, Washington, D. C., Assignor to the Automatic Car Fender Company, same place. Filed April 27th, 1894. The combination of a vertically swinging pin k-up fender, composed of a plurality of independently movable fingers extending forward from a suitable support, a lever for simultaneously raising all the fender fingers, a pivoted trip lever for engaging the finger raising lever, a lengthwise



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movable rod having means to move the trip lever out of engagement with the finger-raising lever, and pendant swinging finger guards for moving the said rod lengthwise.

**523,563. Car Replacer;** Robert E. Alexander, Forest City, Pa. Filed March 3, 1894. A car replacer comprising a pair of grooved replacers or guides adapted to be placed alongside the rails, and having laterally and longitudinally sloping outer surfaces converging to a smooth apex, the apical portion of one of the replacers or guides being made lower than the apical portion of the other, whereby the wheels are successively deposited upon the track in the manner and for the purpose.

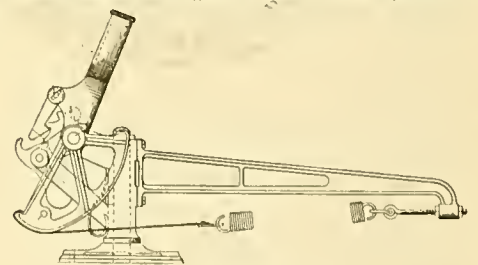
**523,564. Car Coupling;** Lawrence T. Backus, Atchison, Kan. Filed March 10, 1894. In a car coupling, the combination with the pivoted hook having an arm provided with a beveled end, the latter being also convex in a plane parallel with the pivot, of the swinging locking plate having a concave edge opposite the end of said arm, whereby an extended locking bearing is provided.

**523,586. Starting and Controlling Device for Electric Motors;** Joseph W. Moore, Boston, Mass. Filed April 25, 1894. In a starting and controlling device for electric motors, the combination of the armature circuit divided into two branches or lines, a switching device for closing and opening the circuit through which the current passes to the motor, a variable resistance in the armature circuit, a contact arm adapted to cut in and out said variable resistance, a helix or solenoid included in a shunt of the armature circuit and having its core connected with said contact arm to control the movement of the same, and a second helix or solenoid controlled by the first named helix, the latter being dependent on the influence of the counter-electromotive force of the armature and entirely independent of the strength of the current in the armature circuit.

**523,588. Apparatus for Heating Cars;** James F. McElroy, Lansing, Mich., Assignor to the Consolidated Car-Heating Company, Wheeling, W. Va. Filed November 12th, 1887. In a heating apparatus, the combination with a system of steam supply pipes, of a system of water circulating pipes, of a heating apparatus containing two nests of heating pipes or two water receptacles, a steam or transfer chamber and a combustion chamber.

**523,595. Truck Clearer;** Oscar Rothrock, New York, N. Y. Filed December 6th, 1893. In a vehicle, the movable shield, with suitable devices for securing it to the dashboard, rollers applied between the stationary and movable parts, means for raising the shield, and a foot-rest on the shield for forcing the shield down when necessary to clear the way. A car having the front shield bodily movable vertically, guides therefor, springs for yieldingly holding the shield raised, said shield having a foot piece extending above the platform of the car, whereby the shield can be forced down.

**523,625. Trolley-Catcher;** Edwin M. Drummond, Louisville, Ky. Assignor of one-half to Joseph O. Had-



No. 523,625.

dox, same place. Filed March 3, 1894. A trolley support comprising a pivotal pin carrying a ratchet firmly attached thereto, a trolley pole or socket pivotally supported upon said pivotal pin and moving independently thereof, a holding pawl carried by the pole and adapted to engage the ratchet, and a spring connected with the ratchet for holding it against the left or pull of the pole through the medium of the holding ratchet. (See illustration.)

**524,626. Car Coupling;** Horace L. Dunlap, Topeka, Kan. Filed Aug. 25, 1893. In a car coupling a coupling lock consisting of a perforated lug on the coupling rod supporting and secured to the coupling block passing through and beyond the draw head, a lock arm pivoted to the side of the draw head adapted to embrace the lug and a pin passing through the arm and the lug, and thus preventing the turning of the coupling rod and raising the coupling block.



# Street Railway Gazette.

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End of the Youngstown Strike. The Youngstown street railway strike is ended, at least so far as the company is concerned, which apparently won a complete victory. There was seemingly no excuse for the action of the men, who failed utterly to realize the folly of striking when scores of applicants were ready to fill each vacant position.

Stopping at the First Crossing. The People's Traction Company of Philadelphia has adopted the plan of stopping its cars at the near crossings of streets, and the practice is now followed by all the trolley cars in the city. The change seems to meet general approval, as it is asserted that since the new plan was adopted fewer accidents have been recorded.

Signs of Improvement. Those who consult the news columns of the STREET RAILWAY GAZETTE will find indications of renewed activity in the street railway field. The number of companies incorporated to engage in local transportation is increasing very materially, while many of the old companies are now preparing to make extensions and improvements which have been postponed heretofore on account of the business depression. The outlook is certainly more encouraging than it has been for months.

French Mechanically Driven Carriages. Mechanically driven carriages for common roads seem to have reached a state of high development in France. The result of an interesting test of vehicles of this class is presented elsewhere in this issue. The French inventors appear to see in these carriages promising means for urban transportation, but no such an idea could gain currency on this side of the Atlantic, where the public is thoroughly familiar with improved systems of local travel. Not only are vehicles of this kind utterly inadequate to give good service on any large scale, but they are manifestly clumsy and unsafe when operated in city streets. Paris cannot hope to find solution of the transit problem along any such line. For good surface transportation it must come to the overhead trolley or to the cable system, not such a cable line as it now possesses in the Belleville single track road with turnouts, but a well-constructed railway, such as may be found in New York, Chicago or San Francisco.

Attack on the Milwaukee Company. It is a singular fact that during the last year, when so many street railway companies have found their incomes greatly curtailed, municipalities have taken occasion to impose heavier burdens upon them. Milwaukee affords a striking illustration. The receipts of the local company have fallen to such an extent that it found it impossible to pay the interest on its bond issue. As they had a confident belief in the future of the property, the holders of these securities agreed to waive their claims for eighteen months. During the month of July the earnings fell off \$17,000, as compared with the corresponding period of last year. It would seem that such a statement would convince even the dullest of officials that the company was in no position to support new burdens; but a different idea has obtained in Milwaukee. In accordance with a new system of taxation the company is assessed for threefold the amount which it was called upon to pay last year. No attention has been paid to its indignant protests, and it has been forced into announcing that important

changes must be made in the system of charging for transportation. It is proposed to do away entirely with commutation tickets, and probably the transfer system will be abandoned. Such changes would seem to be matters of course if the company wished to protect itself. The company is now assailed by all sorts of remonstrances, and the city is petitioned to discipline the offending corporation. What the outcome is to be is not apparent, but it is difficult to see any force in the protests of the citizens when the company is merely adopting such protective measures as seem to be entirely justified under the circumstances.

Electrolysis from a Legal Standpoint. The matter of the electrolysis of buried pipes by currents escaping from electric railway circuits is discussed from a legal point of view somewhat at length in this issue by R. D. Fisher. This very practical phase of the subject must of necessity force itself on the attention of street railway managers, for gas and water companies are preparing to institute legal proceedings to recover for damages already caused to their pipes, and to prevent by injunctions additional injury to their buried property. If they succeed in securing perpetual restraining writs the assumption of Mr. Fisher is that we must come to the double trolley, a consummation that is certainly to be avoided if possible. Mr. Fisher discusses in a general way the liability of electric railways, and indicates the possible positions which courts may be inclined to assume, basing his conclusions on legal decisions handed down in telephone-electric railway litigation. Judging from the findings of courts in these warmly contested suits we may consider it settled that they are agreed that no single interest is entitled to an absolute monopoly in a street; hence damages cannot be inflicted with impunity by one company on another when both are occupying the same street. At the same time it would seem that courts hold to the view that street railways have a paramount right to the streets, inasmuch as they materially and directly facilitate public travel, which is the primary purpose for which streets are laid out. The fact that electric lines are novel means of transit, involving radically new appliances for their operation, is of no significance in the premises. If the railways possess superior rights it is not unreasonable to assume that when the courts are appealed to for a remedy by the gas and water companies they may be inclined to let the latter shift for themselves, should they find that these companies can by any means protect themselves against the escaping currents of the trolley circuits. On the other hand, if they conclude that they are entirely helpless, and will continue to sustain heavy losses unless changes are introduced by the railway companies the legal tribunals may force the adoption of the double trolley. This is as far as Mr. Fisher's speculations extend, and they cannot well go further, for it is only less difficult to predicate what courts will decide than to predict with any certainty the verdict of the average petit jury. The outlook is certainly as favorable as could be expected, for as Mr. Fisher says in conclusion "it may be that the courts will decide that . . . each and every company using the streets must exercise care and ingenuity to protect itself from the effects of intrusion by a neighboring system for lawful ends and by legitimate means, only insisting that each must use the best and most improved appliances practicably available for producing the best results and the least disturbance."



**WRONGLY PUNCHED TRANSFERS.**

The question of the liability of a street railway company for its failure to honor a transfer ticket wrongly punched by a conductor, so that the time limit had expired before it was presented, was decided by the General Term in the case of William H. Muckle against the Rochester (N. Y.) Railway Company. While riding on an Exchange street car in Rochester in the spring of 1892, Mr. Muckle procured a transfer to be used on the West avenue line. He left the Exchange street car, according to his own story, and boarded the West avenue car at about 6:40 o'clock. When he presented his transfer to the conductor of the West avenue car the latter refused to receive it in payment for the ride, on the ground that the time limit had expired. The transfer ticket had been punched to expire about an hour before it was presented to the conductor on the West avenue line. Mr. Muckle explained that he had just left the Exchange street car and said that the conductor on that car must have made a mistake. This explanation was not satisfactory to the conductor, whose instructions were not to accept in payment of fares transfers, the time limit of which had expired. Mr. Muckle was requested to pay his fare and he refused. Then he was requested to remove himself from the car and this he also refused to do. The conductor then ejected him.

Mr. Muckle brought suit against the railway company and when the case came up for trial before the special county judge a motion for a non-suit by the company was granted.

At a new trial the jury gave the plaintiff a verdict for \$50. The railroad company appealed on the ground that the trial judge in his charge to the jury refused to instruct that compensatory damages only could be awarded the plaintiff.

The General Term holds that it was an error on the part of the trial court not to have instructed the jury that punitive damages could not be awarded, and because of this error the General Term has granted a new trial.

The opinion of the General Term was written by Justice George B. Bradley, who says in part:

"A passenger is by statute given the right to a continuous passage to his place of destination on the payment of a single fare, and it cannot be said that it was by any fault or neglect on his part that the right was denied to the plaintiff. It is a general rule that a carrier of passengers is answerable for all the consequences to a passenger of willful conduct or negligence of the persons employed by it in the exercise of the duty it has assumed toward him. The defendant had by its contract with the plaintiff undertaken for a consideration paid to carry him to his place of destination, and pursuant to it he had the right of passage, and as between him and the defendant he was at liberty to refuse to pay his fare and to insist upon his continuous passage.

"In violation of that right the defendant, by its conductor, proceeded to forcibly eject him from the car in which he was rightfully seated as a passenger. Although the conductor presumably may have been justified by his instructions to do so, the defendant was put in the wrong by the act of the other conductor, and was no more justified in the attempted act of ejection than it would have been if the plaintiff at the time had and had presented the evidence of his right to remain as a passenger in the car without further payment. It follows, if these views are correct, that the defendant is liable to the plaintiff for the consequences of such violence upon his person as was used by the conductor for the purpose of ejecting him from the car."

It is predicted that the case will be settled now that the law has been laid down by the General Term.

**FAILURE OF QUEEN & CO.**

Queen & Co., manufacturers of scientific instruments, Philadelphia, made an assignment last Monday for the benefit of creditors to John Gordon Gray. No statement of the assets and liabilities has yet been filed. A meeting of creditors will be held next Monday to determine upon the best means of disposing of the assets. The failure is attributed to the continued depression in business, and to inability to make collections. The firm was established in 1853 by J. W. Queen,

who, after amassing a large fortune, sold out the business, a number of years ago, to Samuel L. Fox, who had afterward several partners associated with him. In 1893 the company was incorporated. The officers are: President, Samuel L. Fox; vice-president, E. B. Fox; secretary and treasurer, F. W. Stanwood. The directors, in addition to the above, are J. Gordon Gray, William Biddle, Jr., and J. S. Biddle.

**POWER PLANT OF THE CHICAGO GENERAL RAILWAY COMPANY.**

In May last the Chicago General Street Railway Company issued a circular letter, inviting drawings and specifications of a model plant for the use of forty cars, giving dimensions of the prospective site on which the buildings would be placed, and offered a first prize of one hundred dollars; second prize, seventy-five dollars; third prize, fifty dollars; and fourth prize, twenty-five dollars. The selection was recently made by which the first prize was awarded to J. R. Cravath; the second prize to Caywood & Ritter, contracting engineers, Chicago; the third prize to A. S. Krotz, an engineer, of Springfield, O.; and the fourth prize to E. W. Goss, superintendent of the Amesbury Electric Light, Heat & Power Company, Amesbury, Mass.

None of the plans selected will be used in full, but ideas will be adopted from each. The site selected for the new power plant is a four acre lot, corner of Kedzie avenue and Thirty-first street. It is expected that a car shed, 125 x 300; engine room, 100 x 100; and boiler room, 100 x 60, will be constructed this fall, the other buildings to follow as rapidly as the work will permit. The operation of the present lines will be under the management of the president, Congressman McGann, and the superintendent, Mr. W. F. Brennan, while C. L. Bonney, vice-president, will have charge of constructing the new lines and power plant.

This company will on Monday morning, Aug. 20, receive separate bids for the following supplies: Two 450-H. P. Corliss type engines, two 300 k. w. generators, three 200-H. P. boilers. The apparatus is to be set on proper foundations by the manufacturer. One engine, one generator and two boilers are desired for immediate delivery, the other unit to be delivered by May 1, 1895. The proposals will be considered with reference to—first, quality and quantity of necessary attachments and fixtures; second, place of delivery; third, guaranty as to operation and repairs; fourth, price; fifth, efficiency.

Proposals may be sent by mail or express to C. L. Bonney, vice-president, and should be marked boilers, engines or generators, as the case may be, and should be delivered at 1032 Lawndale avenue, Chicago, before twelve o'clock Aug. 20. An award will be made on such proposals as soon as the same may be considered.

The company's business has shown the most remarkable increase within the last year. During the first three months of operation in the summer of 1893 less than 400 passengers were carried weekly. During the last week in June the number carried was 23,000.

**YOUNGSTOWN STRIKE ENDED.**

The strike on the system of the Youngstown Street Railway Company seems to be a thing of the past so far as the company is concerned. The company decided to make no attempt to reach an understanding with its former employes, but determined to hire new men. Under existing conditions it was a matter of no great difficulty to secure all the men necessary to operate cars. The old employes interfered to a certain extent with the operation of cars, and at first their threats were of such a character that the company deemed it wise to cease running cars at night. On the morning that the company started its cars after the tie-up, which lasted 10 days, it was found that several of its circuits had been grounded. A

reward of \$200 was offered for the arrest and conviction of the persons who had done the work. One man was arrested charged with the offense.

**VESTIBULING CARS IN MINNEAPOLIS AND ST. PAUL.**

Labor Commissioner Powers, of St. Paul, who was instrumental in instituting proceedings last winter against the Twin City Rapid Transit Company because of its failure to equip cars with vestibules, has recently inquired of the company in regard to its progress in equipping its cars. Under the law the street railway company was required to have half of its grip and motor cars vestibuled by Nov. 1, 1893, and the rest to be completed by Nov. 1, 1894. The company reports that in addition to those vestibuled last year 80 cars still require vestibuling. Of these, 14 are now in the shops in Minneapolis, and the material is already on hand to fit up 60 more. As to the 20 grip cars in use on the cable line in St. Paul, the statement is made that some arrangement for protecting the gripmen from the severity of the weather will be made before Nov. 1, but just what those arrangements will be has not been determined upon.

**STANDARD PAINT COMPANY'S PATENT SUSTAINED.**

A decree recently made by the United States Circuit Court for the District of New Jersey is a decided victory for the Standard Paint Company of New York. The case was that of this company against Henry J. Bird and James L. Reynolds, and suit was brought for infringement. The court holds that the assignors of this company were the first persons to produce a paper coated with the solid residuum of petroleum, and combining the characteristics of an odorless, water, acid, alkali and air-proof paper, and that the patent under which the Standard Paint Company has hitherto manufactured was valid and had been infringed. The court, by Hon. George M. Dallas, circuit judge, holds that any paper possessing the same essential characteristics and produced by the coating with any material similar to that employed by this company, by whatever name it may be called, is an infringement of the patent, and that the patent is good and valid in law.

The court made a decree giving the Standard Paint Company a permanent injunction against the defendants in the action referred to, and directing that an accounting be had to ascertain and determine the damages to the complainant by reason of the infringement.

**CANADIAN ELECTRICAL CONVENTION.**

The Canadian Electrical Association will hold its annual convention in Montreal next month. The following programme has been arranged:

Paper on "The Possibility of Securing Better Regulation at Central Light and Power Stations by Means of Flywheel Accumulators of Improved Construction," by John Galt, C. E. and M. E., Toronto.

Paper on "A Method of Distribution with Equalization of Potential Difference," by D. H. Keeley of the Government Telegraph Service, Ottawa.

Paper by E. C. Breithaupt, Berlin, Ont.

Paper on "The Application of Electricity for Medical and Kindred Purposes, from Light and Power Circuits," by W. B. Shaw, Montreal.

Paper by T. R. Rosebrugh, Lecturer in Electricity, School of Practical Science, Toronto.

Paper on "Electrolysis," by J. A. Baylis, Bell Telephone Company, Toronto.

Paper on "Telephone Cables: Their Construction and Maintenance," by F. J. F. Schwartz, Bell Telephone Company, Montreal.

Paper on "Alternating Motors," by L. M. Pinolet, Montreal.

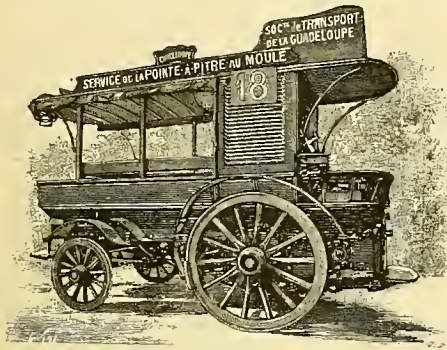
Paper by Mr. John Langton.

Caldwell, N. J.—The common council has granted the North Jersey Street Railway Company a franchise to operate an electric line, which is to run through Bloomfield Avenue to Verona, Montclair, Bloomfield and Newark, providing franchises can also be obtained in those places.



**TESTS OF FRENCH MECHANICALLY DRIVEN VEHICLES.**

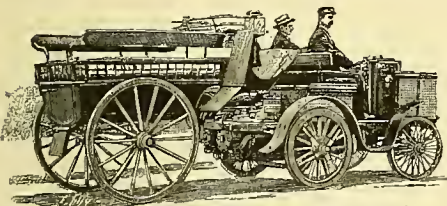
The Parisians, while anxious for improvement in means for local transportation, are earnestly opposed to the use of overhead wires, and, as a result, the trolley system has not made headway in the French capital. They also are not favorably disposed toward rails in many of their thoroughfares.



Serpollet Steam Carriage.

Under these circumstances it is not surprising that a great amount of interest has been taken in mechanically driven vehicles of various sorts, and from time to time carriages operated by steam, electricity, compressed air and gas engines have made their appearance on the Paris streets. How general was the interest shared by inventors in this field has not been adequately realized until recently. Although to those who are familiar with the operation of electric and cable railway systems little of significance is likely to come from work in this field, it is evident that a different idea obtains among French inventors.

A short time ago a French periodical offered prizes ranging from \$1,000 to \$100 for superiority in passenger vehicles designed for operation by mechanical power on common roads. It is a remarkable fact that 102 entries were made, and that about one-half this number actually turned up in the preliminary trials. It seems still more surprising that in the competition no electric or compressed air carriages were entered. An explanation may perhaps be found in the fact that means for recharging the batteries or refilling the air reservoirs were not available. The preliminary trials consisted of runs of about 30 miles on roads



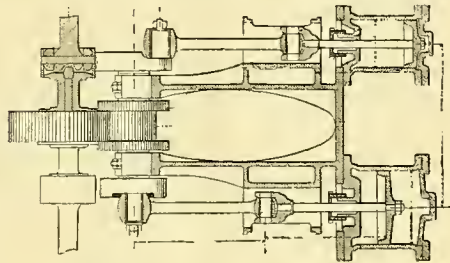
Dion & Bouton Steam Carriage.

radiating from Paris. Twenty-one carriages were selected to make the final trial on July 22d. Of this number one-third were propelled by steam engines and the others by oil engines. The carriages, which were of all types, brakes, phaetons, etc., carried, as a rule, four persons, although one of the steam carriages carried ten and another eight passengers, and some of the oil engines had accommodation for two persons only. One firm, that of Les Fils de Plugot Frères, had five carriages running, all driven by oil engines; another, that of Messrs. Panhard and Levassor, had four, also propelled by oil engines; and M. Le Blant had two steam carriages.

The final trial consisted of a run from Paris to Rouen, a distance of 68 miles. At 8 o'clock the first carriage commenced its journey, followed at brief intervals by the other 20. It was intended that they should keep in line as far as possible, as the object in view was to test the relative fitness of the various vehicles as compared with carriages drawn by horses, in the way of ease of management, comfort, freedom from breakdowns, etc., rather than a competition for speed. It was in

fact expressly stated that no credit would be given for speeds above 7½ miles per hour. At this rate, allowing for stoppages of two hours' duration, it was estimated that the journey would be accomplished by 8 o'clock in the evening. As a matter of fact, the first carriage, that of Messrs. De Dion, Bouton & Cie., driven by steam and carrying four passengers, arrived at 5:40 P. M. It was followed within the half-hour by three of Messrs. Plugeot's carriages and by one of those of Messrs. Panhard and Levassor, and by 7:10 13 of the competitors had arrived. Four others came in later on, so that of the 21 carriages which left Paris only 4 failed to complete the trip. The jury divided the first prize between Messrs. Panhard and Levassor and Messrs. Plugeot, as having approached most nearly the ideal of freedom from danger, ease of management and lowness of cost on the road. These engines were provided with Daimler motors. The second prize was allotted to Messrs. De Dion, Bouton & Cie.'s steam carriage. M. Le Blant (steam carriage, Serpollet's system), M. Vacheron (Daimler motor), M. Le Brun (Daimler motor), M. Roger (oil motor) and M. Scotte (steam carriage) also received prizes.

Illustrations of the Serpollet, Dion & Bouton, Panhard & Levassor vehicles are presented herewith. The Serpollet system, which has been described more than once in the STREET RAILWAY GAZETTE, is peculiar in its use of a special type of high pressure tubular boiler that was invented especially for use on road vehicles and tramways. The Dion & Bouton carriage is operated by a steam engine, and was equipped with a special type of



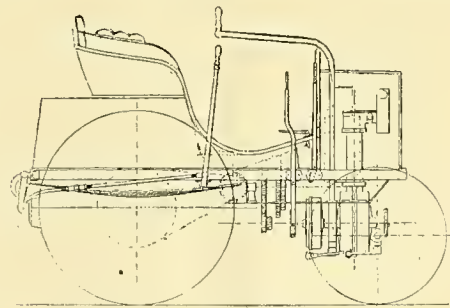
Plan of the Dion & Bouton Carriage.

boiler built for the purpose. The Panhard & Levassor carriage was equipped with a Daimler gasoline motor, which is built especially for service of this kind. It will be remembered that the Daimler company made a very complete exhibit, at the World's Fair, of its motors, which were shown in use on a tramway in the rear of the Transportation Building, in launches and in operating dynamos.

While it appears that the trials were fully as successful as could have been anticipated, the results do not appear to show that the mechanically driven carriages can be of much service in transporting passengers in city streets.

**SIEMENS & HALSKE FACTORY BURNED.**

The factory of the Siemens & Halske Electric Company, of America, in Chicago, was destroyed by fire on the night of August 1st. It is estimated



Panhard & Levassor Daimler Motor Carriage.

that the loss will reach \$300,000, and the insurance carried was about \$110,000. The destruction of the building was complete, and a large amount of machinery which the company was constructing was utterly ruined. The generators designed for

the Toronto Street Railway Company were destroyed; considerable of this machinery was about ready for delivery. The company was fortunate in saving its books, drawings and patterns. The plans of the company are not announced, but it has determined not to cancel any of its contracts; so that it must make arrangements for resuming manufacture at once.

**ELECTROLYTIC CORROSION: LEGAL STATUS OF THE QUESTION.**

BY R. D. FISHER.

Water, gas and other companies using conduits and operating throughout the country are industriously taking counsel with a view of obtaining their protective rights against electric railway companies chargeable for the damages alleged by reason of continuous injury occasioned by escaping currents. Water and gas supplies are necessary to the health and comfort of the citizens of a municipality, the latter in some instances owning the plants; thus the question becomes one of common interest and demands co-operation for mutual protection. If remedies are reluctantly adopted or are applied with doubtful success a resort to the courts will unquestionably follow. In this case the proper mode of procedure will be that of an injunction restraining the companies from operating leaky and damaging plants. We are safe in saying that the managers of electric railways are seriously concerned about the charges made and damages claimed on account of electrolytic corrosion and are anxious to avert any tests in the courts for damages. Aside from the liability under which they are supposed to rest for reputed damages to adjacent underground systems, their interest in a successful solution of the electrolytic question goes farther and means to them a corresponding reduction in operating expenses, greater efficiency and a relief from the menace of an interrupted right of way on account of corroded and leaky pipes. It is claimed that street railway companies cannot hope to escape liability on account of the excessive cost of construction or adoption of some method to arrest the hazards complained of. If electrically welded rails produce a continuous rail through which the current passes direct to the power house without leakage, and if expansion and contraction can be controlled without trouble arising from buckling, it would seem that this plan would not only solve the problem but be far less expensive than continually to defend in a court of equity.

The new uses of electric wires have led to controversies between the new and the old; telephone companies having obtained possession of the streets naturally resented the intrusion of the more powerful currents of the electric light and the electric railway, because of serious disturbances caused to their circuits. Strenuous opposition therefore was made to the use of the streets by electric light and railway companies, when the latter's wires were in damaging juxtaposition to the telephone circuits, and much litigation and some conflict of decisions have grown out of it.

The first legal struggle took place between the telephone and the electric light companies. The Nebraska Supreme Court interfered, so far as to protect telephone wires already set up in a street, by compelling the electric light company to keep its conductors at a certain distance, but relief was refused as to those streets which had already been occupied by the electric light wires (17 Neb., 284). But in case of an electric railway it was necessary that the battle be fought to a finish, for the reason that in this case electricity was simply applied to the uses of an interest which had acquired a prior right, and had occupied the streets long before the telephone was invented; hence its use for purposes of public travel gave it a superior claim to the use of the streets. Early in January, 1890, the question arose in a Wisconsin court. The statute relied upon contains a provision that "it shall be the duty of each electric company and each and every person engaged in the transmission of electric



energy within the State, to provide, by suitable insulation, return wires, or other means, against the injury to person or property by leakage escape or induction of every and any current of electricity." The plaintiff (telephone company) alleged that great and irreparable damage had been done to its business and property, yet the court denied a temporary injunction. (Tel. Co. v. Elec. St. Ry. Co., C. C. Eau Claire County.)

A different conclusion was reached by a trial court in Ohio, and a perpetual injunction issued against the offending street railway, restraining it from operating its road by a system alleged to be faulty because of leakage. This court held that the street railway was inflicting a legal injury upon the plaintiff. The claim was made that the damage was not irreparable because the plaintiff could, by the expenditure of money, avoid it, thereby arriving at the exact loss; in such case its remedy would be not by injunction, but at law. The court refused to sustain this view, and said that the most frequent exercise of the power of injunction was that of preventing the recurrence of injuries; that a plaintiff should not be put to endless litigation or be forced to expend vast sums to avoid the injury. On this theory an injunction was issued restraining the operation of the road under the existing system after a period of six months. On appeal to the Supreme Court this order was reversed. It was held, as the controlling proposition, that the rights of the parties in such a case do not depend upon the time at which the grants were made, but upon the fact that the franchise of a telephone company to use public streets was subordinate to the rights of the public therein for the purposes of travel and transportation, which are materially facilitated by the operation of electric street railways (St. Ry. Co. v. Tel. Co., 27 N. E. R., 890). This decision is noteworthy as being the first rendered on this important point of controversy. Thus it will be seen that, according to this ruling, it is incumbent upon telephone companies to make use of such remedies as are possible to protect their systems from injury by reason of the escaping currents of an electric railway plant. If this be true of a telegraph or telephone company, cannot the same theory be adopted concerning water and gas companies?

In Tennessee a preliminary injunction having been granted, restraining a street railway company from using the single trolley system, the case was brought before the court on bill, answer and affidavits upon a motion to dissolve the injunction. The street railway admitted that it did not propose to use the double trolley system, but said it had adopted a precaution which had never been applied before to increase the conductivity of the rails and prevent the leakage complained of. The court thereupon consented to dissolve the injunction for the present upon condition that the street railway company give bond to secure any damages that might be adjudged to the complaining company. It will thus be seen that the question between the telephone and electric railway is still open for argument, and that a conflict of authority exists so far as courts are concerned. But, applying the weight of authority to that of a recent cause decided by the United States Supreme Court, and assuming that a water company or a gas company stood in the precise attitude of a telephone company, it would be the rule to compel a street railway company to adopt the double trolley system if that would obviate the injury to the complainants without exposing the railway company or the public to any large expense; but if it could be proved that a more effectual and less expensive remedy is open to the complaining water and gas companies, the latter's duty would be to adopt such a remedy, and a failure to do so would relieve the railway company for any liability to indemnify. (See 42 Fed. Rep., 273.)

By a careful review of a recent Ohio Supreme Court decision it is safe to assume that public travel is the chief purpose for which streets are laid out, and that all franchises to use the streets

are subservient to the rights of the public to use the streets for this purpose; that the people have the right to avail themselves of new and improved modes of travel, and when franchises are granted for this purpose they confer a right paramount to the franchise of a water or gas company, and if the operation of a street railway by electricity disturbs the working of a water or gas company the latter must readjust its methods to meet the new conditions as a matter of protection. Hence, if we adopt these conclusions as sound law, it will appear that the contest between electric railways and the water and gas companies over the use of the streets and the alleged damaging effects by reason of electrolysis must ultimately be settled by the ingenuity of inventors rather than by skillful and technical efforts of lawyers and courts. Notwithstanding the contest between electric railways and telephone companies has not as yet been definitely settled, it is true that the former have driven the latter to the adoption of devices and systems for the purpose of securing the best electrical results, and thus avoiding all danger of disturbance from the former. It is quite certain, therefore, that public convenience will demand that the streets shall be used for all the electric currents that may be required, yet it is the duty of the courts to protect existing property from unnecessary injury without needlessly obstructing the application of such a valuable force as electricity as a motive power for the public benefit. It is certainly true, as the courts have generally held, that no one mode of public service has a right to monopolize the earth or the air of a public street, but the power of injunction will only be exercised so as to avoid present injury to existing property until scientific and practical men find a way for all to operate in harmony free from negligence and wanton injury. Whether the power of restraint will be exercised even to this extent against electric railway companies for the use of water companies is not yet settled, and it may be that the courts will decide that in these particulars each and every company using the streets must exercise care and ingenuity to protect itself from the effects of intrusion by a neighboring system for lawful ends and by legitimate means, only insisting that each must use the best and most improved appliances practicably available for producing the best results and the least disturbance.

#### GAS MOTORS FOR STREET RAILWAYS.\*

FRANK H. MASON,

United States Consul-General at Frankfurt, Germany.

In a former report (published in *Consular Reports*, No. 163, for April, p. 695) some account was given of a street railway car of the Lübrig model propelled by a gas engine, and carrying its supply of compressed gas in cylindrical reservoirs hung beneath the floor of the vehicle. Although of recent invention and somewhat complicated in construction, this car had been worked successfully in Dresden at a net cost of operation so far below that of electric or even horse railways that it seemed to embody the germ at least of a new and important departure in street railroad equipment, particularly for the large class of lines whereon traffic is limited and varies essentially in volume at different seasons or hours of the day. Though the death of the inventor and other circumstances, the ardor of improvement appears to have been temporarily checked in Germany, and the field of experiment has been transferred to England, where the Lübrig patents have been acquired by a syndicate, and the car has undergone, during the past four or five months, modifications which from trustworthy accounts, have greatly lessened its weight and cost and enhanced its practical value.

A car of this improved type is now worked regularly on the lines of a tramway company at Croydon, near London, and has attracted expert attention from all parts of Great Britain, where the problem of street railway equipment and man-

agement is quite as complicated and difficult as in any portion of the United States. Not less than \$70,000,000 is invested in tramway lines within the United Kingdom, with results so generally unsatisfactory, as regards profits to stockholders, that there is a wide and urgent demand for a new and simplified motor or system that will secure equal effectiveness and greater economy in operation. Notwithstanding the relatively dense population of Great Britain, only a small proportion of its tramways, as worked at present by cables, steam locomotives, electricity, or horse power, is really satisfactory to the public or pays regular dividends. The same need exists there, or elsewhere, for a motor which shall be clean, noiseless, manageable, independent of overhead wires or underground constructions, and withal so cheap in initial investment and working expense as to successfully supersede horse cars, to which there are many objections on the score of cleanliness, speed and economy on lines which have a light or varying volume of traffic.

One important difficulty in the case of every self-contained car lies in the fact that, for climbing grades, starting under full load, passing curves, or meeting sudden falls of snow, a car which, when in motion, can be easily drawn by two horses must be equipped with a motor capable of exerting temporarily 10 or 12 horse power, and for this a considerable weight of machinery is unavoidable. The general defect which has been found in gas motors for street-railway purposes hitherto has been that they have been available only for light traffic, and, if made sufficiently powerful for city lines, their excessive weight and cost would form a fatal objection.

Through the modifications which have been made in the Lübrig motor car by the English engineers, these defects are believed to have been practically overcome. The original car was rigged with two double cylindered gas engines, one under each seat, and both working upon the same driving shaft, and weighed, without passengers, 7½ tons. In the improved car but one gas engine is used, the two cylinders of which are set facing each other, and both working to the same crank. The engine is located under the seat on one side of the car; the other end of the driving shaft, which extends across beneath the floor of the vehicle, carrying a flywheel, which steadies and regulates the motion of the engine. By this improvement, the number of working parts, and, therefore, the weight, cost, and wear and tear of the motor, have been greatly reduced. What is equally important, in a commercial sense, the motor has been reduced to a form and dimensions which will permit it to be adjusted to cars already built for cable, electricity or horse power.

But, by reducing the engines to one, the power of the car to start promptly with a heavy load was compromised, and this weakness has been overcome by the momentum of the flywheel, and by the device of keeping the engine constantly in motion while the car is in service and transmitting its power from the crank shaft, through a second-motion shaft, to the running gear by friction clutches under the control of the driver. This is arranged as follows:

The driver, standing on the front platform, has before him the brake wheel, and beside him a movable lever, not unlike the reversing bar of a locomotive. When this lever is in a vertical position the engine shaft is disconnected from the second-motion shaft and the axles, so that the car may be at rest while the engine is running free. When the lever is pushed to the right the second-motion shaft, with which the axles are connected by chain gearing, is brought into engagement by a pinion and friction clutch, which gives the car a speed of four miles per hour. Shoving the lever to the left brings into similar engagement a larger pinion, which, without changing the speed of the engine, gives the car a pace of eight miles an hour, which is the limit of speed allowed by the municipality of Croydon. A second lever is provided for operating reversing clutches whenever, at the end

\*From advance sheets of the *Consular Reports*.



of the line or elsewhere, the movement of the car has to be reversed. The friction clutches, which form so important a feature of the machine, are made of hard wood set between the two discs of iron, and are said to be effective and durable.

There must be, of course, some device to regulate the speed of the engine and keep it as nearly as possible uniform while the car is stopped and under the varying conditions of grade and load. This has been provided for with great ingenuity; first, by a governor, which, when the work is light, cuts off automatically the gas supply from one of the cylinders, leaving the other to do the work alone, and, still further, through a mechanical connection between the governor itself and the lever, already described, which operates the clutches. When this lever is upright and the engine shaft disengaged from the axle gearing a weight on the spindle of the governor is lifted which cuts off the gas at half stroke in the one working cylinder. so that, while the engine is running free with the car at rest, it is reduced to half speed, and the explosions are rendered so light and gentle as to be hardly perceptible.

Ordinary street gas is used, condensed to a pressure of 10 atmospheres, and the reservoirs under the floor of the car, which can be filled through a flexible pipe within the time required to change horses, carry gas enough for a run of eight or ten miles. The consumption of gas by a loaded car is stated to be 25 cubic feet per mile, which costs, at Croydon, two cents. The syndicate, under whose management the car now in service has been built and tested, is naturally disinclined, as yet, to disclose fully the detailed results; but the editor of *Engineering*, who has been permitted to examine the experiments somewhat carefully, states his conclusions as follows:

The car is not noticeably different from a horse car. It runs quietly and easily, emitting neither smoke nor steam, and is quite under control. Inside passengers can hear a slight rumble of machinery and perceive a trifling vibration; but, after a minute or two, these are unheeded, and practically there is nothing to detract from their comfort. Neither they nor the bystanders in the street can perceive any machinery whatever, for the engine and gearing are entirely inclosed, the motor lying under one seat and the wheels and clutches under the floor of the car. . . . It carries 28 passengers in all and makes a very fair speed, the limit allowed by the Board of Trade being 8 miles per hour. With the slow gear in action, it will readily mount an incline of 1-in-23, with a short piece of 1-in-16, and in coming down it can be stopped by the brakes in its own length. It also goes round a curve of 35 feet radius on a 1-in-27 grade. Its weight, when filled with passengers, is 5½ tons. For gas, it costs 1d. (2 cents) per mile, against 3½d. (7 cents) per mile for fodder and bedding for horses; so that the gas motor car starts with an advantage of 2½d. (5 cents) per mile. The performance of the car is quite satisfactory.

The main question, which remains to be decided by prolonged experience, would seem to be that of net cost of maintenance. The initial cost of the motor car is about the same as that of an ordinary horse car and the eleven horses which are required on well-managed lines to operate it. The point to be determined is, whether it is or is not cheaper to keep one gas engine in order than to keep in health and serviceable condition 11 horses, and whether the machine will last longer in service than the animals. When the motor car is not needed, it costs nothing but a shed to shelter it, while the horses must be fed and cared for. From the English standpoint, the horse car is the only system that offers any serious competition with gas, and, as the latter starts with an advantage of 5 cents per mile in the cost of material consumed, its victory on a large majority of the lines in that country would seem to be more than probable.

A special motor car of the type above described, combining all the improvements thus far made and reduced to the utmost limit of simplicity and lightness, is now being constructed in England, to be carried to the United States for exhibition and trial in October. Its performances will doubtless merit the attention of all who are interested in the complicated subject of city and suburban transportation.

### THE CORROSION OF IRON PIPES BY THE ACTION OF ELECTRIC RAILWAY CURRENTS.\*

BY D. C. JACKSON.

The foundation of this paper is an investigation carried out under my direction by Paul Biefield and Fred. D. Silber, at the University of Wisconsin. I have incorporated the report of their experiments directly into the paper as far as possible. Their work was divided under two heads; First, to determine what chemical action really occurs under the conditions that are met in towns where corrosion of the water and gas pipe systems have occurred through the action of electric railway return currents; second, to examine the action which has actually occurred in various towns, apply the deductions gathered from the results of the first division of the work, and determine the best methods of avoiding difficulty or danger from corrosion.

About two years ago engineers of the West End Street Railway Company of Boston began to connect the reinforcing wire laid between the tracks to the water pipes, anticipating little or no trouble from so doing. They soon found that the supplementary wire was destroyed in places. They first attributed this to chemical action of the soil, but finally concluded that it was due to electrolytic action. As a remedy, they reversed the polarity of their generators, sending the current out through the rails and back through the overhead trolley wire. This change was followed by disastrous results. The current pumped through the rails took to the water pipes and lead cable coverings, according to the law of divided circuits, and, leaving these at many points along the line, caused serious corrosions at these places. It was found that lead pipes at some points disappeared inside of six or eight weeks, and galvanized iron and brass pipes deteriorated noticeably in an equal time.

After a conference between representatives of the city and the railway company, it was decided to go back to the old way of current distribution. The direction of the current was therefore reversed, and careful tests were made which showed that considerable current flowed along the water pipes. So great in fact was this current that the arc formed at a joint where oakum was used for calking, was sufficient to set fire to the oakum. This loss of pressure on the return circuit was found to be from 25 to 100 volts, or from 5 per cent. to 20 per cent of the total pressure. As an experiment the water system was connected to the negative pole of the dynamo, and now a new danger was found in the difference of potential between the gas and water pipes, causing a marked electrolytic effect on the former. It was then proposed to connect the gas and water pipes together in all parts of the city in order to arrest the action, and this was done with fair results. The expense to the city and the company was great and the final solution of the difficulty was far from satisfactory to either party.

The report of the Board of Commissioners of Electric Subways of Brooklyn for 1892 briefly referred to the same trouble as of uncertain character and extent. Since then the problem has become very serious in Brooklyn on account of the growth of the electric railways in that city, and the same report for 1893 calls attention to the fact that discoveries of corrosion have been numerous enough to justify the belief that all kinds of buried pipes are being eaten away in many places. As an example, may be cited the fact that a certain iron service pipe buried at a depth of four feet below the track had been completely perforated in a month. In Brooklyn, as in Boston, connection between the return circuit and the corroded service has been tried with some success. The means for preventing the action in Brooklyn is as yet in an experimental stage, so that proposed extensions of the railway system along the line of one of the

largest water mains in Brooklyn is regarded with anxiety.

Milwaukee has also had her share of trouble from the same cause. O. M. Rau, electrical engineer of the Milwaukee Street Railway Company, tells about it in an article in the *Street Railway Review* in December, 1893. At two feet from the power house on Wells street a six-inch water main was so badly corroded after the electrical railway had been operating for four years as to render it entirely useless. When taken out of the ground it was so soft in places that a cane could easily be poked through it. In Milwaukee the corrosion was arrested by making numerous low resistance connections between the pipes and rails, thus keeping the two at the same potential. The connection is made most secure at the pipe station, where both pipes and rails are led to the negative pole of the generator by heavy cables. It is found that as much as twenty-eight per cent. of the total output is now returned by means of the pipes, and no difficulty is encountered. The plan has been working very satisfactorily for over a year.

The Chicago experiences have been set forth in a report made by Professor Barrett to Mayor Harrison in June, 1893. The destructive effects in Chicago are apparently entirely similar to those of the cities above mentioned. In Professor Barrett's report some experimental work is referred to, in which a current of .3 ampere, continued for three weeks, was most destructive to a lead telephone cable, while a cable which was buried in the same soil but was not subjected to the action of the current was unaffected.

In Zanesville, O., a 4 inch cast-iron water main was completely perforated in two years. All the neighboring pipes were affected, some of them lasting only six months.

Columbus, O.; Hamilton, Ont.; Indianapolis, Ind.; Philadelphia, Los Angeles, Cal., and many other cities where considerable electric railway systems are in operation have experienced the same difficulties. In every case the corrosion has exhibited the same general features and pointed to the same cause.

It is not practically agreed that the reason for the extraordinary corrosion which is referred to here is to be found in the perfect character of the return circuit of the electric railways. When electric railways were first constructed, the rails in connection with the surrounding earth were relied upon to carry all the current back to the generator. It was soon discovered that the current would not confine itself to this path and that the resistance of the earth was far from being as low as was originally supposed. Bonding the rails, cross-bonding, supplementary wires and ground plates were then tried. The last were found to be of little avail, while the copper bonds and supplementary wires were often themselves electrolyzed, and bond wires up to the present time have frequently been far too small in cross section for the large current to be carried. The tendency which now obtains, and which is the current one, is to make the return circuit of fully as great conductivity as that of the overhead supply circuit, without relying upon any conductivity from the ground. This is being accomplished by affecting the rail bonds and running heavy track feeders, or electrically welding the rails. There is little doubt that with a perfect return system, which is properly connected to systems of underground pipes, electrolytic disturbances will practically disappear in nearly all cities.

Though the corrosive action of the return current has been so frequently noticed and commented upon, no one has really determined what actually occurs in the ground under the conditions brought about by the operation of electric railway systems. Two theories have been put forward relative to the corrosion: First, that it is simply due to chemical action caused by ammonia, saltpetre, leakage from gas mains, etc., found in the earth; second, that it is the result of electrolytic action. While simple chemical action undoubtedly has much to do with shortening the life of a pipe, it cannot on the face of it produce effects of the magnitude of these

\* Read before the Western Society of Engineers, July 11, 1894.



noted above. The ordinary life of water and gas pipes where chemical action alone is met is said to be about 20 years, while the corrosive action with which we are dealing has destroyed new pipes in intervals having from a few weeks to half a dozen years' duration. In every case of the corrosion to which we refer, an electric current has traveled along the pipe and the corrosive action has taken place at the point where the current left the pipe. This is conclusive proof of electrolytic action. Secondary chemical reactions play an important part in the final decomposition of the pipe, and these are dependent upon the character of the salts in the soil, but the current sets the ball rolling.

The electrolytic action of the current may occur by means of two processes—(1) direct electrolysis of iron, and (2) electrolysis of chemical compounds which are held in the water of the soil, setting up secondary chemical reactions at the electrodes. In order to have electrolysis at all, it is necessary to have the equivalent of an electrolytic cell. In the case of a current leaving a pipe at any point, the pipe is the anode or positive plate of such a cell, the wastes of the soil containing the chemical compounds in solution is the electrolyte, and the rail is the cathode or negative pole of the cell. All corroded iron pipes taken from the earth present practically the same appearance. They are generally "pitted" in many places, and although the pipe is covered with a layer of reddish oxide, the bulk of the corroded metal has generally been entirely carried away in some form or other, presumably by a secondary chemical change.

In order to have the first electrolytic action go on (that is, direct electrolysis of iron), a soluble iron salt must be present in the soil, reaching from anode to cathode. The analysis of street soils shows no such salts, and hence we are safe in concluding that this factor does not enter into the corrosion to any practical extent. The point has been made by several writers on the subject, that the phenomenon may be due to the electrolysis of water, the nascent oxygen set free at the anode attacking the iron directly, and forming iron oxide. An examination of the facts of electrolytic action shows that this is not an effect of practical magnitude. This leaves us but one hypothesis to work upon—that is, the electrolysis of substances held in solution in the water of the soils, with a resulting secondary chemical action on the pipes.

In order to determine as exactly as possible what occurs in the soil due to the return current, a series of laboratory experiments were performed, in which the practical conditions were reproduced as fully as possible.

Almost every chemical analysis of street soils shows the presence of some soluble salts of ammonia, potash, soda; and because of their common occurrence, an experiment was performed to determine the effect of these salts on the electrolytic corrosion of iron plates per ampere-hour. Six small electrolytic cells were run in series under an electric pressure of about 100 volts, with a current varying from .2 to .04 ampere. The cells contained clean glass sand moistened with water containing the salts.

Cell 1 contained	NH <sub>4</sub> NO <sub>3</sub> .	(Nitrate of ammonia.)
" 2 "	NH <sub>4</sub> Cl.	(Chloride of ammonia.)
" 3 "	KNO <sub>3</sub> .	(Nitrate of potash.)
" 4 "	KCl.	(Chloride of potash.)
" 5 "	NaNO <sub>3</sub> .	(Nitrate of soda.)
" 6 "	NaCl.	(Chloride of soda.)

After a run of 14½ hours, the number of ampere-hours was .7465:

Loss of anode of NH <sub>4</sub> NO <sub>3</sub> cell per amp.-hour was	Grams.
" " " NH <sub>4</sub> NO <sub>3</sub> " " "	....921
" " " NH <sub>4</sub> Cl " " "	....1.314
" " " KNO <sub>3</sub> " " "	....1.857
" " " KCl " " "	....1.346
" " " NaNO <sub>3</sub> " " "	.... .729
" " " NaCl " " "	....1.299

It had been shown by previous experiments upon cells containing these salts that iron was carried off from the positive plates but was not deposited on the negative plates. The deposit of iron was made in the form of a layer of hydrate or hydroxide of iron near the middle of the cell. The

same was true of experiments made with cells containing street soil where only a comparatively small percentage of carbonates was present. This explains the remark often made in reports of the corrosion of pipes, that the products of the corrosion had disappeared. It was noticed during the experiments that all the cells containing a nitrate gave off a gas at the anode; and this, on being collected, was found to be oxygen. The same cells showed an acid reaction at the anode when tested with methylorange, and the reaction grew less in intensity as the current decreased. In cell No. 1 of the series already referred to, this acidity failed to show itself when the current fell to .6 ampere, in cell No. 3 at .045 ampere, and in cell No. 5 it was very faint at .04 ampere when the current was shut off. The acid reaction and the escape of oxygen in these cells seemed to be associated, and here it becomes necessary to refer to the losses of the anodes in the different cells. It will be seen that the chloride cells exhibit the greater losses, while the nitrate cells show the smaller. Moreover, the cell containing a nitrate in which the formation of acid and oxygen ceased first, shows the greatest anode loss; and the one in which it continued to a slight degree to the end of the experiment, shows the least. These facts point very strongly to the soundness of the theory of the corrosion which has been finally worked out; namely, in an electrolytic cell with iron electrodes and a soluble salt or salts of the metals of the alkalis or alkaline earths in solution in the electrolyte, the salt is electrolyzed by the current, the acid radical attacks the anode, forming an iron salt, while the alkaline metal forms with water a hydroxide at the cathode, liberating hydrogen there. Finally, the meeting by diffusion of these two products precipitates ferrous hydroxide, Fe(OH). As the amount of electrolysis varies with the strength of the current, a comparatively high current will liberate the acid radical more rapidly than it can combine with the iron, the critical point depending upon the affinity of the acid for iron. When this excess is present, the radical forms an acid by combining with water and at the same time liberates oxygen. Neither the acid nor the oxygen can combine with the anode, because that is already engaged in the formation of an iron salt with the acid radical, and hence the gas escapes into the air. If the acid is formed in sufficient quantity, it diffuses through the electrolyte, meets the alkaline hydroxide and forms the original salt and water. In the case of chlorides the nascent chlorine liberated at the anode forms with it a chloride of iron, and if the current is strong enough to form an excess of chlorine it will be dissolved in the water and may, under the influence of light and heat, form an acid and liberate oxygen; or, if enough heat is generated, free chlorine will be given off, as is shown by experiment. All conditions of these laboratory experiments are practically parallel in the earth, and hence it is safe to say that similar chemical reactions must go on there. Although the composition of street soils is more complex than the electrolytes of these experiments, they contain the same soluble salts, and as these are diffused through the moist earth they must lend themselves to exactly similar electrolytic influences and chemical changes. In fact, where street soils were used in the experiments as the electrolytes of cells which were placed in series with cells containing known quantities of simple and mixed soluble salts, the losses of the anodes were entirely comparable. It is consequently seen that only such measures as will stop the electrolytic action on salts in solution in the soil can be relied upon to stop the corrosion of iron pipes.

The soil frequently contains carbonate of calcium and magnesium which are dissolved by virtue of the carbonic acid in the water. When carbonates are present in the water to a considerable degree a reddish layer of iron carbonate is found on the pipe. This is generally mistaken by observers for oxide of iron, but we have never found the latter present as a result of electrolytic corrosion. To

find the effects of carbonates upon the corrosive powers of soils we ran four electric cells in series. The first two had for electrolytes glass sand moistened with a ½ per cent. solution of chloride of soda in distilled water, and the other two had the same electrolyte with the addition of a solution of carbonate of magnesia and carbonate of lime of uncertain strength. The latter solution was obtained by passing carbonic acid for 1½ hours through wafer containing equal parts of these carbonates in suspension. The test current was kept at .09 ampere for 7 hours, making .65 ampere-hours.

The average loss of the anodes of the cells containing chloride of soda alone was .6565 gram, while that of the carbonate cells was .601 gram. This makes it evident that the presence of the carbonates does not aid in the corrosion of the anode, and even the slight cathode loss due probably to ordinary oxidation is less in these cells than in those containing the chloride only. The difference in the losses of the anode is easily explained. In some previous experiments the loss of anode caused by the electrolysis of a nitrate, a chloride, and a mixture of the two was compared. The chloride caused the greatest loss of anode, the nitrate the least, and the mixture caused a loss between the two. In the same way in the case of the carbonate and the chloride, the chloride caused a certain loss of anode, and when mixed with carbonate the loss is somewhat less than when the electrolyte is a chloride alone. The fundamental effect of the carbonates is shown by a further description of the experiment. Soon after the current was turned on, the chloride cells began to show the formation of the ferrous hydroxide layer between the electrodes which has been previously spoken of, while in the other two cells a reddish layer formed at the anode spreading toward the cathode as the action progressed. The reddish layer consisted of carbonate of iron which was formed by the action of the carbonates upon the products of the electrolysis.

The results of many experiments and the condition of corroded water pipes as observed lead to the conclusion that under the conditions existing in street soils, the corrosion will primarily go on by virtue of the acid radicals of the hydrochloric, nitric, sulphuric and other acids, the carbonates held in solution by virtue of the carbonic acid acting merely to change the ferrous salts to the normal iron carbonates and the ferric salts to the ferric hydroxide. Should the carbonates in solution be electrolyzed in addition to the salts of the alkaline metals, the carbonic acid radical would not attack the iron, as the corrosive power of the other acids is so much greater, but would again form with the ferrous salts the iron carbonate.

(To be continued.)

#### NEW YORK STREET RAILROAD REPORTS.

The following street railroad reports for the quarter ending June 30 last have been filed with the State Railroad Commissioner in Albany:

The Forty-second Street, Manhattanville and St. Nicholas Avenue Railway Company of New York City: Gross earnings from operation, \$170,000; operating expenses, \$128,000; net earnings, \$42,268; other income, \$999; gross income, \$43,268; fixed charges, \$30,687; net income, \$12,581 cash on hand, \$9,136; profit and loss (deficiency), \$56,821. For the same quarter last year the operations of this road resulted in a net deficit of \$18,862.

The Atlantic Avenue Railroad Company, of Brooklyn: Gross earnings from operation, \$211,484; operating expense, \$151,131; net earnings, \$90,325; other income, \$8,221; gross income, \$98,574; fixed charges, \$71,221; net income, \$27,352; cash on hand, \$63,587; profit and loss (surplus), \$17,662. For the same quarter last year the net income was \$48,307.

The Mohawk & Hion Horse Railroad Company: Gross earnings, \$1,594; operating expenses, \$1,901; deficiency, \$302; assets, \$17,800; including \$15,800 cost of road, etc., and \$2,000 permanent investments. The liabilities: Capital stock, \$15,000; due companies, etc., on open accounts, \$231; profit and loss, surplus, \$2,568.

Fort Howard, Wis.—D. McCartney, president of the Exchange Bank, has been granted a street car franchise for this city.



**NEW RAILWAY DEVICES.**

The accompanying illustrations represent several new devices for street railway work just introduced by J. H. Bunnell & Co., of New York. The Standard trolley which is shown in Fig. 1 is simple, light and strong, and comprises but few parts. The construction of the trolley, which may be seen by referring to the illustration, is such that the action is quick and the wheel makes positive contact at all angles, and the danger of jumping from the trolley wire is materially decreased.

The new trolley wheel which the firm has just

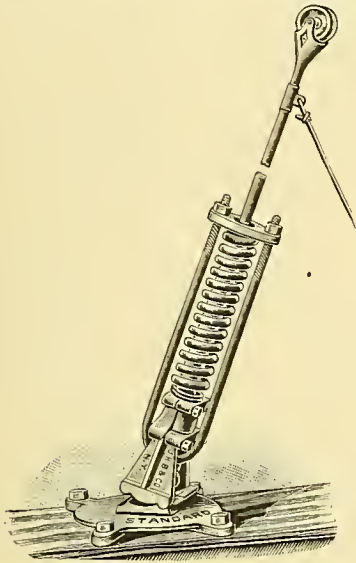


Fig. 1.—Standard Trolley.

put on the market is shown in Fig. 2. It is made of highest grade bronze and is very durable and economical. Special care is taken in its composition to insure long life and yet relieve the trolley wire from all unnecessary wear and tear. It is fitted with the regulation graphite bashing, and is adapted to the standard trolley fork.

The Lain adjustable crossing is shown in Figs. 3

**PENNSYLVANIA STREET RAILWAY CONVENTION.**

The convention of the Pennsylvania Street Railway Association will be held at the Neversink Mountain Hotel, Reading, Sept. 5, 6 and 7. The preliminaries were arranged recently at a meeting in Reading of the executive committee, which consists of Robert E. Wright, of Allentown; B. F. Meyers Harrisburg; William Lanus, York; S. P. Light, Lebanon, and Richmond J. Jones, Reading.

**PINTSCH LIGHT IN ELECTRIC CARS.**

The Columbus Central Railway Company, a trolley line of Columbus, O., has recently awarded a contract to the Safety Car Heating and Lighting Company for the equipment of all its cars with the Pintsch light and the erection of a small plant at Columbus. The engineers of the railway com-

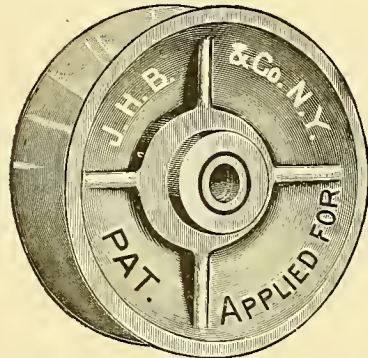
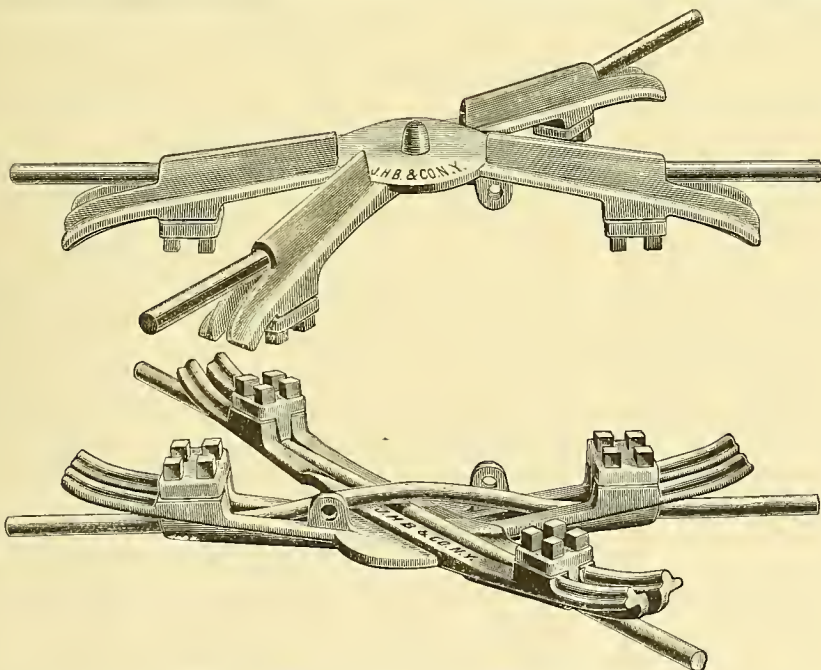


Fig. 2.—New Trolley Wheel.

pany have been investigating the subject of car lighting for some time, and this change was decided upon only after it was demonstrated that the Pintsch light furnished a much more steady and reliable illumination than the electric light derived from the power current, and at about one-half the cost of the latter.

The Pintsch light is already extensively used by



FIGS. 3 AND 4.—LAIN ADJUSTABLE CROSSING.

and 4. Its characteristic features are represented in the cuts. The crossing is light and strong and can be applied without cutting the trolley wire.

**Kansas City, Mo.**—Walter Gillham has resigned the position of superintendent of the "L" road. The vacancy has been filled by the appointment of J. C. Kline, formerly superintendent of the Fifth street line. Mr. Kline's position on the Fifth street line will be filled by Mr. Voorhees, the assistant superintendent.

street railway companies; the Broadway and Third Avenue Cable roads of New York City, the North Chicago Street Railway Company and the Lake Street, South Side and Metropolitan Elevated roads of Chicago, together having about 850 cars equipped.

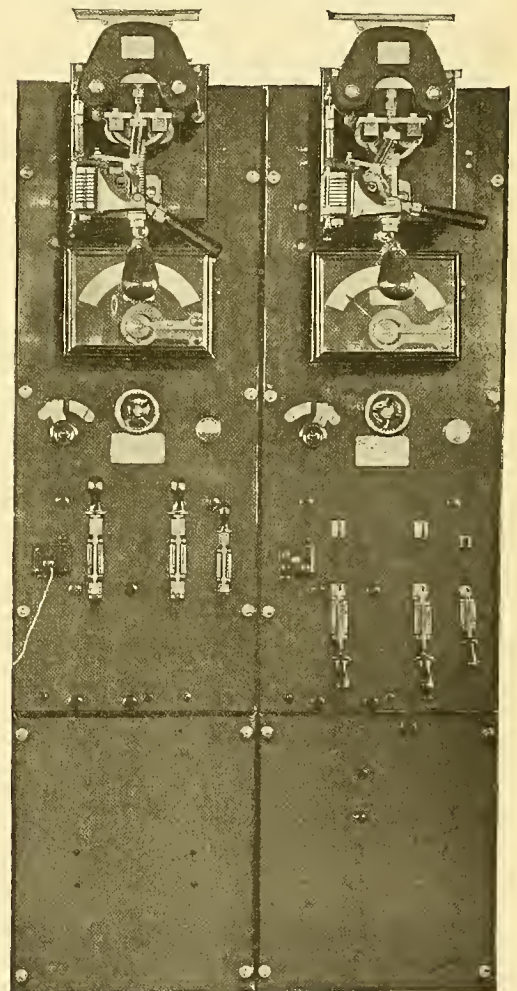
**Chicago, Ill.**—The Chicago City Railway Company has filed its acceptance of the several ordinances granting it the privilege of introducing electricity on most of its lines now operated by horses.

**NORTH AND WEST CHICAGO RAILWAY ELECTRICAL EQUIPMENT.**

The Siemens & Halske Electric Company of America has been awarded the contract for the electrical equipment for the lines of the West and North Chicago Street Railroad companies. The contract calls for three 2,000-H. P. and one 1,000-H. P. generator, and specifies that the first dynamo shall be completed within four months of the award of the contract, and that an additional machine shall be completed every 15 days. The West Side power-house is designed to ultimately accommodate five 2,000-H. P. generators and one of 1,000 H. P., and the North Side station will eventually contain generators aggregating 6,000 H. P.

**RAILWAY GENERATOR SWITCHBOARD PANEL.**

In order that the switchboards of electrical railway stations may be of uniform construction, handsome in appearance, and generally a credit to the station, a departure from hitherto accepted methods is necessary. We described a short time ago a feeder panel of the General Electric Company's



New Railway Switchboard Panel.

make which fulfilled the electrical and aesthetic requirements, and we now show a generator panel made by the same company constituting with that just mentioned the departure in question.

Briefly the system of switchboard construction while becoming greatly simplified, is rendered very compact and convenient. All the instruments necessary for the control of each generator are mounted together on an incombustible base, and are electrically connected before leaving the factory. Each panel may be erected in position without difficulty or delay. Being of uniform size it may be bolted by the side of other panels already in place, and the switchboard extended as the capacity of the station increases without taking away from its uniformity.

These new standard panels are known as type



"K," and are constructed in capacities of from 200 to 3,000 amperes, corresponding to the generator outputs of from 100 to 1,500 k w. The controlling devices mounted upon each panel are the circuit breaker, current indicator, rheostat, main, field and lighting switches, together with the lightning arrester and cut-outs required for the protection of generator and instruments. A double pole plug switch allows of connection with either a portable or station voltmeter placed in some convenient position. The panels of from 200 to 1,000 ampere capacity are of the same width and height, and in the latter dimension are similar to the feeder panel. The illustration shows two panels of 400 amperes each.

The automatic circuit breaker is intended to relieve the generator of the severe strain caused by short circuit. The tripping armature is fitted with an adjustable spring whereby the circuit breaker can be set to open at any desired point within the range of the instrument. The current is nominally carried through a main contact in shunt to a contact operating within a magnetic blowout. Thus when operating no arc occurs at the main contact. The armature is provided with a scale 18 inches long, which may easily be read at a distance. The positive and negative main switches and the station lighting switch, all of the quick break type, are mounted on the panel, the equalizing switch being mounted on a pedestal near the generators. In the lightning arrester the special feature is an iron clad electric magnet, in the field of which are two carbon points slightly separated, the line and ground each being connected to one of these points. The magnetic blow-out principle, as in the automatic circuit breaker, is here employed with unvarying reliability. The incombustible controlling rheostat is placed behind the board and is operated by a hand wheel shown on the front. The generator terminals are connected by a small four point plug switch with an illuminated dial voltmeter mounted on an adjustable bracket fastened near the top of the panel.

The panels are supported by vertical angle irons, tie rods and brackets. They are wired complete, and after setting in place it is only necessary to connect the leads from the generators and bolt in place the bus bars which run horizontally back of the switchboard.

## FINANCIAL DEPARTMENT.

### Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

IT IS A WAITING MARKET.—That is the term aptly applied by brokers to the condition of the street railway market at present. While all of the lines are doing a tremendous business, transactions in street railway shares are at a standstill with the exception of the usual trading in traction securities at Philadelphia. Buying and selling there continues with unabated interest, though there have been no material changes in prices. The New York market as noted is awaiting the return of financial people from the summer resorts, and the revival in trade which is looked for after the summer dullness. Every day the fact is becoming more generally known of the superior comparison street railway statements are making over those of steam roads, and only time is needed to convince the general public that street railways can be traded in with the same freedom and profit as the regular railways.

THE THIRD AVENUE RAILROAD COMPANY makes an excellent showing in its quarterly report, ending June 30. The net income was \$216,056, while for the same period last year it amounted to \$42,191. The gross earnings 1894 were \$557,799, which is \$100,000 more than those of 1893. Operating expenses since the advent of the cable are shown to be \$98,132 less than last year. The fixed charges have increased from \$62,000 to \$87,475. The Third Avenue is doing a splendid summer business and is cutting into the Manhattan earnings. People do not care to climb elevated railway stairs in hot weather. It is said the July earnings of the Third Avenue will eclipse those of any month in the company's history.

THE BROOKLYN TROLLEY ROADS continue to extend their lines and are doing well. The Brooklyn, Queens County and Suburban Railroad has opened its through trolley line from Williamsburgh to

Jamaica. A new feature is to be added to the Brooklyn lines this week in the trolley postal cars. These cars are to run in the suburban districts, and will make another addition to the earning capacities of the roads. The Atlantic Avenue line has entered suit in Brooklyn courts against the Long Island Rapid Transit to compel the latter road to give better service.

THE LYNN & BOSTON June earnings showed an increase of \$10,500 over those of last year. July gross earnings were \$160,000, which is about equal to those of 1893. The company has not yet considered the plan of placing a freight and express line on the road.

Quotations in all street railroad stocks are holding firm, with no fluctuations worth noting.

## Financial Notes.

Chicago Northwestern "L" Mortgages.—The Northwestern Elevated Railway Company and the allied lines which it controls have evidently raised the money to carry out their plans, as shown by the filing last week of mortgages amounting to \$4,500,000. These mortgages run to the Illinois Trust and Savings Bank and are three in number. One places an indebtedness of \$1,500,000 on all the property of the Northwestern Elevated Railway Company, running 50 years and bearing interest at 5 per cent.; the second is for \$1,000,000 on all property of the North Chicago Electric Railway Company, running 20 years and paying 6 per cent. interest; and the third is for \$2,000,000 on all property of the Chicago Electric Transit Company, running twenty years and bearing 6 per cent. interest.

Boston, Mass.—The incorporators of the Boston & Lowell Railway Company have elected the following directors; George A. Bruce of Somerville, Hon. E. Moody Boynton of West Newbury, Hon. Francis W. Breed of Lynn, Harland P. Conant of Somerville, A. H. Mawhinney of Boston, E. L. Sanborn of Boston, J. B. Bell of Boston, W. H. Boynton of New York and Henry W. Moulton of Newburyport. The directors elected Hon. Francis W. Breed of Lynn president, Hon. E. Moody Boynton vice-president and E. L. Sanborn treasurer and clerk. A unanimous vote was passed that application be made immediately to the Railroad Commissioners or to the governor and council for permission to build.

Tiffin (O.) Receivership.—Three of Tiffin's street railways which are embraced in the Tiffin and Intersuburban Consolidated Railroad Company have passed into the hands of Meshech Frost as receiver. The assets are \$150,000 and the liabilities will likely exceed that figure. The appointment of a receiver was made by Judge Norris at the suit of the Cambria Iron Company to secure a claim for \$5,000, but this was merely a form, as the Consolidated, since it failed to float its \$300,000 of bonds in New York City, is hopelessly involved, and the only way out of the difficulty, it is stated, is the sale of all their roads.

Racine Railway Changes.—C. H. Holmes, president and treasurer of the Belle City Street Railway Company, has transferred all of his interest in the road to Jackson I. Case, and Mr. Case in turn transferred all of his interest in the Green Bay (Wis.) Electric road to Mr. Holmes. The latter gentleman will go to Green Bay and manage the road. The value of the Racine road is \$250,000, and the Green Bay road \$150,000.

Sale of Attleborough (Mass.) Railway.—The Attleborough, North Attleborough & Wrentham Street Railway in Attleborough, Mass., which has been in the hands of the receiver and closed for the past six months, has been privately sold to the United Traction Company of Providence, R. I. The price paid is not stated. It is expected that the line will be opened at once under the old management.

Third Street Line, Seattle.—M. F. Backus, receiver of the Rainier Power and Railway Company, has presented to the United States court a statement of the results of operation for the six months ended June 30. The report shows that in that time there was a loss of \$4,056.68 in operating the railway.

Receivers for the Ries Company.—Bernard Weisenfeld and Sylvan H. Lauchheimer have been appointed receivers of the Ries Electric Specialty Company of Baltimore. The application for the receivership was made by the president, Elias E. Ries.

West End Report.—President Little says the West End will close its fiscal year Sept. 30 without floating debt and with \$1,000,000 to the good. He does not think it will be necessary for the company to raise money for two years.

The Westinghouse Electric Company is now employing more than 2,000 hands at Pittsburg and about 700 in Newark, and is turning out its full capacity.

West End Earnings.—The Boston West End Street Railway earnings for July are understood to have made a gain of about \$30,000 over last year.

## NEW INCORPORATIONS.

Boston, Mass.—Ten of the thirteen incorporators of the Meigs Elevated Railway system last week organized the Boston Elevated Railway Company. The following directors were elected: Gen. Charles Whittier, of New York; Gen. Thomas W. Hyde, of Bath, Me.; Willard Howland, of Chelsea, Mass.; Joseph V. Meigs, of Lowell, Mass.; Theodore W. Myers, of New York; Joseph H. O'Neil and George H. Towle, of Boston. Several places on the board will be filled at some future meeting. At a meeting of the directors, which immediately followed their election, Gen. Charles A. Whittier was chosen president; George H. Towle, vice-president; Fred C. Patch, clerk of the corporation; George J. Carney, of Lowell, treasurer; Willard Howland, general counsel; Joseph V. Meigs, chief engineer; Gen. Herman Haupt, consulting engineer. The directors chose General Whittier, George T. Towle and Gen. Thomas W. Hyde members of the executive committee.

Asbury Park, N. J.—The Monmouth Electric Traction Company has filed certificate of incorporation, the incorporators being William W. Conover, Charles C. Parsons, James Enright, Jr., Daniel H. Applegate, William T. Parker, Robert Avery, Joseph W. Robinson, George W. Palmer and Thomas R. Wolley. The capital stock is \$300,000 with \$50,000 paid in, and it is proposed to build and equip a street railroad in Red Bank and from Red Bank to Long Branch and return, making a circuit. The exact route has not been decided upon yet. The central power house will be in Red Bank.

Chicago, Ill.—The Chicago and Suburban Electric Elevated Railway Company has been organized by J. M. Hannahs, Albert Wahl, Fred W. Wolf, Canute R. Matson, Benazette Williams and Michael W. Ryan. The object of the company is to build an electric elevated railroad in Chicago and suburbs, but first of all to secure the necessary frontage consents for a loop for the elevated roads already in existence. The latter is stated as the principal object of the company.

Westminster, Md.—The Westminster and Union Mills Electric Railway Company has been organized by Gov. Frank Brown, George W. Webb, of Baltimore; T. Herbert Shriver, of Union Mills; Charles E. Stewart, John L. Reifsnider, George W. Albaugh, Edwin J. Lawyer, Wm. B. Thomas and Charles C. Gorsuch, of Westminster. The capital stock is \$250,000.

Scranton, Pa.—The Lackawanna Valley Traction Company has been incorporated with a capital stock of \$400,000. The company contemplates the construction and operation of motors and cables or other machinery for supplying motive power to passenger railways. The promoters are Louis A. Watres, Lemuel Amerman, Plummer S. Page, all of Scranton, Pa.

Cohoes, N. Y.—The Cohoes City Railway Company has been incorporated with a capital of \$50,000. It is to operate a railway in the city of Cohoes. The directors are: Urban Weldon, Murry Hubbard, G. W. Lansing, George E. Simmons, John Garside, Herman Kohn, Thomas O'Dea and Hugh Graham, of Cohoes, and J. W. Heimes, of Waterford.

Columbus, O.—The Buckeye Park Street Railway Company has been organized to build a railway to Reservoir Park. The company has applied to the County Commissioners for a franchise. The incorporators of the company are: James H. Anderson, C. B. Cowan, De Witt C. Jones, T. J. Keating, George L. Converse, R. R. Dubois and William H. Simonton.

New York, N. Y.—The Richfield Construction Company (incorporated in West Virginia) has been organized. The company is formed to build, equip and operate steam and electric railroads, etc. The capital stock is \$100,000. The promoters are Horace Moody, A. M. Farnum, G. G. Jackson, W. J. de Rivera, New York City, N. Y.

Upper Sandusky, O.—The Sandusky Valley Electric Railroad Company has been incorporated with a capital stock of \$10,000. The company will build an electric railroad running from Marion to Port Clinton, O. The promoters are: Jno. O. Wirick, R. R. Dumm, F. E. Dumm, C. H. Roppold, Thos. Carroll.

Pottsville, Pa.—The Pottsville Traction Company, with a capital stock of \$300,000, has been incorporated. Following are the names of the promoters: J. L. Kaufman, New Cumberland, Pa.; L. S. Sadler, W. F. Sadler, Jr., Carlisle, Pa.

Pittsburg.—The Pitcairn, Wilmerding & Brad-dock Street Railway Company has been organized with \$21,000 capital stock. The promoters are G. W. Barricklow, Geo. H. Garber, H. L. Castle, all of Pittsburg, Pa.



**Chicago, Ill.**—The Red Line Traction Company has been incorporated with a capital stock of \$500,000. The promoters are R. V. McNellis, Frank Keogh, F. J. Hodgkins.

### NEWS OF THE WEEK.

**Trenton, N. J.**—The South Jersey Electric Street Railway Company opened its line at Point Pleasant last week. The occasion was celebrated by a banquet, and guests from New York, Philadelphia, Jersey City, Camden, Newark and other points were present. The road is a remarkable instance of energy in railway construction. Within three weeks  $2\frac{1}{2}$  miles of track were laid, poles set and equipped with wire and a power plant at the corner of Atlantic and Cincinnati avenues was equipped. The plant has a capacity of 150 H. P. It is equipped with Westinghouse apparatus. The people of Point Pleasant were enthusiastic over the enterprise, and before a wheel was turned \$1,000 was paid into the hands of the treasurer for ticket books. Following is the personnel of the road management: Henry A. Mandeville, president; John R. Weeks, secretary; Frank Brewer, Edward H. Murphy, G. A. Mangold, Benjamin F. Coles and John Hart Brewer, directors.

**Brooklyn Bridge Car Overturned.**—A singular accident happened on the Brooklyn Bridge cable road on Saturday last. A curve plate on the forward truck of the last car of a train broke in two, and a small piece fell on the track and wedged in between a switch rail and a main rail. The forward wheel of the rear truck of the car struck the obstruction, and was lifted up and off the track. The wheel on the other side of the truck was forced over and up on a wooden guard. That tilted the car over on one side, and the first jolt after that tossed it clear over and off the track. It carried with it the latch-up-lever man's house and a ventilator and the shed over the entrance to the engine room. It landed half on its head in the roadway, the forward end resting on the track. There were five passengers in the car, and they received a few slight bruises.

**Philadelphia, Pa.**—The fire which started in the Base Ball Park last Monday spread to car sheds owned by the Philadelphia Traction Company, and caused a loss of about \$2,500. Superintendent Gorman, of the Philadelphia Traction Company, had two trolley towers on the scene, and before the embers of the bleachers and pavilion had ceased to send their smoke over Fifteenth street, men were as work lifting the fallen trolley wires and clearing the tracks. In an hour new trolley wires had been stretched, new ears had been attached to the cross-wires, and the solderers had completed their work, and the line was ready to resume as soon as the engines lingering over the hay fire should take up their hose and depart.

**Chicago, Ill.**—An injunction restraining the Lake Street "L" company from interfering with the structure of the Metropolitan "L" at the crossing on Lake, between Paulina and Page streets, has been issued by Judge Horton. This was applied for by the Metropolitan company, which informed the court in a bill that it had received notice from the Lake Street company that unless alterations were made in the complainant's structure at the crossing it would be removed. The Metropolitan company branch line crosses the main line of the Lake Street "L" at a height of 14 feet. This, the Lake Street company demanded, should be increased to 16 feet.

**Lancaster, Pa.**—The contract for building the projected new electric railway lines in the northern part of Lancaster County has just been awarded by the Pennsylvania Traction Company to a construction company composed of John E. Hubley, Frank H. Steacy, David B. Shenk, of the Hubley Manufacturing Company, Lancaster; H. E. Crilley, Allentown, ex-member of the Legislature and a prominent contractor, and Contractor Trace, of New Jersey. The first line built will be that from Lancaster to Columbia, and the work on this will be commenced without delay. Altogether about 50 miles of new electric roads will be built.

**West Chester, Pa.**—The West Chester & Philadelphia Turnpike Company has procured a charter for an electric railway, and contemplates the construction of a trolley system from Philadelphia to West Chester via Newtown Square, with a branch line from the latter point to Paoli, thence to Green Tree, to Malvern and along the King road to Marmatt, to Indian King, to Whiteland, to Whitford, to Bradford Hills, to Woodbine and to Downington, with a possibility of a continuation to Coatesville and westward.

**Philadelphia, Pa.**—The contract for the building of the Philadelphia, Cheltenham & Willow Grove Electric Railway was recently awarded to William Wharton, Jr. Work was started last week at Rising Sun, the southern terminus of the road, and will be pushed as rapidly as possible out the York pike to Willow Grove, a distance of 12 miles. The line is to be double tracked and built in the most

substantial manner. It is expected to be ready for operation by the beginning of next year.

**Springfield, O.**—The Franklin County Commissioners have granted a franchise for an electric railway to Judge L. D. Haggerty, of Columbus; H. B. Morehead, of Cincinnati, and Judge D. Dwyer and O. B. Brown, of Dayton. The projectors expect to construct a single track road with turnouts from Columbus to the Madison county line, and it is stated \$1,000,000 has already been subscribed. It is announced by Judge Haggerty that work will be begun in a short time.

**Brooklyn, N. Y.**—A Brooklyn paper announces that the Long Island Railroad Company has purchased, or is about to purchase, outright, from the Atlantic Avenue Railroad Company the strip of land owned by the latter company in the center of Atlantic avenue, and with, in some form, the co-operation of the city, build a four-track sunken road down to the South Ferry.

**Kansas City, Mo.**—It has been decided to change the motor power of the Independence dummy line from steam to electricity. The change will be effected during the fall and winter, and cars will be run by electricity next spring. It is probable that the power house will be erected at Washington Park. The line is controlled by the Kansas City Cable Railway Company.

**Peoria, Ill.**—The street car barns on Hansel street belonging to the Central Railway Company of Peoria were destroyed by fire last week. The loss to the company will be about \$10,000. Twenty-nine old cars which have not been in service since electricity was introduced were burned.

**Chicago, Ill.**—The Lake Street Elevated Road's extension ordinance has been signed by the mayor. It is claimed that the road will begin work at once as there is now no legal obstacle in the way of the construction of the extension to Wabash avenue.

**North Versailles, Pa.**—The township supervisors of North Versailles were recently authorized, at a citizens' meeting at Turtle Creek, to grant the right of way for an electric road connecting Brad-dock, Turtle Creek, Wilmerding and Pitcairn.

**Yonkers, N. Y.**—The common council has granted a franchise to the North and South Railroad Company to build an electric surface railroad through the principal streets and avenues of the city.

**Ft. Dodge, Ia.**—At a recent special city election a majority of 354 was returned in favor of granting an exclusive electric light and street railway franchise to home capitalists.

**Hanover, Mass.**—The Hanover Street Railway Company has been granted a franchise for an electric road in Hanover by the Board of Selectmen.

**Keokuk, Ia.**—J. C. Hubinger, who recently purchased the Gate City Electric Railway, proposes to extend the line to Nauvoo, Ill.

**Greenville, Tex.**—The city has granted a franchise for an electric railway to be built on two of the principal streets of the city.

**Chicago, Ill.**—The county board has granted a franchise to the Morgan Park Electric Railway Company.

**Syracuse, N. Y.**—Work has been begun on the Solvay electric line of the Syracuse Street Railway Company.

### PERSONALS.

The Directors of the Consolidated Traction Co. have adopted resolutions on the death of Thomas M. Sayre, superintendent of the Jersey City & Bergen Division. It is stated that "Mr. Sayre's long service with the Jersey City and Bergen Railroad Company prepared him for the promotion to the head of the traffic management of that road, and as Superintendent of the Jersey City and Bergen Railroad Company he maintained its lines in a high state of efficiency when such lines were operated by horses, and when the same lines were operated by electricity under the management of this company he continued the maintenance, and added to his reputation as a street railway superintendent."

H. J. Quigg, superintendent of the New York & New England Railroad, has been selected by the Consolidated Traction Company to succeed D. W. Sharpe as superintendent of the Newark division.

H. N. Ransom, representing the electrical department of the Consolidated Car Heating Company, of Albany, was in New York this week.

H. D. Alexander has resigned as president of the Herkimer (N. Y.) & Mohawk Street Railway Company.

Capt. Allen Tindolph, president of the Vincennes (Ind.) Electric Railway Company, died last week.

Joseph H. Hoadley, of the California Engineering Company, Chicago, is in New York this week.

J. H. Shay, of the Munson Belting Co., Chicago, is in New York.

Charles Wirt, of Chicago, was in New York this week.

### TRADE NOTES.

**Cushing & Morse**, of Chicago, general western agents for Kerite wires and cables, have been much gratified by the report of Professor Carhart, of the University of Michigan, and Professor Jackson, of the University of Wisconsin, who were appointed to test insulated wires at the World's Fair. The letter is as follows:

DEPARTMENT J.—ELECTRICITY.

Exhibitor *W. & R. Briley:* Address *New York,*  
Group 125. Class 769  
EXHIBIT INSULATED WIRE FOR ELECTRIC LIGHT SERVICE  
AWARD.

1st. Highest excellence in insulating qualities.  
2d. Durability of insulation under conditions found in commercial service.  
3d. Uniform high excellence in mechanical qualities of insulation.

NOTE.—This report is based upon the results of exhaustive tests approximating the various conditions to be met with in practice by insulated wires in electric light service.

(Signed) D. C. JACKSON, Individual Judge.  
Approved, HENRY S. CARHART,  
Pres. Departmental Com.  
Approved, JNO. BOYD THACHER,  
Chm. Executive Com. on Awards.  
(Dated June 30, 1894.)

The tests to which the insulated wires were submitted were as follows:

1st Test.—Breakdown Test, using Westinghouse 2,000 volt alternating current in connection with Westinghouse step-up transformer.

2d Test.—Continuous high pressure—5,000 volts—wires run in ordinary water.

3d or Soak Test:

1st. Solution 10 per cent. sulphuric acid.  
2d. Solution 10 per cent. ammonia.  
3d. Solution saturated solution lime.  
4th. Subway refuse dissolved in Chicago hydrant water.  
5th. Subway Chicago hydrant water.

The Mather Electric Company, of Manchester, Conn., reports that it now has on hand more work than at any time for the last 18 months. The recent sales of its standard belted and also of its new direct connected apparatus for lighting work have been very large, necessitating a large addition to the working force in their works at Manchester. The company reports a very good business throughout the Western and Central States, in which territory it is represented by J. Holt Gates, of 1140 Monadnock Building, Chicago. The company has met with much success in the introduction of its new multipolar generator for electric lighting and for electric railway work. The company has contracts for the installation of a number of these generators, some of which are of very large capacity, for railway work.

Charles A. Schieren & Company, of New York, have recently made the following sales of belt electrical plants: Citizens' Electric Illuminating Company, Brooklyn, N. Y., two 46-inch double belts; City and Suburban Railway Company, Baltimore, Md., two 54-inch double perforated electric belts; Allentown Electric Light and Power Company, two 54-inch double belts; Lake Roland Elevated Railway Company, Baltimore, Md., one 37-inch double belt; Lindell Street Railway Company, St. Louis, two 55-inch 3-ply perforated electric belts.

The Berlin Iron Bridge Company, of East Berlin, Conn., is furnishing the iron roof for the new boiler and dynamo room for the Larchmont Electric Company, at Mamaroneck, N. Y. The Geo. W. Helme Company, at Helmetta, N. J., has placed the contract for its new roasting house with the Berlin Iron Bridge Company. The roof will be covered with the Berlin Company's patent anti-condensation corrugated iron roof covering.

Car Contract Awarded.—The Hestonville & Mantua Railway Company, of Philadelphia, has awarded the contract for the trolley cars to be used on Arch street to the St. Louis Car Company, the cars to be delivered before October 1st.

J. H. Bunnell & Co., of 76 Cortlandt street, New York, have just issued a new catalogue devoted to electric railway supplies. The catalogue is fully illustrated and many new and interesting devices are illustrated.

The Eastern Electric Cable Company, of Boston, is not only running a full force of hands all day, but is compelled to work three evenings every week, to keep up with Clark wire orders.

The Consolidated Car Heating Company, of Albany, has closed a contract for supplying the Poughkeepsie & Wappinger's Falls Railway Company with electric heaters.

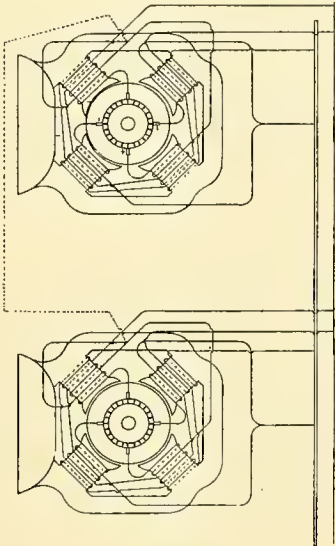
The National Tube Works has resumed work in all departments of the McKeesport mill, and the company has a good supply of orders on hand.



# RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued July 31, 1894.

**523,653. Insulating Block;** Henry P. Ball, Bridgeport, Conn., Assignor to the General Electric Company of New York. Filed May 21, 1894. This is an insulating trolley guard wire block formed in sections having on each of their meeting faces a longitudinal groove for the guard wire and semi-circular opposing projections and recesses with extensions parallel with the guard wire groove, on their meeting faces and on opposite sides of the guard wire grooves, the projection and its extensions on one face fitting into the opposing recess



No. 523,653.

and its extensions on the opposite face, and span wire grooves on the exterior of the blocks transverse to the guard wire block.

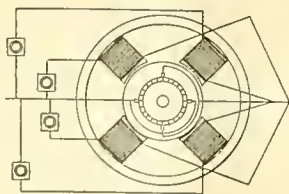
**523,660. Fare Register for Street Cars;** Edmund H. Duchemin, Newburyport, Mass. Filed May 8, 1893. This device consists principally in the combination of a curved oblong case, a curved oblong dial plate therefor, having the circular dial scales of the continuous permanent registering mechanism on one end, a curved oblong slot for sighting the trip indicating disk in the opposite end, the curved oblong dial scale of the detachable trip registering mechanism in the center, between the circular dial scales and the curved oblong sighting slot; a slot in its longitudinal center, for the passage of the detachable trip registering hand therein a continuous permanent registering mechanism of the character herein described, the axes of the registering hands thereof being the common center of the circular dial scales, and a detachable trip registering mechanism in working connection therewith, having a curved oblong trip dial scale.

**523,663. Commutator for Dynamo Electric Machines;** Joseph Hoffman, Schenectady, N. Y., Assignor to the General Electric Company, Boston, Mass. Filed Dec. 21, 1893. This covers the process of insulating commutator bars, which consists in molding the insulating material thereon so as to make it firmly adherent thereto.

**523,668. Dynamo Electric Machine or Motor;** Walter H. Knight, Lynn, Assignor to the General Electric Company, Boston, Mass. Filed Jan. 9, 1894. 1. reads as follows: "The method of equalizing the potential of armatures running in multipolar fields, which consists in varying the magnetism of the poles in greatest proximity to the armatures proportionately to the increased electromotive force generated therein by such approximation." (See illustration.)

**523,683. Life-Guard for Street Cars;** George A. Parmenter, Cambridge, and Charles S. Gooding, Brookline, Mass., Assignors to the Parmenter Car Fender Company, of Maine. Filed Feb. 23, 1894. This is a life-guard consisting of a scoop pivoted so as to swing vertically, and having its forward edge several inches above the track in its normal position, combined with a rod, connected to the scoop, and supported in a bearing on the under side of the car, said rod having a stud or projection therein, against which an upward extension of a pivoted gate or framework impinges, whereby the rod is pulled forward when the frame is swung backward.

**523,685. Armature for Dynamo-Electric Machines;** Henry G. Reist, Lynn, Assignor to the General Electric Company, Boston, Mass. Filed Sept. 15,



No. 523,685.

1893. In the armature covered by the patent a closed winding is formed into coils extending in a plurality of series more than once around the armature and connected to alternate sections of a commutator, so as to connect each section of the commutator to a plurality of other sections thereof; thus forming a plurality of ranges of coils, each range of coils acting in series, and the several ranges acting in multiple.

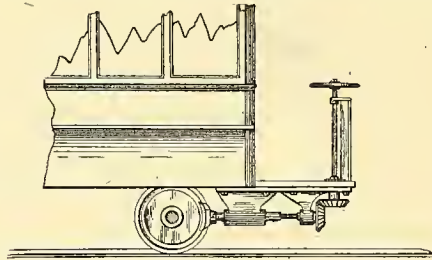
**523,689. Process of Making Secondary-Battery Plates;** William L. Silvey, Dayton, Ohio. Filed Sept. 22, 1892. The process consists in immersing anodes and cathodes in a solution containing a combination of acetic acid and potassium, subjecting the anodes and cathodes to the action of the electric current while in this solution whereby the anode is oxidized and deposited upon the cathode in a metallic state, then removing the cathodes from the depositing bath and compacting the deposit and then washing them in water and then placing them into a solution of sulphuric acid and water and charging them with an electric current whereby positive electrodes are produced.

**523,693. Car Fender;** Edgar Thomas, Pittsburg, Pa. Assignor of one-half to Philip M. Amberg, Allegheny, Pa. Filed Feb. 24, 1894. The fender comprises a fixed member consisting of two sides or pieces and tie rods or cross bars connecting said sides or pieces, a movable member consisting of side frames pivoted to the sides of the fixed member, means to connect the side frames of the movable member, a hanger to support the pivoted member, and a cushion acted upon by the movable member.

**523,695. Electro-Expansion Device;** Elihu Thomson, Lynn, Mass., Assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Nov. 23, 1887. This is the combination of a closed receptacle entirely filled with expansible liquid, and provided with a yielding wall or side, a heating coil arranged around the exterior of said receptacle, and a non-conducting case or cover inclosing said receptacle and its surrounding coil.

**523,696. Dynamo-Electric Machine;** Elihu Thomson, Swampscott, Assignor to the General Electric Company, Boston, Mass. Filed March 19, 1894. The sixth claim reads: "In a dynamo-electric machine having a number of pairs of poles, a multiple-wound armature, field magnets and series windings thereon arranged and adapted, as herein described, to adjust the strength of the weaker poles in accordance with the increase of electro-motive force generated in the armature by its approximation to other poles." (See illustration.)

**523,697. Arc-Rupturing Device;** Gardner T. Voorhees, Boston, Mass. Filed May 8, 1893. This is the combination in arc-rupturing apparatus of electrodes or terminals with an insulator supporting the electrodes

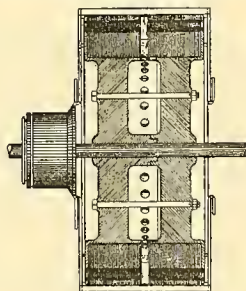


No. 523,763.

or terminals; and circuit looped inclusively around the terminals and supported by the insulator.

**523,701. Automatic Circuit-Closer;** Joel W. White, Providence, R. I., Assignor of one-half to Ashbel T. Wall and George A. Wall. Filed March 11, 1893. This covers in combination a case; a coiled spring; its inner support within and near the middle of the case; its outer support outside of the case, and an electrode insulated from and within the case.

**523,724. Electric Switch;** George E. Lintoo, Worcester, Mass. Filed March 22, 1894. The patent covers the combination of a switchboard, binding posts having tapering walls ending in a groove, L shaped springs provided with apertures in their middle portions, threaded screw holes in the bottom of the recesses between the walls of the binding posts, tapering headed



No. 523,724.

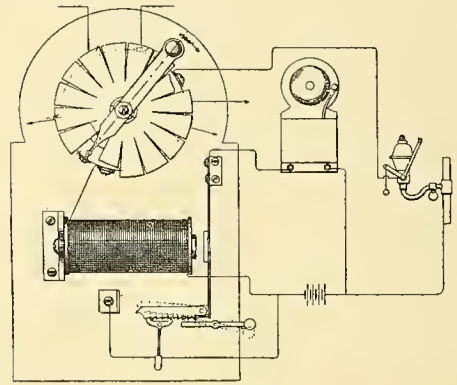
screws to secure and adjust the springs between said walls, and a tapering milled surface lever blade pivoted at one end to the switchboard, and having cut away portions at the other end, and blade portions to contact with the U-shaped springs on the binding posts.

**523,758. Galvanic Battery;** Charles E. Buell, North Plainfield, N. J. Filed Dec. 21, 1894. This is a gravity battery consisting of a vessel charged with undissolved sulphate of copper and water and provided with a copper electrode and an iron electrode.

**523,763. Car Brake;** John T. Duff, Pittsburg, Pa. Filed Feb. 20, 1894. This is a combination consisting of a disk attached to the axle of the car, the frame beneath the floor of the car and in line with the said disk suitable bearings formed integral with said frame, shafts arranged in said bearings, the one connected to the other by means of screw threads, a brakeshoe holder attached to the larger shaft, and a bevel gear attached to the smaller shaft, the gear in mesh with the gear and attached to a vertically arranged shaft fitted with an operating wheel, all arranged and combined for service. (See illustration.)

**523,776. Armature for Dynamo-Electric Machines;** Horace E. Parshall, Lynn, Assignor to the Thomson-Houston Electric Company, Boston, Mass. Filed Jan. 31, 1894. The armature core comprises two or more sections separated from one another so as to afford ventilating spaces there-between, and channels in said sections leading through said ventilating spaces to the outer surface of the core. (See illustration.)

**523,779. Alternating-Current Generator;** Edwin W. Rice, Jr., Swampscott, Assignor to the General Electric Company, Boston, Mass. Filed July 25, 1893. In a generator for two-phase electric currents, the combination with a separately excited field coil, of an auxiliary field coil connected to the brushes of a current rectifier in circuit with both phases or impulses of current, whereby the field is variably excited in accordance with the work.



No. 523,865.

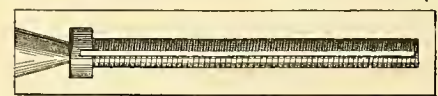
**523,805. Electric Converter;** John A. Cahot, Cincinnati, O., Assignor of two-thirds to Frank H. Kirchner and Henry M. Ziegler, same place. Filed Sept. 22, 1893. The converter shell consists of a series of soft metal plates, placed one upon another and pierced with cruciform slots, in combination with a number of readily detachable H shaped cores, wrapped with insulated, primary and secondary wires, and inserted within said slots, heads applied to the ends of said shell, and fasteners that retain said heads in place.

**523,822. Electromagnetic Reciprocating Pump;** Charles J. Van Depoele, Lynn, Mass.; C. A. Coffin and Albert Wahl, administrators of said Van Depoele, deceased, Assignors to the Thomson-Houston Electric Company, Boston, Mass. Filed Dec. 12, 1891. The third claim reads: "The combination with a continuous current generator having a stationary main positive and negative commutator brushes of a pair of auxiliary brushes adapted to be moved upon said commutator toward and away from the stationary brushes, a double-acting electromagnetic brush shifting engine and mechanical connections between the engine and the movable brushes, an electromagnetic reciprocating pumping engine having a continuous current coil or coils in circuit with the stationary commutator brushes of the generator and alternating current coils in circuit with the moving commutator brushes, and a switching mechanism actuated by the moving part of the pumping engine and connecting the switch to the brush shifting motor, whereby the reciprocations of the pumping engine alternately open and close the circuits of the brush shifting motor."

**523,865. Testing Device for Electric Circuits;** George A. O'Neill, Boston, Mass. Filed Oct. 20, 1893. Claim 5 reads as follows: "A series of main circuit terminal contacts, an insulating base to which they are secured, a generator, and a radially slitted contact plate in circuit therewith and with said series of terminal contacts, combined with a manually operated common circuit breaker adapted to be moved to cooperate with said contacts one by one successively to thereby cut out any desired one of the corresponding main circuits at will." (See illustration.)

**523,921. Guard for Street Railways;** William T. Vose, Newton, Mass. Filed Aug. 19, 1893. This is a swinging fender having means substantially as described for forcing it to its limit of forward and upward movement and provided with an automatically detachable holding mechanism normally holding said fender against the action of said means at a point midway of its limits of up and forward and back and down movements. (See illustration.)

**523,930. Fare Register;** Leo Ehrlich, St. Louis, Mo. Filed Sept. 20, 1893. This register is the combination of a trip register, two or more permanent registers, means for connecting the trip register at will with either one of the permanent registers, and a single handle or operating device for actuating the trip register and controlling its connection with the permanent registers, whereby said device may be operated to ac-



No. 523,919.

tuate the trip register and either one of the permanent registers at will.

**623,919. Method of Making Stiffened Connectors for Secondary-Battery Plates;** William L. Silvey, Dayton, O. Filed Aug. 25, 1893. The method consists in loosely placing a rod or core of high electrical conductivity in a mold, the core resting on the bottom of the mold and then filling the mold with molten metal of low electrical conductivity and of greater specific gravity than the metal of the core. (See illustration.)



# Street Railway Gazette.

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**Ohio Railway Projects.** A report from Ohio which is published in another column shows that there is great activity among street railway projectors, and is sufficient to convince the worst croaker that the outlook is growing brighter.

**More Room for the Motormen.** The tendency seems to be in the direction of isolating the motorman on electric cars. The move is in the right direction. Perhaps not a few accidents have been due to the fact that the motorman has not had room enough to operate his car quickly or that his attention has been distracted by the questions or movements of passengers.

**Trolley Mail Cars.** The new electric railway mail cars are now in regular operation in Brooklyn, and the postal authorities are convinced that their introduction will greatly facilitate the distribution of mail between Brooklyn and Coney Island. The cars will make four trips daily. The first trip from Brooklyn to Coney Island took sixty-six minutes and the return trip was four minutes shorter. The cars are extremely ornamental in appearance, being painted white with gilt lettering. The rear of the car is set apart for the accommodation of smokers, while the front portion is equipped like the typical railway mail car. The postal authorities in Chicago are much interested in the new system introduced in Brooklyn, and it is not unlikely that cars of this kind will be operated in that city. Representatives of all the cable lines in the city met Postmaster Hering several weeks ago and expressed their willingness to cooperate in a scheme by which the street-railway systems might be used in the distribution of mail.

**Municipal Ownership Proposed in Milwaukee.** The City Council in Milwaukee has adopted resolutions which favor the purchase of the local street railway company's property by the city. Little is likely to come of the agitation, and the movement may be regarded as a reprisal against the company because it does not quietly submit when its taxes are trebled despite the fact that its income is several hundred dollars a day less than a year ago. The most convincing argument against the municipal ownership of railways is to be found in the fact that cities are confessedly incompetent to transact the business with which they are now intrusted. They certainly are not so successful in any line of activity that the sphere of their duties should be enlarged so that it will include the difficult undertaking of managing street railway systems. Municipal ownership is earnestly advocated in Detroit by Mayor Pingree, who has distinguished himself by his persistent attacks on the local street railway system. Yet this is the result of the experiment with a municipal electric light plant, according to the *Detroit Tribune*: "After the lapse of one year the city finds itself with an elaborate white elephant on its hands. The people cannot fail to realize that the creation of the new department has simply increased the opportunity for more wrangling in the city government, and the facility with which private parties may control public affairs to suit themselves." If a city cannot manage so simple an enterprise as an electric light plant what would it do with a complicated street railway system?

**Electric Motors and Locomotives.** Although the experience of the City and South London Company has been frequently referred to as proving the success of electric locomotives, that company is anxious to discard its present equipment, and substitute motors on the car axles. The company desires to make the change in order to increase the room for passengers in its trains. The matter was referred to in the report presented at the recent semi-annual general meeting. This statement was made by the chairman: "We have been considering carefully the question as to whether it would be possible to do away with the existing locomotives by substituting motors on the train itself. This, I may tell you, is the idea we started with originally, but we adopted the separate locomotives in deference to the views of the Board of Trade, and for other special and weighty reasons at the time. We have, however, now got this line into such working order that we think it may be possible to revert to our original intention of putting motors on the carriages instead of having separate locomotives. This would give us the necessary room at King William street station to add to the trains another coach. Unfortunately we do not yet know whether we shall be able to carry our idea out. We are making experiments, but the difficulties arising from the smallness of the tunnels, and other matters, render it at present somewhat dubious whether the proposal will be practicable. I believe we shall find means of effecting the improvement, and, if so, as I have already remarked, we shall be able to accommodate a larger number of passengers by each train."

**Remedy for Electrolysis.** D. C. Jackson, whose valuable paper on electrolysis is concluded in this issue, does not believe that we must come to the double trolley in order to avoid the corrosion of buried pipes. His paper summarizes the results of an elaborate investigation to determine what chemical action actually takes place when pipes are electrolyzed by currents leaking from street railway circuits. He concludes that while the double trolley would avoid the greater proportion of evils, this result may be equally well accomplished by the proper construction of the single trolley system. He makes the suggestive remark that "if single trolley systems were really well built, less talk of double trolley systems would be heard." Mr. Jackson is not the only one who holds to this opinion. The conviction is growing that much of the electrolytic trouble is due to careless and slovenly construction. As a partial remedy Mr. Jackson says:

"Connecting the pipes and rails with heavy cables at points where the former are positive to the latter, proves the most complete method of prevention. The conductivity of the track circuit must be properly reinforced by feeders, so that an undue drop is not experienced in the return conductors. These track feeders should always be insulated and put on the lines exactly as are overhead feeders, in order to save them from corrosion. The connection of pipes and rails has been practically carried out in Milwaukee, Wis., at a cost of about \$8,000, and has apparently done away with the trouble, and has at the same time decreased the resistance of the return circuit." The question may be asked, however: Will cities generally allow the connection of its pipes to the rails?



### NEW FACTORY OF THE SIEMENS & HALSKE COMPANY.

The Siemens & Halske Electric Company, has leased the Grant Locomotive Works, in Cicero, a suburb of Chicago, and is prepared to resume the manufacture of electrical machinery. The factory which it has been occupying was completely destroyed by fire on the night of August 1st, and all the valuable machinery which it contained was ruined. It was fortunate, however, in saving its patterns and drawings, so that it was prepared to resume work as soon as a suitable location could be found. The company had recently been awarded a number of large contracts, notably that for the electrical equipment of the North and West Chicago Street Railroad Companies, and as it was determined not to abandon them, it was necessary that a manufactory should be secured at once. It was found that the plant of the Grant Locomotive Works offered excellent facilities. The machine shop and foundry have large electric traveling cranes, and the foundry is of modern make and equipped with all the latest time and labor saving devices. The other shops are fitted up in like manner. The necessary machinery incidental to special work has been ordered, and will be delivered within a few days.

The Grant works were under the control of a receiver, and it was necessary to secure an order of court for the lease of the property. The rental was fixed at \$12,000 per year.

The report has been current that back of the lease to the company was a consolidation of the Grant Locomotive Works, the Wells-French Car Company; and the Siemens & Halske Electric Company; and the report was generally credited. Mr. Mysenburg, president of the Wells-French company as well as the Siemens & Halske company, made the following statement regarding the report:

"There is in contemplation the consolidation of several interests, but this cannot be effected without the approval of persons holding large interests who are at some distance from Chicago. Reports to the contrary notwithstanding, the Wells-French company is building cars, and will continue to build cars, at its present plant. The only part of the plant of the car works which was destroyed by fire was the foundry. Fortunately we had all the wheels and castings for the cars under construction finished prior to the fire, so that the order is being pushed through. Since the acquisition of the Grant Locomotive Works by the Siemens & Halske company, it will be in position to do the casting for the car company, so that the want caused by the fire will be supplied."

The Siemens & Halske company is now taking contracts in view of the new arrangement, and is preparing to employ its old force of men at once. The fire threw 600 hands out of work, but fully that number will be hired when the company resumes. The loss suffered by the company in the conflagration Aug. 1 was at first estimated above \$400,000, but insurance and the discovery that plans and patterns were saved brought the loss down to \$225,000.

### MEETING OF QUEEN & CO.'S CREDITORS.

A meeting of the creditors of Queen & Co., who made an assignment to John G. Gray, was held Monday to consider a proposition for the settlement of their claims. J. Levering Jones, counsel for the assignee, made the following statement of liabilities and assets: Bills payable, \$90,000; merchandise account, \$45,800; sundries, \$3,500; S. L. Fox, \$49,000. The assets were given in these two items: Merchandise and plant, \$424,168; cash and book accounts, \$45,734.30; total, \$469,902.30.

The assignee announced through Mr. Jones that the house would pay 100 cents on the dollar if given time. The expenses had been materially reduced, and every effort is being made to sell the large stock advantageously. It was decided to appoint a committee of creditors and have the members act in conjunction with the assignee. If they believe that it would be wise to accept a proposition to pay 100 cents on the dollar in three years without interest, they are to sign a paper to that

effect, to be submitted to each individual creditor. Under the resolution the creditors bound themselves to abide by the decision of the committee.

The following committee was appointed: A. C. Wood, Samuel J. Megargee, Henry M. Sheip, William H. Rhawn and Mr. Bodine.

### OHIO STREET RAILWAY PROJECTS.

If one were to judge by the reports, it would seem as if hard times were not materially affecting street railway projects in Ohio. A correspondent in Columbus writes as follows regarding the increasing number of electric railway projects:

The depressed condition of business has apparently made very little difference with the projecting of electric railroad lines throughout the country districts of Ohio. It has doubtless lessened the number that are being brought to completion, but even with this reduction it is remarkable how many new roads are coming into existence. There is scarcely a week that some new project in central Ohio is not mentioned. Some of the proposed lines are very ambitious, and will not come to fruition until times are better and confidence greater.

Among these is the proposition to build a line from this city to Cincinnati. The plan is more than an air-castle, however. The road is already partly constructed, I am told, from Cincinnati to Dayton, and the right of way has been secured through some of the counties between this city and Dayton. This is the largest project of the kind that has thus far been seriously broached in this State. It is not likely to be completed very soon, if some of the expressions that have been heard from experienced street railroad men are any criterion of the opinion of the investment public. There are difficulties in securing the right of way through some of the counties which may be a hindrance, even if all the money needed is forthcoming. The road, like all that have been built through the country districts of Ohio, is intended to be used for carrying freight and passengers, as well as mail and express matter.

The number of lines projected about this city is especially large. No less than 11 electric roads are under consideration in this vicinity. They radiate from the Capital City like the spokes of a wheel and aim to connect it with all the surrounding towns. One of the most interesting, because of the historic associations that are called up by it, is the projected line along the old National Road that in the early days of the State was the great highway between the East and the West. It was built by the general government, and 40 years ago scores of thriving villages were scattered all along the Old Pike from Wheeling to this city. When the steam railroad came, however, the stage route passed away, and there are to-day a score or more old towns that are absolutely dead, which two-thirds of a century ago were rivals of Akron and Springfield and Dayton in population and prospects.

### WORK OF THE NASSAU COMPANY IN BROOKLYN.

The Nassau Electric Railway Company is making rapid progress in the construction of its new system in Brooklyn. The road is completed on Thirty-ninth street from the ferry to Church avenue in Flatbush, along Church avenue to the park driveway. Work has been done on Church avenue the other side of the parkway, and the rails are laid and the wires up as far as Rogers avenue, and thence along Rogers avenue to Bergen street. The company has made an agreement with the Atlantic Avenue Railroad to tear up its tracks on Bergen street, from Rogers avenue to Nostrand avenue, and with the Brooklyn Heights Railroad to tear up its tracks on Nostrand avenue, from Bergen street to Atlantic avenue, and in both places to replace them with its own electrically welded rails. The company also has poles on Marcy avenue for its entire length ready to put in position as soon as the rails are in place. Work has been started in the eastern district, on Johnson and Morgan avenues, on the Evergreens Cemetery line. On the line to Canarsie, 1,000 feet of double track has been completed from Canarsie toward the city. All the foundations of the power house are completed, and work is about to be started on the superstructure. A car house on Thirteenth avenue is also nearly in readiness. If the road is ready to be operated before the power house is finished arrangements will be made with

the Atlantic Avenue and Coney Island and Brooklyn Railroad for the use of power from their stations. It is now expected that some of the lines will be in operation by the middle of September.

### PROPOSED MUNICIPAL OWNERSHIP IN MILWAUKEE.

One of the results of the controversy growing out of the trebling of the assessment of the Milwaukee Street Railway Company is a movement for the purchase of the street railway property by the city. The matter was brought up at a recent meeting of the City Council and these resolutions were adopted:

"Whereas, The assessment for the taxation of the Milwaukee Street Railway Company has been fixed at the sum of \$2,800,000; and

"Whereas, The vice-president of that company has publicly declared that assessment to be unfair and unjust and largely in excess of the real value of the property and franchises belonging to said company; and

"Whereas, A large proportion of the taxpayers of the city of Milwaukee believes that the street railway system of this city should be owned and operated by the municipality, and it is believed that the present would be a favorable time to acquire said street railway system, which is now owned by said corporation; therefore be it

"Resolved, That a committee of five members of this Common Council, who, together with the city comptroller and city attorney, shall constitute a special committee for the purpose of ascertaining if the present street railway system, with its adjuncts, the electric lighting plants, can be purchased and at what price and on what terms, and report the same to the Common Council at its earliest convenience.

"Resolved, further, That it shall be the duty of said committee to also report to the council how the money necessary for such a purchase can be raised, and what, if any, legislation is necessary to accomplish such result."

### CLAIMS AGAINST STREET RAILWAYS.

Auditor Calderwood, of the Twin City Rapid Transit Company, of Minneapolis and St. Paul, recently made the following statement concerning the claim department of the company:

"Our claims department requires the services of five clerks, and occupies the time, all told, of 10 employees of the company. If a claim seems to be a valid one we always make an offer for settlement, and the offers are generally accepted. That saves the claimant the expense of a suit, and if a fair offer is made them they are generally glad to avoid the publicity and the uncertainty of a suit. You have no idea, nor has the public, how many cases there are in which the street railway company is liable, where a steam railway company would not be. You see, we have no right of way, and are practically liable for all accidents which occur, which cannot be shown to be due to the carelessness of the person suffering injury. If a steam railway company injures a man or his property anywhere between the regular crossings, the injured have no redress, for they are trespassers in being on the right of way.

"Our claims department has to take care of a vast amount of matter in the way of correspondence, and disposes of a vast number of cases. We paid out over \$100,000 last year upon claims for damages, and the business grows every day. The cases which are tried are usually the cases of those who have the least justice in their claims. There is a gang of lawyers in this city who could not live except for these cases. They make their living by trying to bleed the company, and the skill with which they conduct their methods of legal robbery is surprising. They are sharpers and know how to make a case out of nothing."

Morristown, N. J.—Civil Engineer Fred S. Smith has been engaged by a company of capitalists, many of them from Morristown, to make a survey for a street railway. The line will begin at the Lackawanna Railroad station, running up Morris street to the park, along the south side of the park to South street, then along the westerly side of Park place to and through Washington street to Mills, through Mills street to Sussex avenue, and from Sussex avenue the line will run down Speedwell avenue and along the easterly side of the Park, connecting with the line running up Morris street. Mr. Smith began work on Wednesday and is pushing it right along!







**THE CORROSION OF IRON PIPES BY THE ACTION OF ELECTRIC RAILWAY CURRENTS.\***

BY D. C. JACKSON.

II.

Owing to the doubt which exists as to what minimum voltage is required to induce electrolysis of water pipes by the railway current, a series of determinations was made by means of the electrolytic cells. The iron electrodes were inserted in clean glass sand 1.5 centimeters apart, and had about 20 square centimeters exposed area. In the first cell a 1 per cent. solution of nitrate of soda was used with a voltage of 1.2. As before, the hydroxide layer was formed. The electrolytic action was plain without any other tests. In the following cells, the existence of action was shown by chemical tests for the iron salt and the alkali hydroxide. In the second experiment, a 1/2 per cent. solution of nitrate of soda was used with 5 volts. The action was at once apparent.

Cell 3. Pressure .125 volt.....	Action in 3 mb.
" 4. " .125 " " " " " " " "	" 5 "
" 5. " .125 " " " " " " " "	" 5 "
" 6. " .05 " " " " " " " "	" 49 "
" 7. " .013 " " " " " " " "	" 50 "
" 8. " .005 " " " " " " " "	" 1 hr.

In cell 8 the hydroxide layer began to be apparent after one hour.

Cell 9. Pressure .001 volt 1/4 per cent. solu.....	Action in 1 hr.
" 10. " .01 " " " " " " " "	Action in 4 hrs. 45 min.

Cell 10 the electrodes were 20 mm. apart and were 40 mm. by 68 mm. in exposed surface. The electrolyte was street soil.

A surprisingly low voltage produced an appreciable electrolysis in the sand cells. The pressure on cell No. 10 might undoubtedly have been reduced to a millivolt without stopping the corrosion, but the resistance of the soil was so high and the percentage of soluble salts so low that the time necessary to produce action would have been considerable. A millimeter showed a barely perceptible reading in the case of the experiments in which very low pressure was used. The observations plainly show that a mere directive force is necessary to produce electrolysis, and the corrosion is simply a question of current.

It is impossible to give in a reasonable space even a summary of the great number of experiments which were made, but the following conclusions are directly drawn from them:

1. In no case is the action due to the electrolysis of water; where oxygen is liberated at the anode, it does not attack the iron.
2. Only a mere directive force in the nature of a pressure will cause electrolysis.
3. The actual corrosion is therefore only dependent upon the actual current which flows, and is as much dependent upon the resistance of the soil as upon the pressure tending to cause the current.
4. Only a minute quantity of soluble salt is sufficient to start the action, and it will then continue as long as a current flows.
5. The gravity of a corrosion of a pipe depends on the amount of current flowing from a given area and the nature of the salts present in the soil, the order of the activity of the salts being: (1) chlorides, (2) nitrates, (3) sulphates.

The following table gives the average loss of iron from the anode per ampere-hour due to different salts and mixtures of salts. It must be remembered that the cathode or negative pole in no case showed a gain, but generally showed a slight effect due to simple oxidation.

Electrolyte:	Loss per ampere-hour.
Street soil from a certain place.....	.8 gram
" " " Madison Electric Ry. route.....	1.16 "
" " " " (clay).....	1.14 "
" " " in front of Madison power sta. ....	.91 "
Sand with Na <sub>2</sub> SO <sub>4</sub> .....	1 gram
" " KNO <sub>3</sub> , 1/2 per cent. solution.....	.66 "
" " NH <sub>4</sub> Cl " " " " " " " " " " " "	1.03 "
" " KNO <sub>3</sub> " " " " " " " " " " " "	1.38 "
" " NH <sub>4</sub> Cl " " " " " " " " " " " "	1.084 "
" " KNO <sub>3</sub> " " " " " " " " " " " "	.921 "
" " NH <sub>4</sub> Cl " " " " " " " " " " " "	1.314 "
" " KNO <sub>3</sub> " " " " " " " " " " " "	.887 "
" " KCl " " " " " " " " " " " "	1.346 "
" " NaNO <sub>2</sub> " " " " " " " " " " " "	1.299 "
" " NaCl " " " " " " " " " " " "	1.299 "
Average loss of chloride cells.....	1.335 "
" " " nitrate cells.....	.892 "
" " " sulphate cells.....	.66 "

\* Read before the Western Society of Engineers, July 11, 1894.

The averages emphasize the fact that the chlorides produce the greatest losses of metal, nitrates coming next, the sulphates last, the mixtures in an intermediate place. This seems to show that the power of the acid radical to corrode varies in general as the activity of the corresponding acids.

In I. H. Farnham's paper on "The Destructive Effects of Electrical Currents on Subterranean Metal Pipes," which appeared in the Transactions American Institute Electrical Engineers in April, 1894, the statement was made that when the current was reversed every minute extending over a period of 10 days, no material change took place in either during that time. Our experiments have shown that only the positive plate or anode is affected by the electrolytic action which occurs under practical conditions, and hence we should expect that when the current is frequently reversed both plates will be corroded, since they are alternately positive, unless the frequency of reversal is too rapid for chemical action to occur at all. In order to ascertain the effect of such reversals, the following experiments were performed: An electrolytic cell was run containing a weak solution of nitrate of soda. The period of reversals ranged from 15 seconds to five minutes, the current flowing being .04 ampere under a pressure of three volts. After a few of the quarter-minute reversals, the presence of the iron salt was detected at both plates of potassium ferricyanide tests. On prolonging the periods the iron reaction diminished at one plate and increased at the other during the same period, and *vice versa* in the following period. When the period of reversal reached 2 1/2 minutes the electrolytic effect was very evident, the iron salt disappeared at one of the plates with each reversal, giving way to alkalinity. The experiments showed that the minimum period of reversal during which corrosion goes on must be below 15 seconds, which makes the prevention of corrosion by reversals entirely impracticable from this cause alone.

The problem of preventing the destructive electrolytic effects upon iron pipes of the railway return current is shown to consist simply of the prevention of electrolysis of the salts in the soil when the products of electrolysis are of such a nature as to attack iron. It is a problem that requires a careful study of the local conditions in each case before it can be satisfactorily solved. I am quite confident, however, after carefully studying many cases of corrosion and applying the conclusions of these experiments, that there are very few places where the difficulty cannot be avoided by proper construction and arrangement of return circuits. This can ordinarily be done at a comparatively small expense, and with a resulting advantage to the operation of the railway. Some of the conditions that exert the most marked influence upon the corrosion are, the nature and amount of the soluble salts in the earth, the resistance of the earth itself in the locality, and the electrical pressure between rails and pipes. High pressure differences do not necessarily imply a high degree of action, as is shown by the condition of the Madison water pipes. Here as much as seven volts is found between the rails and the pipes in front of the power station, and yet only a very small amount of corrosion is shown after 1 1/2 years' time. Evidently the resistance of the path here must be very high or the quantity of soluble nitrates, chlorides or sulphates is extremely small. The fact that a special and ingenious voltmeter made to measure the amount of current showed but .0003 ampere flowing leads to the former conclusion. On the other hand, with the favorable conditions of a low resistance path between the pipes and rails and a relatively large amount of soluble salts in the earth, there is no doubt that serious electrolytic effects may be produced where a quite small difference in pressure exists between the pipe and rails. The extent of the railway system does not always offer a guide to the destructive influences of the return current. Mr. Farnham, in his paper previously referred to, mentions a small road in Rockland, Me., where

much damage was done to pipes in five months, while the system in Madison, which is probably fully as extended, shows up to date (a period of nearly two years) a barely appreciable action.

The use of alternating currents which produce no appreciable electrolysis would avoid all difficulty, but their use for driving street railway motors is not, up to the present time, an assured success.

The use of a double trolley system of conductors would also avoid the major portion of the difficulty, but I believe it can be equally well avoided by proper construction where the usual single trolley systems are used. This is not a question which has a real bearing upon the discussion of single versus double trolley systems. If single trolley systems were really well built, less talk of double trolley systems would be heard. One great advantage of double trolley construction lies in the absolute certainty of its failure if the insulation of the lines is not excellent. Connecting the pipes and rails with heavy cables at points where the former are positive to the latter, proves the most complete method of prevention. The conductivity of the track circuit must be properly reinforced by feeders, so that an undue drop is not experienced in the return conductors. These track feeders should always be insulated and put on the lines exactly as are overhead feeders, in order to save them from corrosion. The connection of pipes and rails has been practically carried out in Milwaukee, Wis., at a cost of about \$8,000, and has apparently done away with the trouble, and has at the same time decreased the resistance of the return circuit. In the Milwaukee system there are about 125 miles of track and over 200 cars in daily operation. The track circuit was originally put down in excellent shape. In the Madison system present indications show that one connection between rails and pipe systems opposite the power house, costing all told about \$15, would prevent any serious action. Investigations have shown that when the negative pole of the generator is connected with the trolley, the pipes are positive to the rails over an extended outlying district, and corrosion goes on over a large area, while with the reversed arrangement the dangerous area is concentrated about the power station. The latter method of connection allows the difficulty to be most easily handled, and after the district within which the pipes are positive to the rails has been accurately determined by proper voltmeter tests, frequent connections of pipes and rails should be made within its limits. This can usually be done at a comparatively small cost, the interest on which may be annually saved by the decrease of lost power if the connections are properly placed. The boundaries of this district should be rechecked from time to time, and the corresponding changes in connections should be made, if the tests show that they are necessary. The outlines of the danger districts are likely to vary with the growth of the system, and even change slightly with the seasons, and the connecting wires may be eaten away; so that vigilance is here as everywhere the price of safety, but safety may be absolutely secured in most cases.

Proper tests with a satisfactorily arranged voltmeter, such as was used in testing the Madison road, seem to give sufficient indications of the density of the current which is leaving the pipes at any exposed point. Such tests, when re-enforced by chemical examination of the soil, probably may be used with advantage in determining the extent of the corrosive action which is occurring at any point.

I have not touched upon any argument in regard to the really serious corrosion which has sometimes occurred from other causes than electric railway return circuits. This is a matter which is now generally understood, but is of less magnitude in most cases than the electric corrosion. The owners of pipes are often at fault from the fact that they have filled the soil with electrolyzable salts, but even in that case they may generally avoid danger by proper co-operation with the railways.

(Concluded.)



FIRST ELECTRIC RAILWAY IN RUSSIA.

The only electric railway in Russia is that at Kiev, which was installed about two years ago. The line has given great satisfaction since it has been in operation, and it is likely that when its merits are thoroughly appreciated by the Russian people other similar roads will be constructed. The railway is only about two miles in length and is located on the principal thoroughfare of the city. The road is single tracked throughout, with turnouts at several points. The profile of the route shows that there is a grade from terminus to terminus. The steepest grade is 9.3 per cent.

The power station is located in about the middle of the line. The plant consist of two bipolar generators, built by the Allgemeine Electricitaets Gesellschaft, of a capacity of 30 K. W. each. These machines can for a short time be called upon

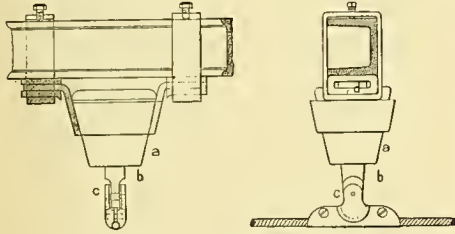


Fig. 1. Trolley Insulator.

for 40 K. W. if necessary. Power is supplied by two Otto two-cylinder gas engines which are belted direct to the generators. The engines are of 60 H. P. each, and make 140 revolutions per minute. The engine flywheels are about nine feet

the porcelain portion. This is bolted through iron collars to the bracket. Insulation is provided by rubber rings. The other form of insulator which is used in the case of side pole construction is illustrated in Fig. 2. It is not materially different from that shown in Fig. 1. The style of sus-

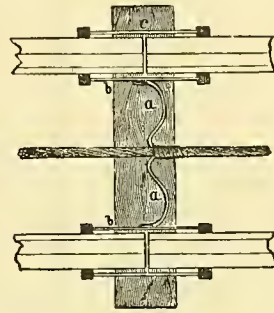


Fig. 4. Bonding and Supplementary Return Wire.

pension used at the turnouts is illustrated in Fig. 3. This device is made entirely of bronze.

The track construction is rather light. A grooved rail is laid on wooden stringers. Fig. 4 illustrates the manner of providing for the return. The rails are carefully bonded on each side of the joint, the bond on the inside being connected to a copper cable 95 millimeters in section, which is laid between the rails. The wire is soldered both to the bonds and to the cable.

The operating company has been considerably annoyed by ice forming on the trolley wire, and to remove it the device shown in Fig. 5 was designed by M. Perwenko, who is connected with the company. The blades on the wheel are of steel, and the harp is designed for attachment to a trolley

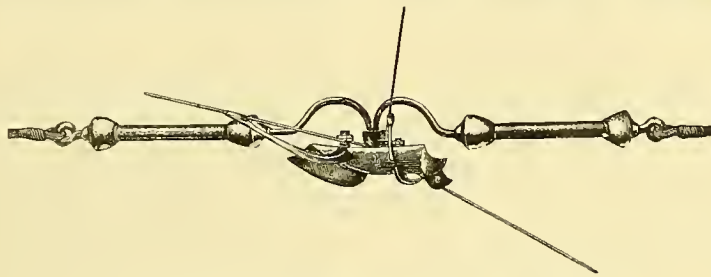


FIG. 3.—FORM OF SUSPENSION USED AT TURN-OUTS.

in diameter. The gas which is consumed by the engines is that furnished by the local works, but special means are employed in the station for increasing the pressure.

The trolley wire is silicon bronze, six millimeters in diameter, and it is suspended at a height of about 19 feet above the roadway. The feeders are insulated cables, which are attached to the poles by insulators of the type adopted generally on the continent on telegraph lines. As it has been stated, the road is a single track line with turnouts. A part of the distance it is located on the side of the street and for the remainder in the center. In the

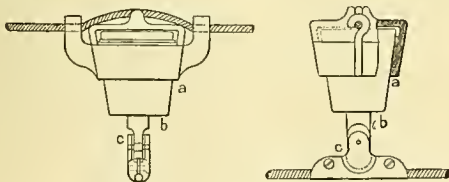


Fig. 2. Trolley Insulator.

former case brackets are used, and in the latter case the ordinary side pole construction is followed. Two different styles of insulators are used. When the wire is attached to the brackets the form illustrated in Fig. 1 is adopted. This is composed, first, of the porcelain portion a, through which passes the iron rod b, which carries a bronze clamp c for holding the trolley wire. The construction is such that the clamp can turn on its axis, and the wire is therefore not rigidly held, but may give slightly under the pressure of the pole spring. A metallic ring with two ears holds

pole. It does not appear that this device is used as a trolley wheel, but is apparently intended for the use of an employe who stands on the front

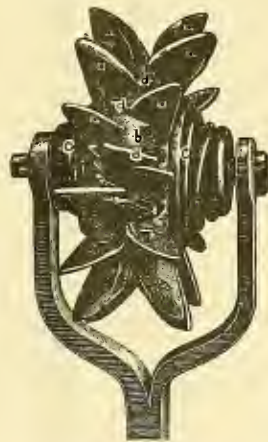


Fig. 5. Knife Wheel for Cutting Ice on Trolley Wire.

platform of the car and exerts such pressure on the wheel as may be necessary to cut the ice. The illustrations are reproduced from *L'Electricien*.

Lockport, N. Y.—Quincy G. T. Parker has petitioned the Common Council for a franchise to operate an electric street railroad. He also asked permission to use the present railroad with horse cars until it was used by the Electrical Street Railroad Company. He agreed to furnish a \$10,000 bond to cover all risks to the city.

SOME PRACTICAL HINTS IN DYNAMO DESIGN.

BY GILBERT WILKES.

Chief Engineer of the Detroit Electrical Works.

II.

Having thus outlined the considerations which hold good with any high grade dynamo, we can consider the questions which must receive attention in the designing proper. The most important of these is economy of manufacture. Thirteen years ago it did not matter if the field cores of an Edison "Z" machine were not only twice as long as necessary but in fact were the cause of a waste of material and efficiency, making the machine both cost too much and require too much power for a given output. At that time few people knew any better, and dynamo building in this country was carried on by only two or three small concerns. The importance of economy had not as yet been felt, machine work was lavished without question. Anything was done to make the dynamo work: then it was sold for a large enough price to cover all shortcomings in economy of manufacture. I had to do with an evidence of this lavishness in expense when an officer in the navy. An Edison "L" machine, a 250 lighter, was installed on board ship in 1882. It towered above me and naturally had not its sea legs on. In order to keep it upright a heavy bronze brace weighing from 200 to 300 pounds, was bolted to the keeper and to the ship's deck. There was evidently a determination to prevent any loose magnetism getting away by this route. Yet this needless waste in using bronze never excited remark. Matters are now in a very different condition. Every state—almost every town of over 100,000 inhabitants—has one or more smaller or larger manufacturers of electric machinery, up to the size of 75 H. P. The business in these smaller machines is enormous, but the margins of profits are very close. There are probably a dozen different makers whose machines fill the preliminary requirements of a good dynamo. Several of these, with enough others to make about 10, are apt to meet in competition on every contract of considerable size. Large sums of money are invested in the different companies, and, with very perfect systems of commercial inquiry, the principal companies are alive to the opportunities of every contract. Every dollar on the selling price counts. Remember that magnet wire costing originally about 18 cents per pound costs double this before it leaves the shop on a completed machine. I will explain this large increase. Different shops have different methods of costing. In some, the cost of the actual amount of raw material required for the finished article is added to the sum obtained by placing a fixed charge per hour for each class of work and keeping account of the number of hours each operation requires. In other shops, to the cost of the raw material is added the actual cost of the labor of the men. To this is also added a proper proportion of the shop salaries and general shop expenses. In either case the result is usually known as the shop cost and amounts to about the increase mentioned above.

The design of the dynamo must be so perfect in economy that when all these additions—running expenses of the shop, shop salaries, percentage for interest and depreciation of plant, percentage for offices, agents and commissions, and finally the percentage for profit—have been made to the actual bare cost of the labor and material, the price must not exceed that of other reliable makers. Think of this and you will appreciate how dimes in the original material mount up into dollars in the selling price, and how an hour's labor at even 15 cents makes a large difference in the product.

There are several details of design and manufacture on which an hour might be spent exclusively, but I shall touch only briefly on the following: Building up the armature core; armature winding; commutator construction; prevention of

\* A lecture before the students of the College Mechanics and Engineering University of Wisconsin



spark; the relation of size of armature to output; and the relation of field loss to radiating surface. Each of these subjects is worthy of a separate lecture, and in these days when a new armature insulator is advertised every month, one ought to be posted on the requisites of a good insulator for this purpose, to keep from being led astray by plausible agents.

**Armature core.**—There are a great many different mechanical methods of building up the cores of armatures, varying not only for the drum, Gramme and Pacinotti types, but also varying in each type. All are, however, built up of thin disks of sheet iron or mild steel, forced together between two substantial heads by means of hydraulic pressure or powerful screw presses, and held tight by through bolts, nuts and thread on the shaft, or shrunk collars on the shaft. I have used the last method with success in the case of drum armatures, but great care is necessary to obtain the best Norway iron for the collars, to prevent their bursting when contracting on the shaft. There are three methods of preparing the plates for the laminations—first, by pasting paper on one side of each sheet and then punching out the armature plates; second, by punching the plates from the sheets and separating them with loose sheets of tissue paper in building up the armature; third, by using no separator at all and relying on the oxide formed in rolling to separate the plates sufficiently from metallic contact. This separation does not need to be of high resistance.

I regret that I cannot now state the difference in heating due to the different methods of construction, but I am now having armatures built up to determine this point. It is usual to turn armature cores and balance them before preparing them for the wire. The turning, of course, tends to bridge over the insulation between the disks, but it is necessary to make a good mechanical job.

The iron usually used is not less than 14 mils thick; the paper should be not more than 1 mil. Concerning the thickness of iron, many of the smaller concerns use taggers iron, which is not made in this country, but comes from England. It is only 7 mils thick, and costs, pound for pound, twice as much as good domestic iron 14 mils thick. The latter, therefore, commends itself if it is adapted to the purpose. To determine this point I made very thorough tests on 15-k. w. armature cores built of each, with the result that the heating was with the thin disks 29 degrees C., and with the thick 38.5 degrees C., when run for three hours at their proper speed and field, the induction of which was 5,300 lines of force per square centimeter.\* This decided me in favor of the thick iron. There is one unknown factor in armature heating—eddy currents in the core—and this must be determined for each type of machine and kind of iron. A loss equal to that for the hysteresis is a usual figure.

In designing dynamos you will find that you cannot always control all of the quantities as you wish. Thus in the continental type, unless you wish to use very high speeds and have very little torque in the machines as motors, you must use large armatures, and this means low induction, as the fields are of cast iron.

**Armature Winding.**—Armature winding is like the fifteen puzzle. When accustomed to the general plans, you can carry them in your head and will become fascinated with the new ideas that form themselves in intricate curves and cross connections. But fortunately or unfortunately for the inventor there seems to be little new under the sun in this line; and one is very apt to find his pet scheme only a variation of one of the many diagrams in that little book entitled "Ankerwicklungen der Gleichstrom-Dynamomaschinen," by E. Arnold. It is useless to touch on this very broad subject. I will simply say that the old Siemens-Hefner-Altenack winding has had its day and is succeeded by a number of symmetrical windings. The Gramme ring is disappearing for four pole machines and being succeeded by the Pacinotti

drum wound, preferably with symmetrical, replaceable coils. This substitution, weight for weight and dollar for dollar, increases the output of a machine 15 to 20 per cent. or more, depending upon the size and design.

**Commutator Construction.**—The commutator is the most vital part of the machine, and too much attention cannot be paid to it. There are dozens of different shaped bars and modifications of the general way of holding them in place. Great variety of opinion exists as to the amount of insulation to be used between the bars. I have found the thickness of insulation between the bars the sole cause of destructive sparking in a line of machines which otherwise worked well and were cured of this by thinning the mica. What sense is there in putting as much mica between the bars, where there is small difference of potential, as there is between the bars and hub, where there may be at least half the voltage of the machine? I have found in my experience that thinner mica between the bars than is usually used gives better results. The proper amount varies with the number of segments and kind of brushes. The best practice is now unanimous in requiring mica between the bars and at the ends of the bars. This does not refer to the special direct connected generators, whose conductors also serve as commutator segments. The size of bars and diameter of commutator vary greatly with the kind of brush. On account of economy of operation, automatic adjustment, and small amount of attention required. I prefer the carbon brush for all purposes, except of course for special machines either of very high voltage or very great current (as for electrical deposition). I have spent much work and study on the subject of brushes, for carbon brushes have some serious faults, though they are ideal in the matter of wear of commutator, small cost, and the small attention they require. The high specific resistance of the material causes heating in the brushes and, by conduction, in the commutator. To overcome this, I have tried several plans, such as plugging the carbon with bunches of fine wires; depositing a heavy coat of copper around parts of a brush and then soldering these segments together; building up a brush of two thin plates of carbon with a sheet of copper gauze between, and soldering a connection to this gauze. The last promised well, but in the course of a few months the commutators showed cutting, and the plan was abandoned for a simple carbon brush with a flexible lead soldered to the back. Carbon brushes were also tried incased in brass sheaths, but these arced to the brush holders and stuck. Other plans which I have tried are incasing copper gauze in babbitt, and, also making the whole brush of a block of babbitt fed radially. One small machine fitted in this way has been running two years without showing wear either on the brushes or the commutator, but I have not seen the plan succeed with larger machines. The following data give an idea of the comparative size of commutators using copper and carbon brushes. The Edison 45 k. w. bi-polar machine has 52 segments, a brush bearing surface  $5\frac{1}{2}$  inches long and  $6\frac{1}{8}$  inches diameter; the same sized machine of the continental type designed by me, using carbon brushes, has 54 segments, with a bearing surface  $8\frac{1}{2}$  inches long and  $9\frac{1}{2}$  inches in diameter, or there is nearly twice as much copper in the one using carbon brushes. This is, however, an extreme case, as this is the largest sized machine that I should recommend building of this type. The brushes are thick and are apt not to bear over their entire surface, and yet it is difficult to subdivide them. Of course, going into the multipolar type, the brushes for low voltage and heavy current can be made thinner and more numerous. I shall compare these two 45 k. w. machines again later.

(To be continued.)

**Sixteenth Annual Clambake of the American Electrical Works.**—The sixteenth annual clambake of the American Electrical Works, of Providence, will be held August 25th. A large representation of the electrical fraternity will be present.

## BLOODSHED AT BENTON HARBOR, MICH.

The Chicago *Record* prints the following dispatch from Benton Harbor under date of Aug. 12:

The controversy between the Benton Harbor city council and the Benton Harbor & St. Joseph Electric Railway Company terminated in bloodshed to-day. Ald. Charles Shriver was shot by W. Worth Bean, president of the railway company, at an early hour this morning.

The alderman was severely wounded in the leg above the knee by a charge of shot from a double-barreled shotgun. The trouble grew out of the refusal of the railway company to remove its track in East Main street to Sixth street, so that the street might be properly graded for paving. The railway company occupied the street with its tracks by sufferance of the council, as its franchise had been forfeited, as claimed by the council, for not having extended its road farther east in Main street. Monday night the council ordered the city marshal to serve notice on the company to remove its track within one week. The order was not complied with by the railway company, and at 5 o'clock this morning a gang of laborers was set to work tearing up the track under direction of Contractor James Pearl and Ald. Shriver. Suddenly a street car appeared upon the scene, in which were President Bean, Superintendent Mason, Secretary Hull, Mrs. Bean and several conductors and motormen, all armed with shotguns, Winchester rifles and revolvers.

Mr. Bean ordered the track-wreckers to desist from their labors. During a heated discussion Contractor Pearl placed some paving blocks on the track to prevent the cars from running over the contested strip. Mr. Bean then leveled his shotgun at Pearl, but Alderman Shriver stepped in front of the contractor in time to receive the charge of shot in his leg. Although several on the car leveled their guns at the crowd no other shots were fired. President Bean was arrested soon after by Deputy Sheriff Sterns, and at the preliminary hearing he was held in \$1,000 bonds to appear in court at nine o'clock to-morrow. The affair has created a great sensation here. After the riot the track-wreckers again went to work, and the disputed strip of railway has been completely ripped up and hauled away.

When the case was brought up in court on August 13, Mr. Bean demanded an immediate examination. Owing to the excitement prevailing over the occurrence the court decided to adjourn the trial for two weeks. Mr. Bean's bond was raised from \$1,000 to \$2,500. In explanation Mr. Bean says that he first learned of the city's intention to remove his tracks late Saturday night, when it was too late to do anything in the courts, and he accordingly called on Deputy Sheriff Napier to protect his property. Mr. Bean says that the guns in the car were there for personal protection in case they should be needed. An examination of the car shows that some of the shots struck the bars of the gate six inches above the platform. This may be taken as evidence that the discharge of the gun was accidental, as Mr. Bean claims. Alderman Shriver is not very seriously injured.

## AIR-BRAKES FOR TROLLEY CARS.

In a recent editorial the Albany *Evening Journal* refers to the use of airbrakes on electric cars as follows:

The "deadly trolley" notion has properly been exploded. Even non-scientific people understand that the voltage carried will not kill human beings unless they fail to observe ordinary precautions. They don't attempt to tifle with steam engines for fear of injury; and they see that it is no wiser to play with electrical apparatus.

It is the car wheels which are doing the deadly work. There are numerous experiments being made with life-saving fenders and guards, but thus far this feature of street railway apparatus is in its infancy. So much time and money have been expended in improving the motor and trucks that the matter of preventing accidents or saving life has been forced to take a subordinate place. Now the motors and trucks have been in a measure standardized, managers of large roads, especially, are being asked by their patrons why they do not adopt proper precautions so that the death rate may be cut down.

There is no one part of electric or cable railroading so important as the ability to stop the cars quickly. The tendency nowadays is to run at high speed. In cities like Cleveland it is not uncommon for cars to be run at 18 miles an hour in parts of the city, and this is increased to 22 miles outside the city limits. Cars are being built much heavier than was formerly the case. Trailers are being used more frequently. It is hard enough to stop a single car, especially on a steep grade. The difficulty increases when trailers are added. At such times handbrakes show their inherent inadequacy.

\*Refer to *Elektrotechnische Zeitschrift*, vol. 14, page 737.



One trembles to think what consequences may follow if a motorman gets rattled or has a fainting fit when trying to wind up a handbrake in time. Muscles grow weary and relax at a critical time. Even when a man is in fine working condition the strain upon him is severe when compelled to handle grip lever or current controller and the present hand-brake simultaneously. Similar causes led to the perfection and manufacture of the Westinghouse air-brake. It has proved such an absolute necessity that not only are all passenger coaches

**MANCHESTER PLANT OF THE MATHER ELECTRIC COMPANY.**

The manufacturing plant of the Mather Electric Company, of which a view is shown herewith, covers several acres of ground at Manchester, Conn. The town is three hours distant by train from both New York and Boston, and is located on the main line of the New York & New England Railroad. From this road a spur track runs

heavy apparatus. The entire plant of the Mather Company is operated by electric motors, the sizes varying from 5 to 50 H. P. The system of transmission and subdivision of power has proved to be exceedingly satisfactory and economical in the operation of the works.

**ROBINSON RADIAL SNOW PLOW.**

The illustration shows how a Robinson radial freight car may be converted into a snow plow. The operation may be accomplished in five minutes by simply hanging the portable plow nose in place; no bolting is necessary. Conversely the snow plow is converted into a freight car in two minutes by simply lifting off the plow-nose.

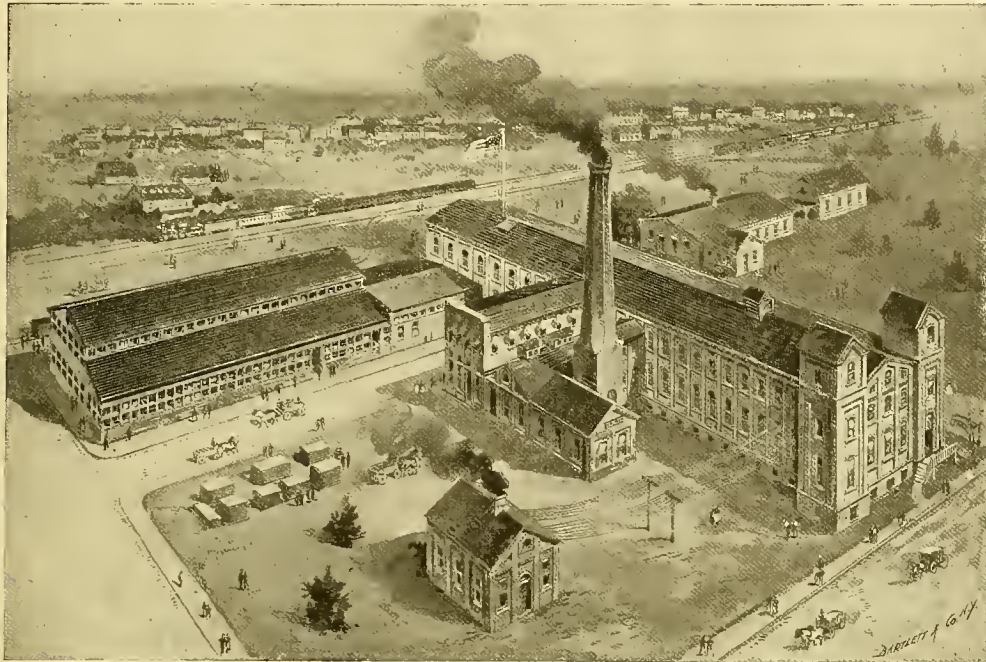
Any standard Robinson radial truck may be quickly transferred from a passenger car to a snow plow body without disturbing a bolt, in a few minutes. The appliances are introduced by the Robinson Electric Truck & Supply Co., of Boston.

**THE OHIO TROLLEY.**

The Ohio trolley, which is introduced by the Ohio Brass Company, of Mansfield, seems to be one of the simplest and most effective on the market. It is made up of less than a dozen pieces, any of which can be easily duplicated. The spring is of the regular flat leaf style, such as any manufacturer of carriage springs keeps in stock. The working parts of the trolley are made of steel and malleable and wrought iron, and in consequence are not easily broken. The base and stand are 3 feet long and 8 inches wide, and, when the trolley-pole is in a horizontal position, but 13 inches high. The trolley-pole can be swung either forward or backward or in a complete circle, and the pressure against the trolley wire diminishes as the pole assumes more nearly a horizontal position.

The trolley can be assembled or dismantled in a few minutes time without the aid of tools. It is very easy and flexible in action, and will follow the variation of the trolley wire quickly and surely. These trolleys have been given a practical and thorough test, and are in use on many roads.

In fitting these trolleys out complete, the Ohio Brass Company uses its special carbonized steel trolley-pole. This pole is drawn cold through a die and is made of the best Norway iron. It is then carbonized to the proper degree to give it sufficient elasticity. It is seamless and endless, and formed to a perfect taper. The claim made on this pole is that it is lighter, more flexible and stronger than the regular style trolley-pole. It will not break, and if bent out of shape can be

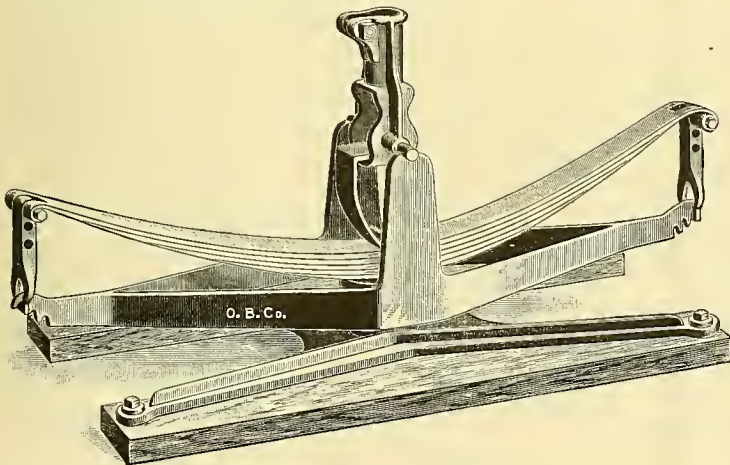


PLANT OF THE MATHER ELECTRIC CO. AT MANCHESTER, CONN.

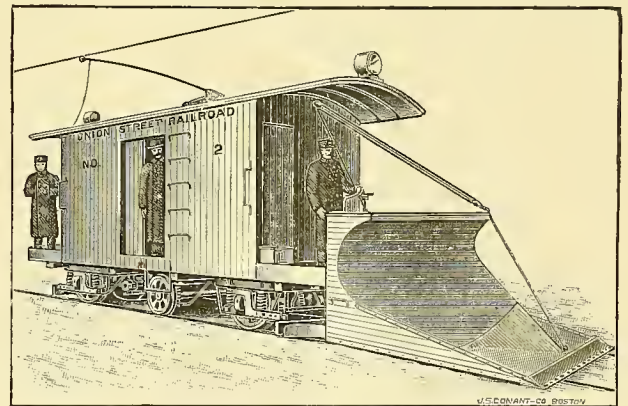
equipped with it, but thousands of freight cars as well all over the United States and in foreign countries. Some roads refuse to haul freight cars unless equipped with air-brakes. In the street railway field there has not been any brake which corresponds with the Westinghouse on steam roads until recently. For several years, according to scientific papers, some of the ablest engineers in the land have been working on an air-brake which would be simple, efficient and trustworthy. Thousands of dollars have been expended and lost because in one point or another the finished brake did not prove wholly successful. One great drawback has been the limited space under a street car and the large amount of space the motors occupied. Success came at last and a brake has been designed which, so the scientific papers say, fills all the severe conditions imposed. It is styled the Genett air-brake.

directly into the erecting shop of the Mather Company, so that its shipping facilities are excellent, and by the existing arrangement heavy generators and other ponderous machinery may be loaded directly on the cars.

The company has recently completed an extension to its plant by the erection of an iron building 300 x 50 feet. This structure, which is to be used as an erecting shop, was constructed by the Berlin Iron Bridge Company, of East Berlin, Conn., and is fitted with 50-ton Shaw electric traveling crane. This appliance and the equipment of machinery recently installed, consisting of heavy planers, boring mills, radial drills, lathes, etc., enable the Mather company to handle large generators up to 500



OHIO TROLLEY.



ROBINSON RADIAL SNOW PLOW.

after the name of its inventor, and is manufactured in Chicago by the Genett Air-Brake Company. This brake is already being put in service on a large number of cars in New York, Brooklyn, Buffalo and Chicago. It works very quickly and noiselessly.

**Bridgeport.**—Judge F. B. Hall has dissolved the injunction restraining the Traction Company from running its tracks across the Consolidated Railroad.

kilowatts, and larger, in capacity. The company is making a specialty of both belted and direct connected work, especially for railway and power purposes. Its facilities for testing generators, from the smallest to the largest, under most severe conditions, are second to none, the steam plant being especially arranged and adapted for this purpose. Another extensive addition to the plant will in all probability soon be built, with new battery of boilers and engines, especially for testing this class of

straightened cold without injury. This pole is one of the specialties which the Ohio Brass Company is now introducing.

**Camden, N. J.**—The present outlook is that the Camden, Gloucester & Woodbury Electric Road will be extended from its terminus at Woodbury to Pitman Grove, and, perhaps, to Glassboro and Clayton, taking in the towns of Mantua, Wenonah and Sewell.



## COMMENTS AND VIEWS OF CONTEMPORARIES.

**BOSTON RAPID TRANSIT ELECTION.**—No doubt the people of Boston themselves are sick and tired of the question of rapid transit. They have been talking about it long enough to gridiron every street in the city with elevated roads or honey-comb a whole area of 20 miles around with tunnels. All kinds of plans have been discussed and dismissed in turn. Now, at last, by a slender majority in a very small vote, they have accepted a hodge-podge arrangement which may work fairly well, but which is quite as likely to work ill. Less than 30,000 of them thought it worth while to come out on Tuesday—although a matter concerning intimately their comfort and convenience, a matter of much more importance than the election of office-holders, was at stake. . . . It will be interesting—at least for those at a distance—to see what kind of rapid transit Boston gets out of its ill-digested measure. The subway will undoubtedly be built, and this will be an advantage to any one who has ever tried to ride up Tremont street in a surface car is certain to appreciate. But a subway can only in small part relieve the congestion of traffic. Either the Meigs road or some other road will be required to supplement the subway.—*Providence Journal*.

**STREET CAR NUISANCES.**—The health department has concluded that it cannot legally prohibit spitting on the floors of the street cars, but will call upon the street car company to enforce the same regulations with regard to spitting on the floors as it does with regard to smoking. The *Journal* does not agree with the health department as to its power to abate this nuisance, but believes it can be done as a health regulation for the prevention of the spread of disease. This paper has already shown that the spread of phthisis is due in a large measure to the filthy habit of spitting upon the floors of public vehicles and public halls, and that it is just as much within the province of the health department to prevent the spread of disease in that way as it is in any other way.—*Minneapolis Journal*.

**GRADE CROSSINGS.**—One of the problems that will have to be settled sooner or later is that of the crossings of steam and trolley railroads. The introduction of the latter system has changed the whole situation as to grade crossings. Before the time of trolley roads a determined effort had been made to get rid of grade crossings. The law required that a certain number should be abolished every year, and the railroad commissioners were cautious in authorizing new crossings of this kind. Every one looked to the final, if remote, abolition of all of them. . . . About all that can be said now is that the public must be served in that way which best suits its safety and convenience, and that in the end the laws and usages which best answer this end will prevail. In the mean time it is right to ask that grade crossings be avoided whenever this is possible.—*Hartford Times*.

**MONOPOLY SOMETIMES BETTER THAN COMPETITION.**—No one individual or corporation more than another has a right to come in and ask to be given a share of the franchises. They are given for public accommodation, and not as a favor for any corporation, and the public can be best accommodated by having a single system reaching to all parts of the city, and able to carry people from every part to every other part. The greatest convenience demands that there should be no competition, just as in the case of the telephone exchange, the distribution of water or gas. It may seem like a hardship to some people, not to cut the city up in small slices and distribute it around among all the corporations who ask for it; but councils, in looking after the interests of the public and the prosperity of the city, cannot do this. The Traction company may be a big corporation, it may be a monopoly, and it may even be base enough to be in the business of carrying passengers around the city for the purpose of making money, but it controls now all the main lines of communication through the city, and those who want transportation facilities desire to be connected with these main lines. This system is the system of the city, its franchises have been granted for the purpose of building up the city and furnishing public accommodation, and nothing should be done that would prevent its extension wherever necessary for the public accommodation.—*Reading (Pa.) Herald*.

**POPULARITY OF THE TROLLEY SYSTEM.**—One of the things that cannot be found in this city is a man who admits that he ever fought the introduction of the trolley system in this city. Every man now claims to have been one of its original advocates and the kickers of a few years ago now are loudest in their praises of the trolley conveniences. It was urged that life would be in constant jeopardy, yet the percentage of accidents is very little greater than under the horse-car regime. Three times the number of cars now move over the streets

and five times the passenger traffic is handled as by the horse cars, while the service is eminently more satisfactory.—*Chester (Pa.) News*.

## FINANCIAL DEPARTMENT.

### Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

CONTINUED STATEMENTS of increased earnings and the passage of a tariff bill have made slight advances in street railway securities within the past week. While the statements of the steam roads so far for 1894 show big decreases in earnings compared with those of 1893, the street railway statements invariably present enormous increases in earnings and in some cases a reduction of operating expenses. These comparative earnings are beginning to tell with the investing public so that street railway stocks are held at firm figures with the tendency of prices to go higher. It must be said as yet, however, that the majority of street railway shares are quoted at ridiculously low figures.

The bulk of the trading at present is in Boston and Philadelphia. In Boston, West End Street Railway stock has some days been the feature of the Boston market, and transactions in it have aggregated 1,600 shares. The stock is now quoted at 50 and 51, par being 50. It is said the West End has \$1,000,000 cash on hand, and that it has never yet failed to earn 10 per cent. dividends, though it has not paid them.

Trading in the People's Traction at Philadelphia is as active as ever. The stock is held around 50. Though insiders profess to be unwilling that the stock make any further advance at present, and assert that they are doing nothing to boost it, the steady paying indicates differently.

The Traction company has extended its Germantown avenue and Fourth and Eighth street line to Mount Airy. Cars began running last Sunday.

THE NEW YORK SECOND AVENUE SURFACE LINE, in its quarterly statement, ending June 30, 1894, shows gross earnings of \$277,914, an increase of \$8,229 over 1894. Operating expenses \$212,546, increase \$2,943; net earnings \$65,368, increase \$5,281. With fixed charges deducted, the net income for 1894 is \$32,920, an increase of \$371. The statement of this road does not show the enormous increase in earnings compared with the roads which have changed their motive power from horse to cable or trolley.

Reports from New Orleans show big earnings since the introduction of the trolley there.

THE SCHEDULE in the assignment of Goodwin & Swift, electric railway constructors, No. 66 Broadway, has been filed in court. The liabilities are \$641,344; nominal assets, \$1,307,405; actual assets, consisting of office furniture and bad notes, amounting to \$105. This firm was known in Wall street before the failure as having too many irons in the fire, and it looks as if the old adage had again proved true.

WEST CHICAGO TRACTION has declared a dividend of  $2\frac{1}{2}$  per cent.

### Financial Notes.

**Sale of Portland (Ore.) Cable Road.**—In the case of T. S. McDaniel vs. the Portland (Ore.) Cable Railway Company, Judge Stearns last week overruled the objections to the sale of the railway property for the purpose of satisfying receiver's certificates, and made an order allowing the sale to take place in accordance with the petition filed by T. S. McDaniel, who holds the unpaid receiver's certificates, aggregating \$33,500. In addition to this claim on the road there is a floating indebtedness of \$8,000, incurred by the receiver in managing the road. The petition of Mr. McDaniel states that the cable road is not making expenses, and has not been for over a year, the gross earnings not being equal to the operating expenses. The petitioner asks a sale of the franchise and property in Receiver Fuller's hands, and out of the proceeds thereof, the floating indebtedness and expenses of the receiver be first paid, and that the receiver's certificates with interest be then paid.

**Chicago, Ill.**—An attachment suit for \$22,500 has been commenced against Underwood & Green, the builders of the Lake street "L" road and heavy stockholders in that corporation, H. R. Holland, the plaintiff, was one of the original stockholders of the road. His claim is vested in contracts for the delivery of stock from the defendant and also in money loaned. It is claimed Underwood & Green had contracted to turn over 1,100 shares of Lake street "L" stock, but for some reason had failed to do so. Similar proceedings were begun against the same firm by Morris H. Alberger for \$33,000 on a contract account for labor.

**Decreased Earnings on the Manhattan L.**—The hard times and the cable roads have made a serious inroad upon the earnings of the Manhattan

Elevated Railroad, as shown by the report of the company for the quarter ended June 30. This report was as follows: Gross earnings, \$2,485,665; operating expenses, \$1,440,120; net earnings, \$1,045,544; other income, \$204,177; gross income, \$1,249,722; fixed charges, \$656,418; net income, \$593,305. The net income for the same period last year was \$709,934.

**L Road Builders Confess Judgment.**—F. L. Underwood and Willard R. Green, of the firm of Underwood & Green, builders of the Lake Street "L" road, Chicago, confessed last week for \$25,157 in the Superior Court on a note in favor of Charles S. Owen. Three suits amounting to \$80,657 have just been commenced against the firm. Attorneys representing Owen said that judgment had been entered on account of the other suits, and because of fear lest the firm's assets should be out of the reach of a judgment.

**People's Traction Stock Issue.**—Officials of the People's Traction Company have decided to issue the 40,000 shares of treasury stock on Sept. 13, and will send a circular to stockholders to-morrow giving details of the increase in capital. Only stockholders of record Aug. 30 will be entitled to subscribe. Those not desirous of availing themselves of the privilege will be permitted to sell their rights between Aug. 30 and Sept. 15.

**Duluth Street Railway Bonds.**—The Duluth Street Railway Company is offering \$2,500,000 of 5 per cent. gold bonds, of which \$1,000,000 are retained by trustees to retire former issues, and \$500,000 held for future extensions of properties. The company says its net earnings are well in excess of the fixed charges.

**Cincinnati Railroad Increase of Stock.**—Circulars are being sent out from the office of the Cincinnati Street Railroad Company announcing that after Sept. 1 the capital stock of that company will be increased \$500,000. The increase will make the actual outstanding stock of the company \$8,750,000.

**Rochester, N. Y.**—The Rochester & Charlotte Electric Railway has been leased by the Rochester Railway Company. The stockholders are to receive 8 per cent. on their stock and an additional dividend whenever the gross receipts of the road exceed \$55,000.

**Royal Arc Company's Patents Sold.**—The patents of the Royal Arc Electric Company were sold for \$500 to James I. Ayer at receiver's sale last week.

## NEW INCORPORATIONS.

**Gloucester, Mass.**—The Gloucester & Rockport Street Railway, with a capital of \$40,600, has been formed to construct a street railway from Gloucester across Good Harbor Beach to Brier Neck, to the line dividing Gloucester from Rockport, the length to be two miles. The board of directors includes David S. Presson, of Gloucester; Albion R. Hallowell, of Gloucester; Francis W. Homans, of Gloucester; Willard B. Ferguson, of Malden; Albert D. Bosson, of Chelsea; John H. Cunningham, of Chelsea; D. Augustus White, of Gloucester.

**Weymouth, Mass.**—A company will probably be incorporated to operate an electric railway from Shaw's Corner, East Weymouth, to the Braintree station of the New York, New Haven & Hartford Railroad, a distance of about four miles. The capital stock will be \$40,000. Among those interested are: Representative John Kelley, Judge James H. Flint, John W. Carey, H. F. Perry, F. A. Sulis, Francis Ambler, E. W. Hunt, A. M. Bachelder and Thomas T. Bailey.

**Trenton, N. J.**—The Lancaster Railway Construction Company has been incorporated. The capital stock is \$100,000. The company purposes to build and furnish material for the construction of electric and steam railroads. The promoters are: Henry Baumgardner, Michael Reilly, Geo. N. Reynolds, John E. Hubley, Frank H. Steacy, David B. Shenk, Lancaster, Pa.; Hugh E. Crilly, Allentown, Pa.; Theo. Mace, Trenton, N. J.

**Chicago, Ill.**—The Co-Operative Electric Railway Company has been incorporated with a capital stock of \$1,000,000. The company is formed to acquire, sell, lease or operate railways, to buy, use or operate franchises for the same, and to manufacture, sell or operate patents, protecting electric railways, equipments. The promoters are Morris S. Evinger, Chas. E. Nurnap, Isaac T. Dyer.

**Chicago, Ill.**—The Chicago, Oak Park & Harlem Street Railway Company has been incorporated with a capital stock of \$50,000. The incorporators are John C. Schumacher, John Gnaedinger, Gustave A. Pudewa, Frank Troost and Henry D. Schumacher.

**Millville, N. J.**—The Millville Traction Company has been incorporated with a capital stock of \$400,000. The promoters are: Geo. Wood, 626 Chestnut street, Philadelphia, Pa.; Wm. B. Munroe, Millville, N. J.; John K. Russell, Vineland, N. J.



## NEWS OF THE WEEK.

**Yonkers, N. Y.**—The controlling interest in the Yonkers Electric Railroad Company and the North & South Electric Railway Company was purchased last week by the banking firm of R. T. Wilson & Co., of New York. The directors of both companies handed in their resignations, and Mr. Wilson named a new board, the principal members of which are R. T. Wilson, R. T. Wilson, Jr., Albert L. Johnson and James M. Edwards. Mr. Johnson was elected president of the new corporation, and Mr. Edwards, treasurer. Jilson J. Coleman, of Bethlehem, Penn., was chosen manager of the road, and assumed his duties at once. Among the conditions of the consolidation are: First, that the tracks on all the lines except that in Yonkers Avenue shall at once be reconstructed, and the present light rails replaced by heavy girder rails, and the new and improved cars put on the several lines; second, that the line from Getty Square through Palisade and Asburton Avenues to Park Avenue, to Lake Avenue, shall be begun within fifteen days, and completed in ninety days, under a penalty of \$10,000; third, that the other lines called for by the franchise shall be begun as soon as the necessary number of consents has been obtained.

**Doylestown, Pa.**—The Bucks County Railway Company has planned to do a considerable amount of construction work in the near future. It proposes first to build railway lines on the principal streets of Doylestown, and it is negotiating with the Doylestown Electric Company for power to operate the cars. The plan, as far as known, then contemplates the construction of a line from Doylestown to Newtown, where it will connect with the proposed Newtown & Bristol Railway, controlled by the same company. The company also proposes to build a trolley line to Perkasie over the route of the abandoned Philadelphia & Allentown Trunk Line Railway. It is probable that it will also construct a line from Doylestown to Willow Grove, although the successful outcome of this project will depend largely on the encouragement received in the sale of bonds along the route. The names of the incorporators are: William J. Fell, Francis Fennimore, of Bristol, and Marshall S. Lynch, S. A. Hamilton and Robert C. Fulton, of Philadelphia.

**Brooklyn, N. Y.**—W. H. Kent has brought suit against the Brooklyn Heights Railroad Company to recover the statutory penalty of \$100 for the exaction from him by the railway of two alleged excessive fares. On July 25, 1894, Mr. Kent rode from Fulton Ferry to Fort Hamilton on the defendant's car and paid one fare to Sixty-fifth street. The conductor demanded and collected another fare for the remainder of the trip. Mr. Kent paid it under protest. Returning he had to pay as before. Under the law, Mr. Kent says, the company is liable to a fine of \$50 for every excessive fare collected, and claims that inside the city limits of Brooklyn only one fare can be charged.

**Taunton, Mass.**—A syndicate from Rochester, N. Y., interested in the proposed electric road between Taunton and Fall River, visited New Bedford last week. They came from Fall River on a special car loaned by the Dartmouth & Westport Street Railway Company. There were ten in the party. The road was examined and after a stop of half an hour or so they returned to the Border City. Thursday afternoon this syndicate proceeded from Taunton to Fall River by carriage and examined the route of the proposed road between those two cities.

**Newark, N. J.**—Work has been begun by the Electric Light and Power Company upon the new power house for the Consolidated Traction Company on the Newark City Ice Company's old wharf property adjoining that of the power company. The station will be 190 feet on the river, running back 155 feet to the railroad. It will be built of brick and stone, laid upon a foundation of closely driven piling and concrete. It is proposed to have the building finished by Nov. 1 and the plant in full operation before winter sets in.

**Lancaster, Pa.**—The contract for building 43 miles of track for the Pennsylvania Traction Company has been awarded to the Lancaster Railroad Construction Company. The lines to be built will connect this place with numerous points of importance, passing through rich, thickly populated districts and include two miles more of track within the city. Work will be commenced at once.

**Harrison, N. J.**—The common council has granted the Jersey City, Harrison & Kearny Railroad Company and the Consolidated Traction Company franchises to run their electric cars on Harrison avenue, from the bridge to the Kearny line, the consideration being \$2,500 and \$10 yearly for each car run.

**Brooklyn, N. Y.**—The Kings, Queens and Suffolk Company states that before long it will soon begin the construction of the bicycle railway, which will

be a competitor of the Long Island road. It claims that the road can be built for \$25,000 per mile, and that it can be operated for 8 cents per car-mile.

**Waukesha, Wis.**—It is reported that effort is being made to raise necessary funds to build an electric road from Waukesha to Pewaukee and thence skirt the lake region and end at Oconomowoc. Most of the right of way has been secured, and it is hoped to begin the construction this fall.

**Philadelphia, Pa.**—The trolley cars of the People's Traction Company, which began running to Cheltenham avenue, Germantown, last Sunday, have commenced running regularly from Mt. Airy, which is to be the terminus of the Germantown division until its completion to Chestnut Hill.

**Toronto, Can.**—The Toronto Railway Company has purchased 250 feet frontage in Roncesvalles avenue, by a depth of 250 feet, and a large power house will be erected, from which the Mimico and the Weston electric car system will be worked. Car sheds will also be erected.

**Brooklyn, N. Y.**—Daniel F. Lewis, President of the Brooklyn Heights Railroad Company, last week sent a check for \$10,640 to the City Clerk in payment for licenses for 532 cars at \$20 each.

**Media.**—The Borough Council has given permission to the Delaware County & Philadelphia Electric Railway Company to lay tracks on Washington street as far east as Olive.

**Baltimore, Md.**—The Highlandtown & Point Breeze Electric road was opened last week.

**Cortland, N. Y.**—Work has been begun on the electric railway.

## PERSONALS.

**W. A. H. Bogardus**, general manager of the Brooklyn Heights Railroad, has resigned from a similar office which he has held in the Brooklyn, Queens County & Suburban Railroad since it was organized. His place is being filled by C. M. Wicker. Since Mr. Bogardus' occupancy of the general management of the Broadway branch of the Suburban railroad was equipped with an electrical system which has resulted in almost doubling the receipts from that line. There were two reasons for Mr. Bogardus' resignation. One because the two positions forced too much work upon him, and the other because of the difficulty in conducting the two offices, similar in nature, in different companies, without having them conflict.

**D. W. Sharpe**, the retiring general superintendent of the Consolidated Traction Company of Newark, was presented a gold watch by the employees of the company last week. The watch was a heavy stem-winding hunting-case one, with a massive gold chain and a heavy locket containing a portrait of Mr. Sharpe's wife. The inscription was: "Presented to D. W. Sharpe, Superintendent of Consolidated Traction Company of Newark, N. J., by his employees and friends, August 9, 1894." The locket was set with a diamond. The presentation took place at a dinner at which 100 of the employees were present.

**Jas. Wolff**, of the New York office of the New York Insulated Wire Company, has succeeded J. B. Olsen as manager of the Chicago branch, Mr. Olsen returning to the New York office.

**A. D. Doran** has resigned as superintendent of the Seelye Street Car Line of Montgomery, Ala., and Samuel Walker has been selected to fill the position.

**Frederick H. Tidman** has been appointed superintendent of the Suburban Traction Company's lines, of Orange, N. J.

**William Robinson**, of the Robinson Electric Truck and Supply Company, of Boston, was in New York this week.

**T. A. W. Shock** has been appointed superintendent of the Central Electric Railway of Sacramento, Cal.

**Reynolds T. White**, inventor of the White elevated railway system, died at Medford, Mass., last Saturday.

**Dr. J. Allan Hornsby**, of the National School of Electricity, Chicago, was a New York visitor this week.

## TRADE NOTES.

The Ohio Brass Company reports orders of considerable size during the month of July for its type W. material from the following roads: Middletown and Goshen Traction Company, Middletown, N. Y.; The Elyria-Lorain Electric Railway Company, Lorain, O.; The Consolidated Street Railway Company, Toledo, O.; The Cincinnati Street Railway Company, Cincinnati, O.; The Toledo and Maumee Railway Company, Toledo, O.; Keokuk E. L. and Power Company, Keokuk, Ia.; Des Moines Railway Company, Des Moines, Ia.; East Liverpool & Wells-ville Railway Company, East Liverpool, O.; Beaver

Valley Traction Company, Beaver Falls, Pa.; Lake Cities Electric Railway Company, Michigan City, Ind.; Consumers' Electric Light and Street Railway, Tampa, Fla.; Citizens' Street Railway Company, Memphis, Tenn.; Fort Wayne Electric Railway Company, Fort Wayne, Ind.; Warren Street Railway Company, Warren, Pa.; The Chillicothe Electric Railway Company, Chillicothe, O.; The Akron Street Railway Company, Akron, O.; Punsutawney Passenger Railway Company, Punsutawney, Pa.; Union Street Railway Company, Saginaw, Mich.; West End Street Railway Company, Knoxville, Tenn.; Riverside Park Street Railway Company, Saginaw, Mich.; Brightwood Railway Company, Washington, D. C.; Nashville Traction Company, Nashville, Tenn.; The Delaware Electric Railway Company, Delaware, O.; The Marion Street Railway Company, Marion, O.; West End Riverside Electric Railway Company, Montgomery, Ala.; The Columbus Street Railway Company, Columbus, O.; The Lansing City Electric Railway Company, Lansing, Mich.

The Joseph Dixon Crucible Company, Jersey City, N. J., manufacturer of lead pencils, crucibles, stove polish, and other graphic products, writes that it has felt the necessity of stiffening the backbones of salesmen who have complained of competitors' cut prices, and do it after the following fashion: In times like these when work is none too plenty, and the manufacturer is anxious for orders and the salesman likewise, there is great temptation to cut prices for the sake of getting a quantity of business and thereby deluding ourselves into the idea that we are prosperous because we are busy, forgetful of the fact that the more business one does at a loss the slimmer will be the bank account at the end of the year. Prices once broken down are hard to re-establish, and it is even doubtful if they can be re-established. Furthermore, a manufacturer who once gets the reputation of making cheap goods will find it difficult to obtain good prices even for his best goods, and fine products at good prices are always in fair demand at all times. There is neither money nor reputation to be gained in doing work for less than a fair price, and the very men who profit by beating the salesman down, and by inducing him to enter their order at cut-throat competition prices, respect him less, and respect his house less, than if he had stuck manfully to the principle that first-class goods demand a fair price.

The Ball Engine Company has lately shipped the following engines: Edison Electric Light and Power Company, Erie, Pa., one 350 H. P. vertical compound; Edison Electric Light and Power Company, Erie, Pa., one 300 H. P. cross compound; Eureka Light Company, Eureka, Cal., one 300 H. P.; Industrial Home of the Blind, Chicago, one 80 H. P.; J. H. Houghton, Boston, Mass., one 50 H. P.; Minneapolis General Electric Company, Minneapolis, Minn., one 35 H. P.; Bronx Gas and Electric Light Company, Van Nest, N. Y., one 250 H. P., tandem compound; Hotel Newcombe, Quincy, Ill., one 60 H. P.; Gen. A. S. Bushnell Building, Springfield, O., one 60 H. P.; Lexington Electric Light Company, Lexington, N. C., one 50 H. P.; Greenwich Gas and Electric Light Company, Greenwich, Conn., one 150 H. P.; Greenwich Gas and Electric Light Company, Greenwich, Conn., one 125 H. P.; Kennard House Company, Cleveland, O., one 50 H. P.; City of Griffin, Ga., one 135 H. P.; Howe Pump and Engine Company, Ladd, Ill., one 50 H. P.; Sykes & Wagner, Minneapolis, Minn., one 30 H. P.; F. F. Vater & Co., Minneapolis, Minn., one 35 H. P.; Risdon Iron Works, San Francisco, Cal., one 150 H. P.; Electric Supply and Engineering Company, Detroit, Mich., one 70 H. P.

The Mather Electric Company, of Manchester, Conn., reports the shipment last week of a car-load of electrical apparatus, consisting of one 250-light dynamo and ten 3-H. P. Manchester type slow-speed motors, with special starting boxes, to the Massachusetts State Insane Asylum, at Danvers. The motors will be used for operating ventilating fans throughout the building, the whole installation being in the hands of G. M. Angier & Company, of Boston, New England contractors for Mather apparatus. The company reports the sale, through Harry S. Smith & Co., of Philadelphia, of two 45-k. w. direct connected dynamos for the Bartian apartments of that city. These dynamos are to be of the new Mather multipolar type, directly connected to Woodbury engines, and when completed will be one of the finest direct connected plants in Philadelphia.

The Falkenau Engineering Company, Limited, Betz Building, Philadelphia, is the name of a new company which has recently been organized for the purpose of conducting a general business as mechanical and electrical engineers. Messrs. Arthur Falkenau, Edwin R. Keller, Clayton W. Pike and Elmer G. Willyoung constitute the company, which will devote itself to designing and building light, heat, ventilating and power plants, central stations and electric railways, complete or in part, and to giving expert advice in all matters pertaining to



the same. Special attention will also be paid to making expert examinations and tests of existing plants with a view to increasing their capacity or economy of working.

**McGuire Truck.**—It would seem that the Philadelphia Electric Traction Company is well pleased with the McGuire make of truck. It bought 70 in January, 170 in June, and last week ordered 50 more. The McGuire company is one of the fortunate concerns that are crowded with business. Everything the company takes hold of seems to prove successful. It has orders on hand for nearly 400 trucks, 11 combination track sweepers and about 300 of the new Columbian stoves.

**New Street Railway Catalogue.**—President McKinlock, of the Metropolitan Electric Company, Chicago, says that he expects to have the new catalogue of street railway material ready for dis-

tribution within a week or ten days. The company carries an extensive line of street railway goods, including many first class specialties. The company reports business as very satisfactory in all its branches.

**Siemens & Halske Contracts.**—The Siemens & Halske Electric Company reports that since the fire which destroyed its Chicago factory, this company has closed six contracts for various classes of machinery, of which the two most important are the Hotel Savoy, New York, for a lighting plant, and Franklin McVeagh & Company, in Chicago, for a power transmission plant.

**The Berlin Iron Bridge Company,** of East Berlin, Conn., has been awarded by the Worthington Hydraulic Works, at Brooklyn, N. Y., the contract for making large additions to the latter's already extensive plant. The same company is putting up

a gashouse roof for the New Jersey Gas & Construction Company at South Amboy, N. Y.

**E. J. Wessels, of the Genett Air Brake Company,** has recently closed contracts for air brakes to be used on the Athol, Mass.; Lowell, Lawrence & Haverhill, Mass.; Newport, R. I.; New Haven, Conn.; and Easton, Pa., railways. The company is receiving inquiries from Europe regarding the brake.

**Brownell Cars Ordered.**—Robert Gullham, receiver for the Northeast Electric Street Railway Company, has made a contract with the Brownell Car Company, of St. Louis, for 10 new cars for the road.

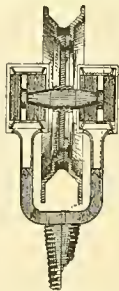
**James A. Trimble,** of 230-232 East Twenty-eighth street, New York, will soon introduce a fender which will embody, it is predicted, a number of new and especially meritorious features.

## RECORD OF STREET RAILWAY PATENTS.

### U. S. Patents Issued Aug. 7, 1894.

**523,998. Dynamo-Electric Machine;** Gustaf Rennerfelt, Lynn, Mass. Filed March 6, 1891. This patent covers the combination of a magnet with a divided core, a series of rotating conductors interposed between the parts thereof, and means for electrically connecting said conductors in series.

**524,011. Electric Motor;** Frederic C. Whitmore, Lynn, Assignor to the General Electric Company, Boston, Mass. Filed May 5, 1893. In a multipolar motor,



No. 524,017.

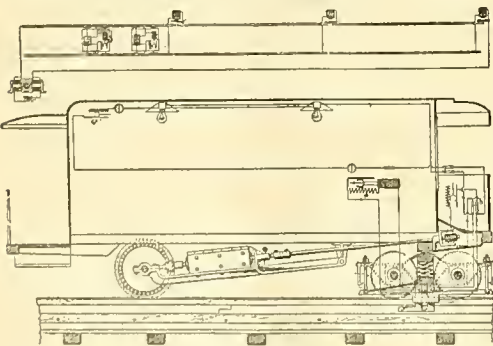
a base portion formed of a box-shaped casting open at the top and having a polar extension in combination with a top formed of a casting similar to the base and inverted, and wound field magnet cores held by the meeting side walls of the top and base portions which are secured together, the polar extensions of the top and bottom portions forming consequent poles to said wound field magnet cores.

**524,014. Trolley Wire Support;** Levi Yakel, Allentown, Pa. Filed April 15, 1893. Renewed December 27, 1893. In an electric insulator the combination of a bolt, the lower end of which is adapted to be secured to a pin for an electric wire, a series of asbestos and mica disks alternately strung thereon, a ring, a cap adapted to be secured thereto and means of securing said bolt in said ring and cap.

**524,017. Trolley for Electric Cars;** George C. Bourdreaux, Peoria, Ill. Filed March 12, 1894. The fork is constructed of two separable parts having enlarged hollow heads, bearing blocks retained within said heads, a shaft having tapering ends with the heads let into the said blocks, a trolley wheel mounted upon the shaft, said wheel composed of two separable halves inclosing a ring. (See illustration.)

**524,020. Dynamo-Electric Machine;** Rudolf Eckenmeyer, Yonkers, N. Y. Filed Oct 7, 1891. This is the combination in a dynamo electric machine of an armature; separate U-shaped electromagnets each having its own field coil, or coils, and provided with appropriate cheek pieces, and having the several similarly magnetized cheeks located closely adjacent to each other but separated by air spaces parallel with the armature winding, and a counterfield coil on each magnet, in circuit with the armature winding, and having portions thereof located in said spaces, and parallel with the armature winding.

**524,025. Conduit Electric Railway;** Rudolph M. Hunter, Philadelphia, Pa., Assignor to the Thomson-Houston Electric Company, of Connecticut. Original



No. 524,025.

application filed Nov. 30, 1886, No. 220,246. Divided and this application filed Sept. 12, 1891. The system comprises the combination of a working conductor arranged along the railway, a slotted conduit containing said conductor, an electrically propelled vehicle having a pivoted truck, and a laterally movable collector suspended from said truck substantially below its pivotal point projecting into the conduit and making contact with the conductor. (See illustration.)

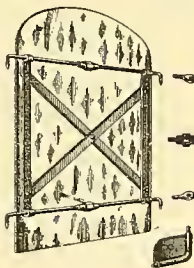
**524,040. Adjustable Gate for Street Cars;** Lorenzo R. Godwin, Memphis, Tenn. Filed March 5, 1894. The gate has suitable framework, a solid plate secured thereto, and arms capable of rigid adjustment extending from the sides of the gate, whereby the gate may be immovably attached to different widths of gateways. (See illustration.)

**524,062. Electric Heater;** Jesse F. Kester, La Grange, Ill. Assignor to the F. P. Little Electrical Construction and Supply Company, Buffalo, N. Y. Filed April 29, 1893. This heater consists of a slab of soapstone provided with a cavity, a resistance medium arranged in said cavity and an insulating filler composed of 25 parts of soapstone, 25 parts of flint glass, 15 parts of carbonate of soda, 10 parts of boracic acid and 25 parts of silicate of soda. (See illustration.)

**524,066. Waterproof Insulated Electric Conductor;** Duncan Macfarlan, Philadelphia, Pa. Filed May 17, 1894. This is a water and fire proof insulated electric conductor having a thread or chord of fire-proof material saturated with a liquid insulating substance wound around the same and a waterproof sheet or strip surrounding said conductor.

**524,100. Supporting Insulator for Electric Wires;** Lauren S. Beardslev, Naugatuck, Conn. Filed June 11, 1891. This holder for insulators consists of a pin provided with screw threads designed to engage the screw threads in the interior of a glass insulator, the pin having projecting therefrom a bolt, a bolster for the bolt, and means for securing the bolt in position.

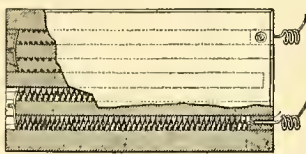
**524,104. Conductors' Money Belt;** John T. Doherty, Cambridge, Mass. Filed June 29, 1894. The device comprises in its construction a belt, a neck strap, connected thereto, aluminum boxes secured upon the



No. 524,040.

belt having covers provided with spring locking devices, a pocket formed in the belt, and means for attaching and adjusting the belt and strap.

**524,117. Motor Suspension for Railway Work;** Edwin W. Rice, Jr., Lynn, Mass., Assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Aug. 13, 1889. The supporting frame is



No. 524,062.

sleeved on the car axle and consists of two side and two cross pieces formed in one piece, one of such yoke pieces constituting the yoke piece or bar for the field magnet of the motor. (See illustration.)

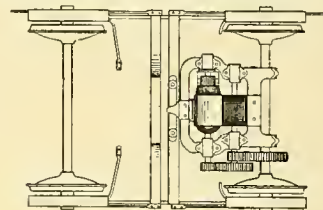
**524,119. Dynamo Electric Machine;** William B. Sayers, Glasgow, Scotland. Filed Jan. 6, 1894. The armature has the sections of the armature winding connected to the commutator sections by commutator coils; portions of each of which are located on opposite sides of a section of the said winding, to one end of which said commutator coil is connected.

**524,136. Regulator for Dynamo-Electric Machines;** Thomas A. Edison, Menlo Park, N. J., Assignor to the Edison Electric Light Company, New York, N. Y. Filed Nov. 11, 1881. An electromagnet is placed directly in the main circuit of the dynamo, and a variable resistance placed directly in its field of force circuit, the said magnet varying the resistance of the field circuit as the magnet is more or less energized. (See illustration.)

**524,168. Guard for Globes of Electric Lights of Lamp;** John C. Galster, Philadelphia, Pa. Filed Feb. 10, 1891. The guard is formed of sections of open work, a hinge connecting the same, and a catch attached to one section and adapted to engage with the other section, said hinge having strengthening pieces connected with the top of the upper section.

**524,175. Car Fender;** Alexander Kidd, Brooklyn, Assignor of one-half to Robert Wood, New York, N. Y. Filed May 11, 1894. The fender consists of a series of members which are coupled together and held by yielding tension devices to present a continuous barrier in advance of the car wheels both when in their normal positions and when moved laterally with respect to the track by contact with an obstacle in the path of the fender.

**524,190. Life Saver for Cars;** Frank M. Chapman, New York, N. Y., Assignor to Stella F. Chapman, same place, and Charles B. Jefferson, Buzzards Bay, Mass. Filed Feb. 15, 1894. The device consists of a buffer in



No. 524,117.

front of said car; gearing connecting one of the car axles with the buffer, said gearing being arranged to rotate, during each revolution of the car wheels on said axles, a given point on the periphery of the buffer a greater distance than the circumference of said wheels; and a safety shield interposed between the buffer and front of the body of the car and having an elastic vertical part and horizontal part.

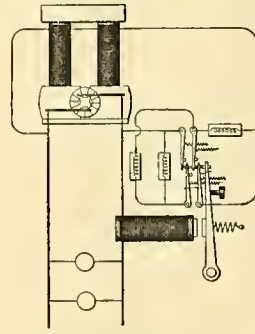
**524,198. Fender for Tram-Cars;** William Dryden, Brooklyn, N. Y. Filed Nov. 3, 1893. The safety guard consists of a body, a fender located at the forward lower portion of the body, and spring-controlled doors or gates located above the fender and constituting the upper front portion of the body.

**524,207. Street or Railway Car Fender or Guard;** Emil Kunitz, Memphis, Tenn. Filed Oct. 27, 1893. The fender comprises a body provided with upright rollers arranged, practically, in the form of the arc of a circle of large diameter, that is, of substantially uniform general curve outward, a avoiding marked prominence of the curve or at any portion thereof, substantially.

**524,232. Insulating Trolley-Wire Support;** Frank M. Zimmerman, Detroit, Mich. Filed Nov. 2, 1893. This is the combination of an outer shell, a central screw threaded nut secured to, but spaced from, said shell by an insulating disk, a supporting stirrup engaging with said nut, and a saddle piece adapted to form a grip therewith.

**524,255. Wire-Splicing Device;** Abraham Kilo, Mount Auburn, Ia. Filed Feb. 28, 1894. The patent covers in a wire-splicer a twister consisting of a body portion having an inclined half bearing therein, a clamping portion hinged thereto having a corresponding bearing, hooks on the side of the twister arranged apart and extending in opposite directions, and a headed bolt pivoted on the body portion and extending through the clamping portion.

**524,282. Electric-Railway Pole-Ratchet;** Thos. J. McTigue, New York, N. Y., Assignor, by mesne assignments, to Frederick K. Fitch, same place. Filed Jan. 23, 1893. Renewed Jan. 22, 1894. The metallic pole-ratchet has a metallic clamping device for attach-



No. 524,136.

ment to the pole, and insulation electrically separating the ratchet from the clamping device.

**524,283. Trolley-Wire Circuit-Breaker;** Thomas J. McTigue and Sumner W. Childs, New York, N. Y., Assignors, by mesne assignments, to Frederick K. Fitch, same place. Filed Jan. 23, 1893. Renewed Jan. 22, 1894. The device is composed of two end castings united by two lateral parallel insulated rods fixed in said castings but insulated therefrom.



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Atlanta Street Railway Con- Already street railway men are taking a great deal of interest in the American Street Railway Convention. The convention to be held at Atlanta in October, and indications all point to a large attendance. Arrangements are making for a special train, and the delegates will be afforded an opportunity to visit Lookout Mountain and other interesting points. From Atlanta the assurance comes that all visitors will be given a most cordial welcome.

Speed of Electric Cars. The public does not desire any decrease in the speed of trolley cars, the daily press to the contrary notwithstanding. Nine out of every ten passengers would if their opinions were asked, express themselves in favor of even more rapid transit on surface lines than they now enjoy. Any decrease in speed is bound to create grumbling. Not a great while ago the chief of police of Worcester, Mass., brought complaints against the local street railway company because it operated cars faster than ten miles per hour. The action was taken in behalf of the public, but it evidently does not appreciate this interest in its behalf. A petition is now in circulation asking the City Council to change the ordinance relating to the speed of electric cars so that outside of the mile circle the maximum rate shall be 15 instead of 10 miles an hour. The company is agreeable to the change and the petition is supported by a large number of influential citizens. It is interesting to note that the *Spy* of that city, in referring to the popular dissatisfaction with the slow running of cars, says: "The complaints, as a rule, upon which the prosecution was undertaken, did not come from persons who use the cars."

Special Cars for Bicycles. Every street railway company now realizes, as it never appreciated before the days of rapid transit, the value of stimulating travel along its lines by following out new plans. Vast increases in traffic demonstrate how profitable have been new departures of this kind. Parks and resorts have been opened, exhibitions have been arranged, special cars have been provided for the use of evening excursion parties, and a score of other expedients have been advantageously adopted by shrewd managers in pursuance of the policy of stimulating travel. The Kings County Elevated Railroad Company, of Brooklyn, has just found a new means of attracting passengers to its coaches, which may be suggestive to street railway companies in a number of cities. There is a great army of bicycle riders in Brooklyn who, it is assumed, will be glad to escape the rough roads when they make excursions into the country. On last Sunday for the first time a special car was provided for the transportation of wheels. The type of car used for this purpose is the ordinary flat car, but around it is a railing 4½ feet high, in which are doors. On one side are bicycle racks, while on the other the wheels can be piled one against the other. In addition to the ordinary five-cent fare, the wheelman pays ten cents, has his machine checked, and rides in comfort until the good roads are reached. It is the present intention to run the bicycle cars only on Saturdays, Sundays and holidays; but if the arrangement proves successful the number of cars will be increased and the service will be extended to other days.

Street Railway Mail Baltimore will probably be the next city to utilize street railway systems for the distribution of the mail. Postmaster Warfield, of that city, has applied to the several companies to assist him in his efforts to improve the service in the suburban districts tributary to their lines, and he is receiving favorable responses. This is as it should be. Every contribution that the street railway company makes to the attractions of suburban life, and to the development of suburban property, is bound to increase its income. The street railway mail service is bound to extend, and companies will act wisely when they co-operate in a liberal way with the postal authorities.

The Benton Harbor Incident. In our last issue we presented a report of trouble which occurred in Benton Harbor, Mich., when an effort was made to remove certain tracks belonging to the street railway company. The report was reproduced from a daily paper, and perhaps injustice was done to W. Worth Bean, who was represented as the chief actor in the encounter. Mr. Bean made the common mistake, as we think, of refusing to make a statement to the reporters, and as a result his side of the case was not presented at the time to the public. It may be remarked incidentally that street railway companies at times suffer in public esteem through the disinclination of their representatives to make statements for the use of the press. Evidently believing that they will be misrepresented in any event, they regard silence as the part of discretion. If, however, they would prepare written statements, or take pains to see that interviews correctly represent them in any given matter, they might save themselves a vast deal of subsequent explanation. If they keep silent they may be assured that their enemies will not be too scrupulous to seize the advantage of presenting uncontradicted their side of a controversy, and this statement in nine cases out of ten will necessitate some sort of a reply. In this event the company's case is prejudiced because of the fact that an original statement creates a stronger impression than a correction, and it gains nothing by the discretion, for it is forced into print after all. In the present issue we present a statement from Mr. Bean, which we strongly wish had reached us in time for publication a week ago. It will be apparent that the encounter at Benton Harbor, according to Mr. Bean, was far less serious than represented in the press dispatches, and that he did not fire his gun in the protection of the street railway property, as the dispatches had it. The alderman who was shot was the victim of the accidental discharge of a weapon, and the wounds were by no means serious. It also appears from the statement that Mr. Bean and his associates were not the aggressors, but that the officials who were removing the track acted "without authority of law, or even a resolution from the City Council." We commend the statement to the attention of the street railway men, a great number of whom Mr. Bean counts among his friends. The incident has created not a little comment, and we are glad to have Mr. Bean set himself right. We certainly trust that the future proves that the incident was one of slight importance.



## STATEMENT FROM W. WORTH BEAN.

*Editor of Street Railway Gazette.*

Sunday, August 13th, the Associated Press sent out a number of dispatches in regard to a riot caused, in Benton Harbor, Mich., by an attempt to tear up the street railway tracks Sunday morning at about four o'clock, and stated that I had shot an alderman while in discharge of his duty. The facts of the case are these:

The street railway company constructed, in November, 1892, two squares of track on Main and Sixth streets, running to Territorial street, under the terms and provisions of an ordinance passed, accepted and approved August 17th, 1892, the same continuing on Territorial street and other streets to the east city limits. On June 7th, 1893, the City Council agreed with the railway company to repeal that portion of the ordinance on Territorial street and change the same to Main street, with the understanding that the property owners were to pay the railway company one dollar per foot to develop their property on Main street. Last June the financial depression caused them trouble and they could not raise the money. In May, 1894, the ordinance expired by limitation, this company claiming no further rights under it. On August 6th, 1894, the property owners and this company came to an agreement. That night the Council passed a resolution repealing the ordinance of June 7th, and requesting the company to remove the tracks at once.

I met the council committee on Thursday, August 9, and agreed to change the grade of two thousand feet of track, move all poles to the curb line, free of expense to the city. I also agreed to see that my track was planked with good three-inch plank. The original grade was established by the city engineer and tracks were laid according to his stakes. The two farmers on the committee said I should pave with cedar blocks. I declined to do it, as the planking was considerably better than the cedar blocks with sap, being the kind they are using for paving. Without authority of law or even a resolution from the City Council, two aldermen of the street committee, with one of the paving contractors, three policemen, four wagons and a gang of thirty laborers, at the unseasonable hour of four o'clock, and on Sunday morning, proceeded to destroy my company's tracks. I appealed to the deputy sheriff after twelve o'clock Saturday night, and at his request and knowledge furnished him a posse of five men and myself, four guns. I ran a car to the scene of action and the rioters and track destroyers upon its approach began to throw blocks and planks on the track and proceed with picks to dig up the track. During the riotous proceedings and while the sheriff was trying to make them desist, my gun was accidentally discharged from the front platform of the car, the contents striking the gate of the car and going into the ground, with the exception of two No. 2 shot, striking one of the aldermen who was some distance away. One shot lodged in the thumb, just under the skin, and the other one lodged in the front part of the leg just above the knee. I assured them at the time that it was an accidental discharge of the gun. Not until after the accidental discharge of the gun was heard did the sheriff have possession of the field. They gave me no time to appeal to the courts for relief, and I knew nothing of it until late Saturday night.

At the time of the trouble and arrest I was in full possession of the property; and after giving bonds and turning the property over to the sheriff for protection, I returned to my office in St. Joseph. After all of us had left the property, and the sheriff had taken charge of it for protection, he allowed the riotous work to begin again, and they succeeded in destroying the track, to the utter disgust of a large number of taxpayers and citizens who so badly needed the road to Morton's Hill. A petition has been circulated among the property owners and citizens of the East Side known as Morton's Hill, and subscriptions had been taken for the further extension of this track. I declined

to give my version of the affair to the Associated Press, through the advice of the railway company's attorney. Doubtless this was a mistake, which time will prove, but with the street railway press and people I desire to keep the good name I have had among them for the past twelve or fifteen years.

You are now in possession of all the facts as they exist, and you do not have to rely on newspaper reports. As stated before, I furnish you these facts and if you desire to comment on this affair you may not be at a loss to know where to begin.

W. WORTH BEAN.

ST. JOSEPH, Aug. 15, 1894.

♦♦♦♦♦  
**GREAT ELECTRIC RAILWAY PROJECT IN  
 NEW HAMPSHIRE.**

According to the Boston *Transcript*, the next General Court of New Hampshire is likely to have on its hands the acceptance or rejection of one of the greatest electric railroad projects ever conceived. It is nothing less than a trunk line extending up the Merrimack Valley from Massachusetts and from the headwaters of the Merrimack to the banks of the St. Lawrence opposite Quebec, and covering in its route the mountain, lake and wild wood regions of New Hampshire and Canada. From this trunk line branches are designed to extend east and west to all points which it is desirable to reach. At the head of this project is Mr. Charles Corliss, a large real-estate owner of Haverhill.

"This system of electric country roads," Mr. Corliss is quoted as saying, "is not designed as a competitor to the excellent steam road systems existing, but to be a feeder to them. The new system is designed to supplant, rather, the lumbering stage coach, barge and farm wagon. The electric car can go at full speed around corners and up hills which defy any other locomotive power. Their construction is now so cheap that they can in most instances be built and equipped by local capital. This system is designed to penetrate every township and hamlet on the trunk line and for miles on either side. Electric power for operating these lines can be easily and cheaply furnished by the unimproved water privileges abounding on the various routes. The zone system will doubtless be adopted in calculating tariffs, and it is thought that one-half cent a mile will be the maximum passenger charge."

♦♦♦♦♦  
**ELECTRIC TRACTION COMPANY'S WORK  
 IN PHILADELPHIA.**

On every division of the Philadelphia Electric Traction Company's system, except those in West Philadelphia, the preparations for the change of motive power are so far advanced that the starting of the trolleys on all the roads east of the Schuylkill River is a matter of only a few weeks.

On August 18th the electric cars will commence running on Lombard and South streets, east of the Schuylkill River. It is stated that in three or four weeks trolley cars will be running on the Fifth and Sixth street road. All of the new track is laid and most of the repaving is done. The trolley poles are up and the overhead wires are being put in place. Feed cables are being drawn into the conduits. There are two lines of cars on Fifth and Sixth streets. One uses Berks street, between Fifth and Sixth, and Front, and runs on Front to Kensington avenue. The other goes to Lehigh avenue and around the Episcopal Hospital to the depot. It is probable that the trolley cars will first be started on the Lehigh avenue route, but only a few days will intervene before the change is made on the other.

The Frankford branch of the Fifth and Sixth street road, running out Kensington avenue, is also practically ready for the trolley, and in a short time the familiar dummies will be abandoned.

On Second and Third streets the new rails are nearly all laid as far as the depot, at Frankford and Lehigh avenues, on the different branches running to the center of the city. A large part of the new granite block pavement is also laid. The trol-

leys will commence running on these branches of the Second and Third streets road soon after they are put in operation on Fifth and Sixth streets.

On Lehigh avenue also the work is well under way, and about October 1, or soon after, it is likely that electric cars will be traversing that thoroughfare.

The company has at last settled its differences with the Pennsylvania Railroad over the crossings of the new Cumberland and Huntingdon streets route, and it will be pushed forward to completion. This line will run from the Delaware River to Fairmount Park by way of Huntingdon and Cumberland streets, Kensington and Lehigh avenues.

In West Philadelphia work was recently commenced on the lines of the Lombard and South streets division. Progress is being made in laying new tracks on Thirty-eighth and Fortieth streets. On Baltimore avenue nothing has yet been done.

The large power station at Beach and Laurel streets, which is to furnish power for the Fifth and Sixth, Second and Third and part of the Lehigh avenue roads, is about finished. Two of the 1,050 H. P. engines and generators and one of 350 H. P. are being installed and will be ready for a trial run in a few days. Four of the boilers have been erected.

Cars for the Fifth and Sixth and Second and Third streets road are being built by the St. Louis Car Company and the Jackson & Sharp Company, of Wilmington, Del. This company is also rebuilding a number of its old horse cars and equipping them with motors.

♦♦♦♦♦  
**BOYCOTT AT YOUNGSTOWN.**

A meeting of the merchants of Youngstown, O., was held last week to consider the strike of the street railway employees. While cars on the street railway system have been running regularly, manned by non-union employees, they are boycotted by the old men, who have determined to extend the boycott to all those patronizing the street railway company. When employees in local stores ride on the cars, their employers have been asked to discharge them under penalty of suffering from the boycott. In view of these and other disagreeable conditions, the merchants decided to meet to consider means by which the strike might be declared off. After considerable speechmaking, these resolutions were adopted:

Inasmuch as the street railway strike now in force here has disturbed the business interests and is retarding the prosperity of society, we, the merchants of Youngstown, in the interest of all parties concerned, respectfully suggest both to the management of the street railroad and the former employees, a method in which the matter in dispute may come to a final settlement, to wit:

*First.*—That the management of the street railway company and its former employees shall submit by its proper officers or attorneys a statement of its grievances which it may now have or have had since the strike has been inaugurated, to the three honorable Circuit judges of this county for their decision as to whether there is now or has been matter which should have been subjected to arbitration.

*Second.*—That if, in their judgment, there are or have been differences between contending parties which should now be arbitrated, that these honorable judges be respectfully requested to give their judgment as to the proper and equitable mode of adjusting these differences.

*Third.*—That the interested parties hereby pledge themselves to submit unqualifiedly to the decision of these honorable judges.

*Fourth.*—That in case of failure of either side to submit its cause as here suggested or to submit to the decision of the honorable judges, the merchants of this city, individually and collectively, bind themselves to sustain that side which will consent to this request.

*Fifth.*—That the chair appoint a committee of six gentlemen whose duty it shall be, first, to solicit the signatures of the merchants of this city to this proposition, and, second, to obtain the signatures of the officers of the Youngstown Street Railroad Company, and those of the street railroad men's union, and, third, to draw up a petition, the same to be signed by some of the influential men of our city, to be forwarded to the honorable members of the Circuit Court of this county, begging them to accept of this trust as a favor to their constituents for the good and welfare of this city.



**THE HEILMANN LOCOMOTIVE.**

A vast deal has been written of the electric locomotive of J. J. Heilmann, which last spring made its successful trip from Paris to Mantes. It scarcely appears to be the case that the results of



J. J. Heilmann.

the experimental trip justified the extraordinary enthusiasm which the combination of Heilmann created on the other side of the Atlantic. A writer in the *Revue Illustrée*, for example, prefaces his

conditions of working steam is used far more uneconomically in an ordinary locomotive than in a well-designed engine used for driving a dynamo. Heilmann naturally claims that because of this fact far better results are obtainable than would appear theoretically. Another point in favor of Heilmann's locomotive lies in the fact that its entire weight is utilized to increase traction without any complication of coupling rods.

The locomotive is slightly over 13 feet in length and weighs 100 tons. The general plant consists of boiler, horizontal compound engine, developing from 600 to 1,000 H. P., and a six pole C. E. L. Brown dynamo of a normal capacity of 410 kilowatts. The electric motors mounted on the axles are eight in number and are 60 kilowatts capacity each.

On the day of the official test from Paris to Mantes 200 invited guests occupied places in eight first-class coaches furnished by the Compagnie de l'Ouest. At its conclusion Mr. Heilmann received the warmest congratulations from those who had carefully observed the performance of the locomotive. It was stated that the test showed that the coal consumption of the Heilmann combination was 20 per cent. less than that of the ordinary locomotive operated on the line. The speed of the train reached as high as 105 kilometers per hour (65½ miles) on the down grade near Limay.

**CORROSION OF IRON PIPES BY ACTION OF ELECTRIC RAILWAY CURRENTS.**

In the last two issues of the STREET RAILWAY GAZETTE appeared a paper read by D. C. Jackson before the Western Society of Engineers, in Chicago, on "The Corrosion of Iron Pipes by the Action of Electric Railway Currents." After the paper had been read the following discussion took place:

O. M. RAU, Milwaukee: We had a case in Milwaukee which leads me to believe that the condition of the soil is as much responsible for the corrosion as the electric current. On a railway line built about four years ago a No. 4 copper wire was laid as a supplementary track feeder. On investigating the condition of this wire recently it was found to be entirely eaten away on the lower end of the line and on the upper end in as good a condition as when new. The electric conditions were the same all over this line, as the powerhouse is situated in the center of the circuit. From this instance as well as others, I do not believe the leakage of electric current will noticeably affect a pipe unless the chemical nature of the soil is favorable to this action. In a number of places where the water pipes were affected special care was taken as to the kind of filling used, lake sand or gravel being considered best.

A. V. ABROTT, Chicago: Professor Jackson has given to us an exceedingly valuable contribution to engineering literature. He has accurately determined the amount of corrosion per ampere-hour, or per unit of electrical energy expended, forming data from which we will be able to make calculations as to the probable effect of the corrosive action. He has also demonstrated what is still more important, namely, the amount of electrical pressure which is required, not only to initiate the trouble, but to constantly maintain the action. These experiments are in line with those made by Mr. Farnham, who showed in one experiment that a piece of lead wire about three inches long and nearly ¼ inch in diameter was dissolved in pure hydrant water: that is to say, in water as pure as is obtained from the Boston water works. The lead was entirely dissolved, with an electrical pressure of ¼ of a volt, in about a week's time—a result which is not only confirmatory of Mr. Jackson's investigations, but furthermore points to the conclusion that very small quantities of the electrolytic salts, to which Prof. Jackson has called attention, are sufficient to initiate and to carry on corrosive action. The actual amount of lead which passed into solution was not very great, but all examination upon the injury done to underground structures has shown that the difficulty arises from an extensive pitting of the metallic surface; a single hole will incapacitate a 30 inch water main as seriously as if the whole pipe were dissolved.

The amount and rapidity of the corrosive action seems to vary greatly in different localities and under different circumstances. The first action was noticed in Boston, in the summer of 1891, three years or more after the first installation of the electrical system of the West End Railway Company. Injury was first discovered by the telephone company in Boston, as affecting the lead sheaths of their underground cables. The Boston



ARRIVAL OF HEILMANN ELECTRIC LOCOMOTIVE AT MANTES.

description of the experiment in these terms: "It was on the 9th of May—remember the date, for it will be famous in the annals of science—that the remarkable electric locomotive of M. Heilmann was officially started on the Havre line. This was the first triumph of electricity over steam, in so far, at least, as French railroads are concerned."

It may be remembered, too, that the United States Consul made a report concerning the performance of the locomotive that fairly bubbled over with enthusiasm. He seemed to think that the problem of high speeds on railroads had been effectually solved and that the sooner American inventors followed Heilmann's lead the sooner they would accomplish something of value in this interesting and important field.

Heilmann's locomotive, it will be recalled, carries its own generating plant. This plan was hit upon by the inventor in view of the fact that because of the enormous outlay involved, a scheme necessitating the equipment of a new line or the transformation of an old one was impracticable. He therefore devoted himself to the construction of an electric locomotive that could be used at once on existing lines. As it has been repeatedly explained by French writers it is not extraordinary as it first appears to use a locomotive for first converting steam into motive power, then using this for generating electrical energy which in turn operates the motors. The contention that such a combination is valueless because of the loss at each stage in transformation of power certainly loses force when it is realized that under certain

This speed was three miles faster than that attained at the preliminary trial in the month of February.

The accompanying illustrations are reproduced



THE HEILMANN ELECTRIC LOCOMOTIVE.

tions of snap shots taken at Mantes at the conclusion of the trial.

Tonawanda, N. Y.—Cars are now running regularly on the Delaware street trolley line.

reports indicate that some of the smaller surface pipes, both of the water and gas systems, have been injured, but no damage is reported to have occurred to the large mains, although the engineers of the West End Railway have expressed an opinion that there is a probability of the ex-



istence of extensive corrosion. In the Brooklyn experience, however, within a very few months after the substitution of electrical propulsion for animal traction, extensive injury to the largest gas and water mains in the city was noticed, injury which, in Court street, necessitated the replacement of several lengths of large gas main.

Mr. Jackson has shown very clearly that a pressure of  $\frac{1}{1000}$  of a volt is sufficient to cause injury, if this action is allowed to continue. Should all electrical industries be allowed to pour their energy indiscriminately into the earth, it would be only a short time when such small differences of potential as this would be found all over the areas covered by our towns and cities. It is, therefore, merely a question of time when underground structures will be seriously menaced and rapidly destroyed by currents of this kind.

Some years ago I had the good fortune to construct about 300 miles of electric railway. At present I represent the engineering department of the Chicago Telephone Company, and so have been on both sides of the fence and have had fair opportunities to see and consider both sides of the question. In my earlier electrical railway experience the double trolley was still in vogue, and I constructed several roads of this kind. I have always advocated the idea that each individual electrical company, no matter what its business ought to have its own complete, entire and private circuit. The idea of constructing arc light plants, incandescent lighting stations, telephone and telegraph circuits and electrical railway lines, with the probability in the future of an indefinite extension of electrical circuits, and to dump the entire energy from all such sources into a common tub, is absurd.

In any other kind of engineering such mutual interference would not be tolerated for a moment. Already every electric lighting company is required by law to provide its own independent and private circuit. Nearly all the telephone companies are rapidly changing their lines from grounded circuits to metallic circuits, not only on account of the injury to which they are subjected from the other electrical companies, but also because experience has shown that the service obtained by the use of the individual circuit is attended with far better results. By this means each company secures a private right of way peculiar to itself, which not only does not interfere with other circuits, but is not interfered with by other circuits.

A few moments since, Mr. Jackson showed that by the construction either of a double trolley road or by providing an electrical road with a sufficiently adequate return circuit, the question of injury to underground structures, no matter what they may be, is completely and satisfactorily solved. This is also the remedy proposed by Mr. Farnham.

In the case of Chicago little or no trouble has as yet been experienced with underground structures, because the trolley roads are now only in the outlying parts of the city, where a minimum of metallic underground structures exists, and where the earth is in good condition to form a return circuit. Only a few trolley roads have at present been placed in operation, and those have been only operated for a short time. The electrical road, however, is bound to extend, and doubtless, in some form or other, will penetrate to the heart of the city before many years elapse. Some of the Chicago elevated roads are already taking up the problem and preparing to change their equipment to electrical propulsion. Unless they provide themselves with an individual circuit, and build that circuit in such a way that underground structures will not form a path for the current, trouble will, sooner or later, occur.

From investigations in Brooklyn and other cities it has been shown that in some cases the current followed a gas or water main, skipping along the main from point to point, running from the main into the earth, and from earth back into the main, depending upon the resistance of the joints. Thus many points of corrosive action were initiated, resulting in widespread and extensive injury to the pipes. The occurrence of such a result will be more and more frequent as trolley roads increase in number and extent and as more current is dumped into the earth.

A few minutes ago Mr. Rau related an experience in Milwaukee, where the difficulty was overcome by excavating around the water mains and return electric circuit and introducing clean gravel or sand. For a very limited district such an expedient may be a success, but it would be utterly impracticable to equip a large city upon this plan. Neither does it seem possible that such an expedient should be a final remedy for the difficulty. The constant accumulation of organic salts in the streets, from animal refuse, would sooner or later impregnate the cleanest and freshest soil with a sufficient quantity of decomposable organic acids to initiate corrosive action. It appears to me, then, that the remedy lies with the engineering societies, which should formulate such specifications and restrictions, applicable to various electrical industries, that should on the one hand protect existing

structures and on the other encourage the development of electrical enterprises by securing such an improvement in both the quality and quantity of the materials and workmanship as shall obviate the defect of poor and cheap building, so forcibly pointed out by Mr. Jackson.

The advantage of the electric road lies in its economical construction. The best cable roads cost from \$125,000 to \$200,000 per mile, while a first-class trolley may be built to cost not over \$60,000 a mile. The electrical road attracts the capitalist because he can earn more on his investment in this form than in any other. The single trolley road offers a special inducement, from the fact that it requires only one-fourth the copper necessary for the double trolley, and consequently requires a proportionally decreased investment for its original installation, but electrical railway engineers are finding that this is an expensive economy. In my own experience I have seen a return circuit through rail bonds running so hot that for a space of 1,000 feet the bonds have burned their way through the ties, allowing the rails to spread to such an extent as to derail the cars. All energy thus lost in these rail bonds demanded a correspondingly greater expenditure of coal, and to that extent diminished the earnings of the road. Quite commonly it has been asserted that an electric railway can be built for \$30,000 a mile, but after construction has been undertaken upon this basis it has been impossible for such roads to pay any dividends. In the past the work has been done not too economically, but too cheaply. If the capitalist would take the advice that the engineer usually gives, if he would plan his entire circuit, both the outgoing and the return branches, in such a manner that not over 5 to 8 per cent. of the energy generated by the station is consumed in the circuit, half of the electrical roads now in the hands of receivers would be earning and paying good dividends. They already have the necessary business, and the question of dividends is one of economical operation and maintenance. Assuming an interest and depreciation account of 10 to 12 per cent., a very little calculation will show that in nearly every road in this country additional copper in the line circuits will earn a good return on the investment. Therefore it seems to me that the way lies in improving electric railway construction to such an extent that it is not only the best engineering construction, but in the end cheapest for the capitalist and safest for other enterprises.

(To be continued.)

#### SOME PRACTICAL HINTS IN DYNAMO DESIGN.\*

BY GILBERT WILKES.

Chief Engineer of the Detroit Electrical Works.

##### III.

*Prevention of Sparking.*—The prevention of sparking is such a large subject that it is a pity to touch upon it at all, as it can only be imperfectly discussed. There have recently appeared on the subject a number of papers in the English electrical journals which are worth reading.

Sparking may come from careless attendance, overload, error in design (such as thickness of commutator insulation which is not based on calculation), insufficient number of commutator segments, insufficient carrying capacity of segments, brushes covering too many or too few bars, and instability of the neutral point. I leave out of the above, machines of positively bad electrical design that have no neutral point. It used to be considered as necessary for steady, sparkless running under wide variations of load, that the field magnets should be saturated and operated well above the knee of the curve of the iron of which they are built. In this I do not agree, and where light weight is no object, I prefer to run lower on the curve—at about the knee—as the magnetism at this point is more unstable and I think the iron can reply more quickly to changes of magnetization, and therefore keep the voltage of the machine more constant under rapid variations.

Granting that the machine is not badly designed, the three principal conditions for obtaining a steady neutral point and therefore the sparkless condition are: the proper number of commutator segments, a proper ratio between the ampere-turns on the fields and of the distorting coils on the armature, and a proper ratio between the total magnetizing force required and that used in overcoming the reluctance of the gap. The first two conditions are

interdependent. The first is more the result of reasoning from experience with dynamos, not only in the shop and testing room but in practice with machines of different designs, than from calculation. The other two are dependent upon the type, and one must make his own empirical formulas from the data of the first tests.

It is the third condition, the proper ratio between the magnetizing force required to overcome the gap and the total magnetizing force, that shows us why it is so much easier to build a sparkless small dynamo than a large one; for 80 or 90 per cent. of the total magnetizing force is necessary to overcome the high gap resistance. The area of cross-section of the gap is not only small, but owing to there being several layers of wire on the armature, the length is relatively greater. This also points out one reason why small machines are relatively much more expensive, because relatively so much more copper is necessary on the fields. Thus a 1 H. P. machine costs about one-twentieth of a 50 H. P., and a 3 H. P. about one-seventh of a 50 H. P. machine.

Going back to the 45 K. W. continental machine, of which I have already spoken: It is at the head of a list of machines of that type. We would, therefore, expect its field coils to weigh proportionately less than any others of the series, and, if so, that it should be nearer the sparking limit; also that the complete machine should weigh proportionately less than the other members of the series and cost proportionately less. All of these points are true. The weight of wire on the field is only equal to that on the similar K. W. machine. Its speed is 80 revolutions at 110 volts as a motor, and when run at about 35 per cent. above this by weakening the field the machine is unbalanced and there appears that peculiarly disagreeable snapping at the brushes. Yet the machine runs at its proper speed with absolutely no lead and no sparking at the brushes. The machine does weigh and cost proportionately less than the other members of the series. Its frame is made entirely of one iron casting, and yet the weight of wire on the armature is practically the same as that on the armature of the 45 K. W. Edison machine above referred to, the weight of the wire on the fields is less, and the total weights are: Edison, 6,800 pounds; continental, 7,635 pounds. This is a very remarkable result, when it is remembered that the Edison machine is of wrought iron and that a considerable expense is necessary in building it to machine and fit the parts of the field circuit. The two machines run at the same speed. Wrought iron does not necessarily make the lightest machine nor cast iron the cheapest. The design must be adapted to the material to be used.

*The relation of size of armature to output, and the relation of field loss to radiating surface.*—Concerning the relation of size of armatures to output, different rules are given by different people; and, in fact, not only will the watts per square inch allowable differ for Gramme rings, Pacinotti and drum armatures, but different armatures of the same type but different size will give varying results. A larger ratio of watts per square inch can be allowed for armatures having a single layer than for those having several layers of wire. This also holds true for field coils. The wide variation that exists may be illustrated by the fact that Kapp states that in field coils the watts per square inch of radiating surface may be taken between one and four. This would be rather an unsatisfactory basis on which to begin designing. I have found Esson's figures good for a first approximation.

As regards the present field for continuous current designing, the popular gaze is for the present in the direction of polyphase power transmission apparatus, so that the time is peculiarly suited for quiet study and advance in continuous current work. It is not necessary that the idea should be entirely novel. Many of the best plans have failed, owing to not being worked out properly. See the toothed armature. Four years ago it was regarded as a thing of the past and was simply remembered as Pacinotti's pioneer attempt. To-day it has re-

\* A lecture before the students of the College of Mechanics and Engineering, University of Wisconsin.



turned in an improved form and displaced everything else for large machines and small slow-speed machines.

Something must be done to cheapen the manufacture of small machines—say from 5 H. P. down—and my remarks may contain a hint as to one way of accomplishing this. Remember that the gap reluctance in small machines is much greater than is necessary for reasons of good running. Is it not possible to use iron wire for these small machines both on the armatures and fields? I feel sure it is. The fine wire used on these machines is very expensive, costing more than twice as

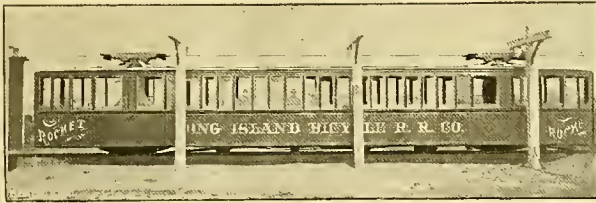
**THE BOYNTON BICYCLE ELECTRIC RAILWAY.\***

BY J. M. KNOX.

The Boynton bicycle electric railway is at present an experimental line running for a mile and a half in East Patchogue, L. I. It is the aim of the inventor "to simplify and reduce friction, thereby largely increasing safety and speed and saving wear and tear on both rolling stock and track."

The components of this friction in the ordinary railway system are: air resistance, lack of parallelism in the two rails, direct friction on the rail due to the weight of the car, and the friction owing

to the wheels are journaled, a vertical shaft rises through the roof of the car and carries a second framework with four guide wheels revolving in the horizontal plane, two on each side of and about half an inch from a 7 x 9-inch guide beam which, with its supports, forms the superstructure of the road and carries the conductor. When the car is at full speed the guide wheels only occasionally come in contact with the guide beam, as, owing to the gyroscopic action of the wheels, etc., the car tends to keep in equipoise. In rounding curves they turn the vertical shafts and thus the framework in which the wheels are set. The



BOYNTON BICYCLE ELECTRIC RAILWAY CAR.



SECTION OF ROAD STRUCTURE.

much per pound as for the larger sizes. I have already built fan motors, even for 500 volts, using iron wire exclusively, and the machines were not larger than the usual run of fan motors of equal capacity. I hope soon to try iron wire on small machines of somewhat greater capacity.

One last remark in relation to experimental machines. Let them be roughly made, for they will be very expensive anyhow. An experimental machine should never be begun until the improvement sought for is well fixed in the mind and all the calculations are made showing just what the machine ought to do, and every detail drawn out to scale. Drawings are slow, tedious, and expensive; but

to jamming, skidding, etc., when rounding curves. In the Boynton system the car is made wedge-shaped and very narrow. This greatly decreases the air resistance, and as the entire car with motor weighs but six tons, the friction due to weight is much reduced. The bicycle construction does away with all jamming and skidding on curves. The further advantages claimed are: More strength with less weight; speed and economy of transportation, with reduced cost of construction; a greater proportion of paying to non-paying loads; a great increase of speed (200 miles per hour); greater safety and smoothness of motion; saving in consumption of fuel, etc.

car body is swung from these vertical shafts by springs, the shafts having ball bearings immediately below the points where the springs join them.

To provide against accident, the car has grooved shoes at top and bottom, so that if a wheel were to break, the car would simply fall an inch or two and then skid along the track, there being no danger of its leaving the rail or falling over, the one shoe holding by the guide beam and the other at the rail.

The overhead conductor in this system consists of a twelve pound rail imbedded up to the head in an insulating material, allowing only a narrow slot for the current collector to enter. The current is taken off by four wrought iron shoes of three square inches contact surface each. It is stated that even at the high speed looked for by the inventors there is no danger of the shoes leaving the conductor.

The motor is a Gramme ring, series wound ma-



END VIEW OF BOYNTON BICYCLE RAILWAY CAR.



INTERIOR OF BOYNTON BICYCLE RAILWAY CAR.

you can change them and cannot materially alter the final product when it appears in copper, brass and iron.

(Conclude.)

Merced, Cal.—It is announced that G. A. Wul-kup, builder and one of the owners of the Hutchinson & Southern Railroad, in Kansas, who has been here about three months, has completed arrangements to build an electric road from Merced to Yosemite.

The car, as run on the company's experimental line in East Patchogue, is some 50 feet long, 4 feet wide and 7 feet high. The wheels, to one of which the motor is directly coupled, are journaled in a framework having no rigid connection with the car, but carrying four rollers, which press against bearing pieces fastened at right angles to each other in the car frame. This arrangement allows considerable freedom of lateral rotation for the wheels. From each of the frames in which

\* From the *Electrical Engineer*.

chine with 1,156 turns of No. 7 wire on the armature, the inside diameter of which is 36 1/4 inches. The field magnet is a solid steel casting of circular cross section placed inside the armature and wound with 210 turns of No. 5 wire; there are 193 commutator segments.

With regard to the commercial practicability of the system it is claimed that it is very economical. The line in East Patchogue, however, is not efficient under the present conditions. The motor was built for a normal speed of 560 revolutions per



minute, but it is unable to maintain more than about one-half of this speed, the car traveling at about 50 miles per hour; this may, in part, account for the large expenditure of energy necessary to run the car. Indicator diagrams taken from the engine which the company had in 1893 (100-h. p. New York safety) show that the engine was working at a very heavy load, but the actual electrical output it was impossible to learn. the

generator is operated under conditions similar to those it is intended to meet in actual practice.

Four or more sets of brushes, as may be required, according to the conditions, are used. Each brush is held in an independent holder; hence any single brush can be raised from the commutator without disturbing the others, and each, having its own spring, may be perfectly adjusted. The diametrically opposite brushes are of the same polarity and

rigidly keyed to a metal spider or sleeve, which can be readily slipped on and keyed directly to the engine shaft. All washers used in the construction of armatures are first treated to an annealing process peculiar to the company, with the result that the armatures when revolving in the most intense magnetic field will only heat up to a few degrees above the surrounding temperature.

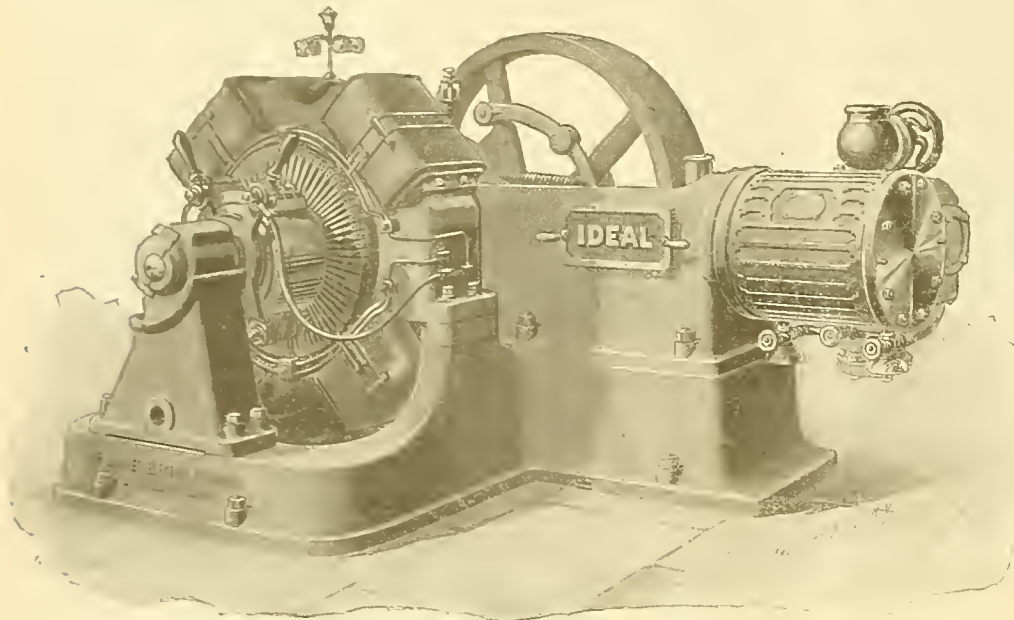
The winding is of the simplest form. The simplicity is particularly noticeable at the end of the armature, where the wires, instead of being overlapped and bunched together, stand out from the core and from each other, allowing free circulation of air around every conductor. No wires having a large difference of potential are adjacent to one another.

A feature peculiar to these direct-connected generators is the employment of cast steel in the field, which increases the efficiency of the generator and is much preferable to cast iron, cast steel giving an extremely powerful magnetic field, nearly double which is possible where cast iron is used, or which can be obtained with laminated soft iron pole pieces cast into the yoke, or frame, of the machine, on account of it being almost an utter impossibility to do this without producing blow holes or large apertures in the field casting, back of the laminated pieces.

The machines are manufactured by the Mather Electric Company, of Manchester, Conn., and the contractors for them in New York are H. B. Coho & Co.

#### GEARED DOUBLE CRANK PRESS.

The accompanying illustration shows a press for cutting out large armature disks, built by the E. W. Bliss Co., Brooklyn, N. Y. This press embodies a number of special features not hitherto used in presses of this class. Many of the large electrical companies have one or more of these presses, and they have given satisfaction and are doing excellent work.



MATHER DIRECT COUPLED GENERATOR.

station ammeter needle running up as far as it could go, 200 amperes being the last scale division, the voltmeter at this time reading about 400 volts. As near as could be ascertained the maximum output at any one time while the car made its trip was 85 k. w. and the minimum 80.5 k. w., the average being 82.5 k. w., or about 111 h. p.

It should be stated that the company is building a new motor to replace the one now in use.

are connected. The rocker arm of the brush holder is of rigid construction, and the different parts are perfectly insulated; it is designed so that it will adjust all the brushes simultaneously.

One of the distinctive features of these direct-

#### MATHER DIRECT-CONNECTED GENERATOR.

The accompanying illustration shows the latest type of improved Mather multipolar 100-k. w. generator coupled direct to a 150-h. p. Ideal engine. The Mather direct-connected generators embody the most advanced ideas in design and construction in this class of apparatus. One peculiar advantage of this type of generator consists in the fact that the fields are cast in four pieces, and entirely separate from the frame, all being bolted together, so that the assembling or taking apart of the generator, or the removal of the armature, is accomplished in an exceedingly short time and with the greatest ease.

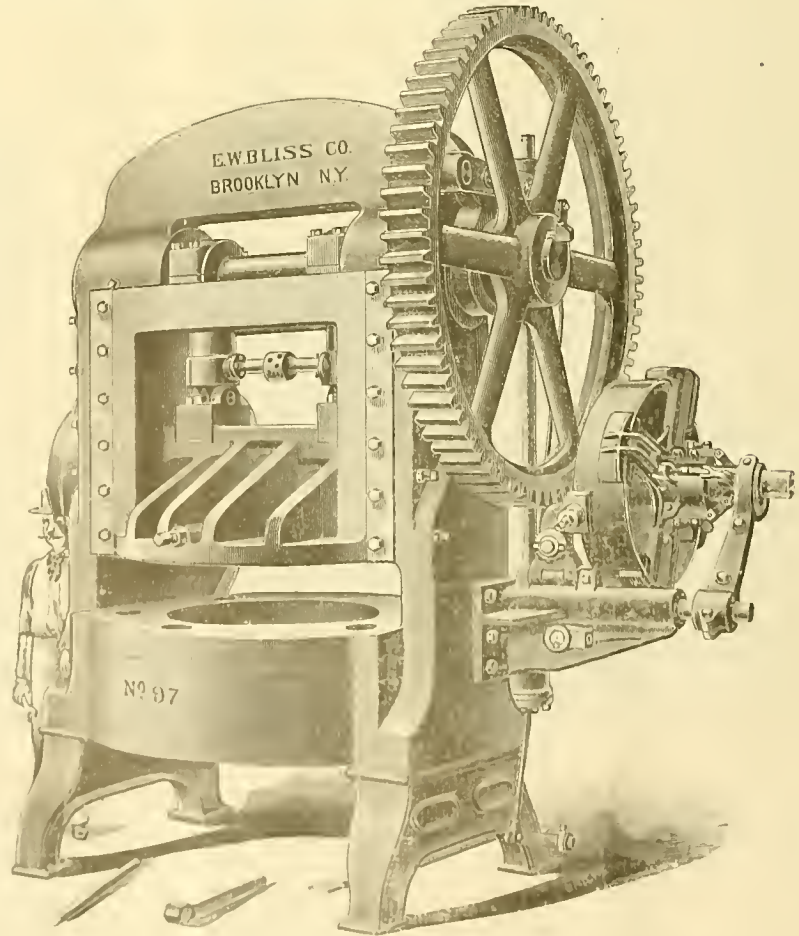
These generators are designed to be directly connected to any first class type of engine adapted for the work, and are exceedingly compact. They are self-oiling, self-exciting, self-regulating, and, after being started, require no attention. They are compound wound and equally well adapted for electric lighting, electric railway, or power purposes.

A common difficulty with a generator is sparking at the brushes, which is usually caused by the point of commutation shifting with the variations in the load. It has been the aim of the company to overcome this difficulty and that it has been done is proved by the fact that after the brushes have once been adjusted, further change in their position is not necessary, no matter how sudden or how great may be the variation in the amount of current supplied by the generator.

One great advantage connected with these generators is that on account of the field and armature being practically identical with those of the company's standard multipolar generators, it has been able to design testing frames, upon which they can be set up and run before shipping, so that every

connected generators is the construction of the armature, which is of the most improved type. The core is built up with thin discs of soft iron, which are forced together under pressure and

That there may be a firm support and accurate guidance to the large and delicate dies, the ordinary center gib has been abandoned and the ways of the slide are spread apart so as to be as wide as



GEARED DOUBLE CRANK PRESS



the frame itself. This has also made it possible to lengthen the ways considerably, without increasing the height of the frame. The illustration shows the additional solidity and accuracy due to this mode of construction.

A new automatic friction clutch obviates entirely many of the difficulties experienced with the regular automatic clutches on heavy back geared presses. A pressure on the foot treadle shown releases the weight which actuate a powerful friction clutch on the back shaft, thus starting the press almost instantaneously and obviating entirely the heavy metallic blow which

housings of 54 inches and is generally made with a 30-inch round opening in bed, which, however, can be varied to suit special requirements. It is geared 1 to 10, and has a flywheel weighing 1,800 pounds on the back shaft. The weight is 30,000 pounds.

STERLING FENDER.

The Sterling fender, which is illustrated in the accompanying cuts, is especially designed for use on cars operating in city streets, and its construction is such that it may be attached to the truck out of the way of damage from collisions with

Third Avenue Company is also using the same device on its cars. The device is manufactured by the Sterling Supply & Manufacturing Co., of New York City.

AN OBSTACLE TO GOOD SERVICE.

An official of the Philadelphia Traction Company recently made the following statement in a daily paper, which will meet with the approval of managers generally:

"One of the obstacles the passenger railway companies have to contend against in their efforts to make good time and give the people good service, is the teams which persist in remaining on the tracks in front of the cars, instead of turning out promptly as the car approaches. There are many drivers who do this persistently and deliberately, looking back or shouting defiantly at the motormen when they ring the gong as a warning. The result is that a carload of people are inconvenienced by one selfish driver.

"Trucks are frequently backed up to the sidewalk for unloading, blocking a half-dozen cars, containing 200 or more passengers, when they could be unloaded just as easily if they were standing side to the sidewalk.

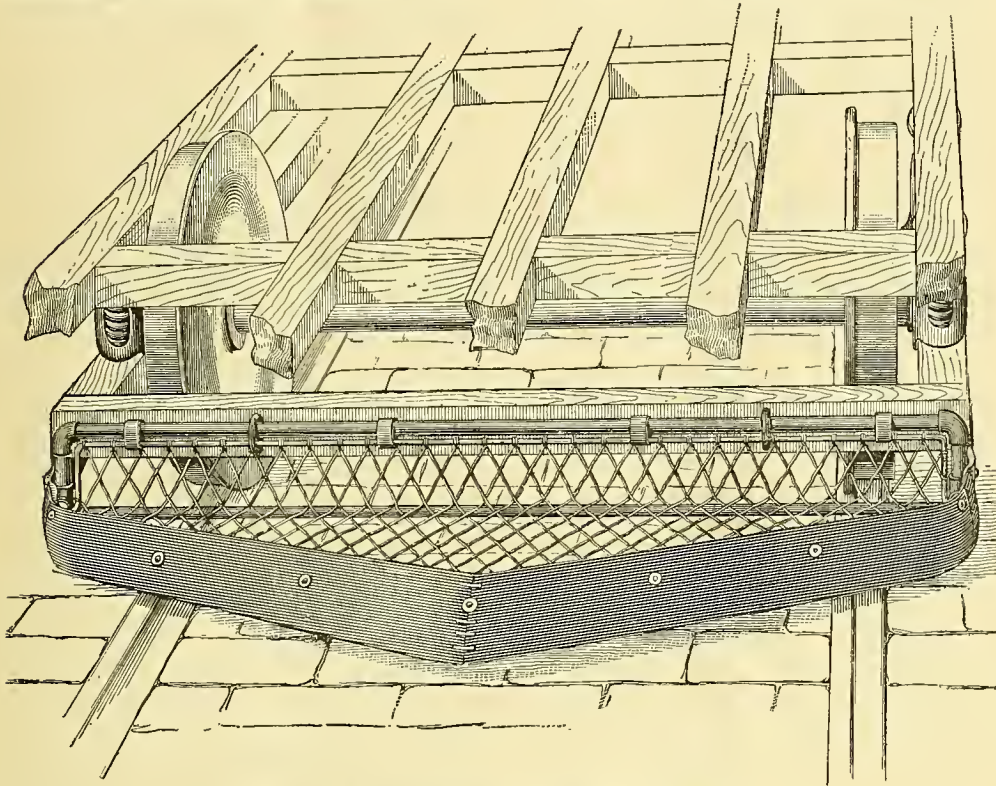
"If the police authorities would enforce the laws against obstructing street-car traffic, which cover the cases mentioned, there would be a decided improvement in the service. The companies have spent thousands of dollars for good pavements on the streets from curb to curb, and should be allowed to use their tracks without continuous obstruction."

THE TROUBLE AT BENTON HARBOR.

In the last issue of the STREET RAILWAY GAZETTE mention was made of the fact that trouble had arisen over the forcible removal of certain tracks by the local authorities. The St. Joseph & Benton Harbor Street Railway Company objected to the tearing up of its property, and in the dispute that followed one of the Aldermen was accidentally shot. As a result it is announced that the street railway company will sue Aldermen William Hovey, James P. Dean, Charles Shriver, Steven Boyle and Martin V. Buchanan, and Paving Contractor James W. Pearl, of Benton Harbor, for \$20,000. It is alleged that these gentlemen were instrumental in destroying the street railway company's tracks without authority of law and without any resolution of the City Council authorizing them so to do.

WOODS FLEXIBLE POLE BRACKET.

The Woods flexible pole bracket, illustrated in the engraving shown herewith, overcomes the hammering effect of the trolley wheel on the hanger, due to the rigid construction ordinarily used on the regular pole bracket, and makes a

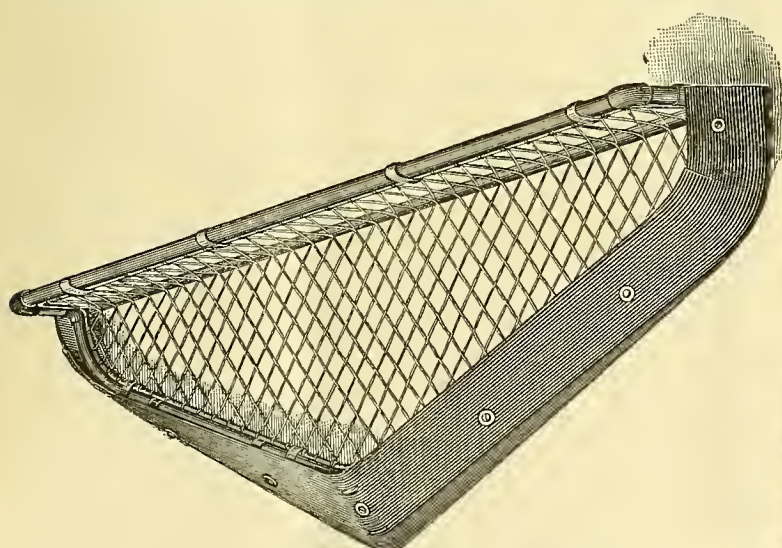


THE STERLING FENDER ATTACHED TO TRUCK

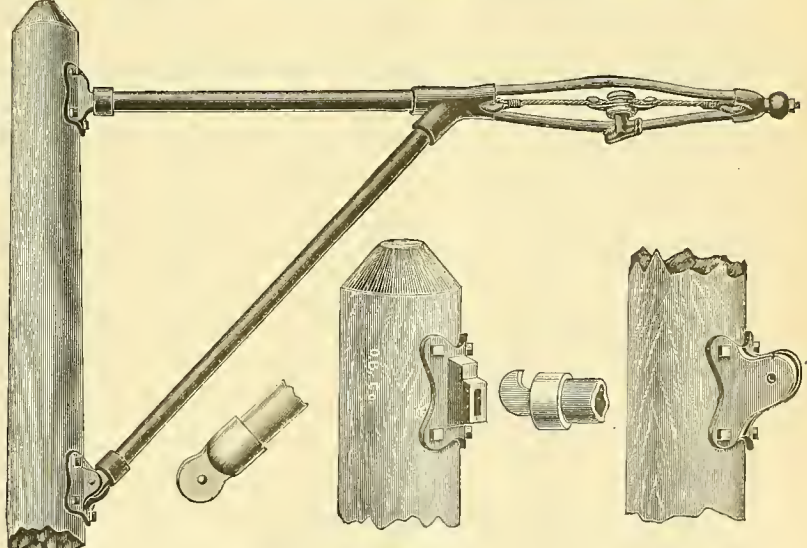
in the ordinary clutches tends to destroy the parts and frequently causes expensive delays and repairs. After the shaft has made one complete revolution a cam releases the friction clutch, bringing into action at the same time a brake, and thus stopping the slide at the highest point of the stroke.

The large gear wheel, instead of revolving continually, is, with these new clutches, keyed on the shaft, and at a standstill until the clutch is

vehicles. The feuder is light and strong, simple in its design, but at the same time it has been found effective in practice. The frame is made of wrought iron pipe with malleable iron fittings. The frame is covered with woven wire and the front is provided with rubber belting. This construction results in the production of a fender which causes a cushioned blow when it strikes a person, and is not calculated to injure him, as very



THE STERLING FENDER.



FLEXIBLE POLE BRACKET.

thrown into action. This constitutes an additional advantage in the saving of considerable wear on the shaft and wheel hub. Easy means of compensation are provided for whatever wear may be occasioned by continuous use.

This press will cut armature discs 30 inches diameter and larger. It has a distance between the

likely would be the case were hard, rigid, unyielding material employed. The fender is adjustable at any desired height from the track, and can be carried as close to the latter as is practicable. The Sterling fender has been adopted by the Metropolitan Company of New York for use on the cars of the Broadway Cable Road, and the

yielding and flexible support, allowing the cars to be operated at a high rate of speed without the evil results often experienced. The device combines the good features of the cross and bracket suspensions. The peculiar construction of the upper pole socket and hook allows the bracket to be easily swung into position and admits of the



adjustment of the horizontal arm vertically. The straight line hanger is suspended between the curved arms on the steel strand cable, the tautness of which can be adjusted by means of the eyebolt at the end of the bracket. The spread of the curved arm is 6 inches at the greatest width. The distance between the centers in which the cable is suspended is 2 feet. The fittings for this bracket are made of malleable castings to insure greater strength. The device is manufactured by the Ohio Brass Company, of Mansfield, O.

#### TRAIN SERVICE TO ATLANTA CONVENTION

The Norfolk & Western Railroad Company, known as the Shenandoah Valley Route, announces in this issue a special train to Atlanta, Ga., for the accommodation of those desiring to attend the convention of the American Street Railway Association, which meets in that city, commencing Oct. 17. As an inducement to those patronizing this route a visit is promised to the famous Caverns of Luray and the Natural Bridge in Virginia, and Mr. L. J. Ellis, the eastern passenger agent of the Norfolk & Western Railroad, will personally look after the comfort of those who avail themselves of this train.

As we go to press we are advised by the Southern Railway Company that they intend running an elegantly equipped Pullman vestibule train from New York City to Atlanta, leaving New York, Oct. 15th, at 4:30 P. M., via Pennsylvania Railroad, for the benefit of those desiring to attend the American Street Railway Convention. The section of the country traversed by this route possesses many scenic attractions, and the train is scheduled to arrive in Atlanta the next day at 3:55 P. M., making the time about 23½ hours from New York to Atlanta.

The members and delegates who attend the Convention of the American Street Railway Association in Atlanta, Ga., in October, will not lack for excellent railroad facilities, as both the Southern Railway Company and the Norfolk and Western Railroad Company are offering special inducements to those who patronize their respective lines. The rate of fare for the round trip over either line, including sleeping car, will be \$44. The headquarters of the association and of the majority of the delegates will be at the Aragon Hotel, and all who have not engaged rooms are advised to do so without delay.

## FINANCIAL DEPARTMENT.

### Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

STREET RAILWAY STOCKS are beginning to show signs of life, though general trading is rather light as yet.

There are so many would-be investors still away from financial circles that there cannot be extensive trading until they return. Brokers are receiving inquiries, however, about the most promising street railway stocks, which is a general indication that street business will follow. Reports are coming in from the West and Southwest of orders for electrical supplies. As these sections of the country have long been dormant, it is one of the most hopeful signs in the street railway situation. It is well known in stock circles that the street railways have done a splendid summer business. They have outstripped elevated and the suburban steam roads of like proportions. One of the probable reasons that street railway stocks are not appreciated according to their worth, as the regular railway stocks, is that earnings of the former are not given the publicity that steam road earnings are. It seems to be the policy of street railway companies to withhold statements of earnings from the public, and only inform a few of the amount of business. There are some exceptions to this rule of not publishing statements, but the majority of the street railways only send reports to brokers, who in turn only show the earnings to investors.

When earnings are published it will do a great deal in popularizing street railway stocks.

### Financial Notes.

**West Chicago Street Railroad.**—The affairs of the West Chicago Street Railroad Company are just now attracting no little interest in this city among those who hold the stock, and the amount is considerable. The statement is made by people whose sources of information are good, that the company will issue, shortly after the return of President Yerkes, another \$1,000,000 of stock. The proceeds of the recent sale of Tunnel 5s have been nearly absorbed, it is claimed, in taking up the company's floating debt and in making needed improvements. In order to change the motive power to electricity on

about 50 miles of crosstown and other lines a large amount of money will be needed. Several expensive electric plants will have to be erected, and people close to the West Chicago management estimate that the company will, during the coming year, need anywhere from \$1,000,000 to \$1,500,000 in order to carry out the scheme of improvements already decided upon.—*Philadelphia Stockholder.*

**Lancaster, Pa.**—The capitalists who own the electric railway system of Reading are about branching out into Lancaster county, having already taken the preliminary steps toward connecting Reading with Columbia, on the Susquehanna River, by way of Adamstown and Lancaster. Preparations are being made to secure the right of way for a line from Columbia to Lancaster, running parallel with the line of the Pennsylvania Traction Company, which has found that line such a profitable investment. The proposed line between Reading and Columbia would tap an exceedingly rich and well populated country, and it is believed that the line would give a large return on investments.

**Brockton, Mass.**—A meeting of the directors of the Brockton Street Railway Company was held in Boston last week. Col. George H. Campbell resigned as president of the Whitman, Holbrook and East Side roads. Fred B. Howard was chosen president of the East Side Company, John P. Morse president of the Brockton & Holbrook Company, and Horace B. Rogers president of the Brockton & Whitman Company. This is an initiatory step toward the proposed consolidation, permission for which was granted at the last session of the legislature.

**Brooklyn, N. Y.**—In the reorganization of the Long Island Traction Company, the following gentlemen have thus far been selected as directors: Theodore F. Jackson, of Jackson & Burr; John Englis, of John Englis & Son; J. G. Jenkins, president First National Bank; C. T. Young, president National City Bank; William Marshall, of L. Waterbury & Co.

**Street Railway & Illuminating Properties.**—Trustees of the Street Railway & Illuminating Properties purchased and canceled on August 17th 463 shares of preferred stock, paying an average price of \$97. This makes a total of 14,024 shares purchased to date.

**Mineral Ridge and Niles Road Purchased.**—The Mineral Ridge and Niles Electric Railway, constructed two years ago, was sold on an execution last week for \$27,800. The sale includes all equipments. D. Moynahan, of Youngstown, was the purchaser.

## NEW INCORPORATIONS.

**Philadelphia, Pa.**—The Chestnut Hill & Spring House Passenger Railway Company, capital, \$48,000, has been incorporated. The proposed line runs from the junction of Germantown avenue and Chestnut Hill and Spring House turnpike road northwardly over the turnpike through Flower town to Spring House Tavern, Montgomery County. This will be a continuation of the People's Traction line. The incorporators are Henry C. Moore, David C. Golden, Thomas B. Fool, Joseph C. Lugar, Hyland C. Murphy, Robert C. Snelmerdine and Nelson Sailer.

**Sioux City, Ia.**—O. A. Goodrich, of New York, and A. Holmes, John Pierce, H. A. Johns and E. C. Peters have organized the Sioux City & Suburban Street Railway Company, with a capital of \$1,000,000, for the purpose of consolidating all the street railways here. They now have the Riverside Park line, the South Sioux City and Covington road, the Short Bridge line, the Jackson Street line, and the Sioux City & Leeds line, all electric roads. They still want the Sioux City Traction Company line, with thirty miles of track, and the Morning Side line.

**Chicago, Ill.**—The Robertson Insulated Conduit Electric Company has been incorporated with a capital stock of \$1,000,000. The object of the corporation is the making, acquiring and selling of inventions, improvements and patents in electric railway appliances and devices, etc., equipping and operating street, horse and dummy railways, etc., in the city of Chicago. Following are the names of the promoters: J. Luttrell Murphy, Smith B. Bracey, Hamilton B. McMillan, Bernis W. Sherman, Wm. O. Osgood, Chas. A. Dye.

**Lockport, N. Y.**—The Lockport City & Olcott Electric Railroad Company has been incorporated to construct an electric road twenty miles long, from Lockport to Olcott, Lake Ontario. The capital is \$200,000, and the directors are William T. Holt, M. E. Stone, Adrian G. Funck, Jacob L. Toch, Edward J. Cunningham, Thomas J. Agnew, Noel Gale, George E. Dunscombe and F. Eugene Crasson, of New York City.

**South Orange.**—The South Orange and Maplewood Street Railway Company has been incorporated. The capital stock is \$100,000. The promoters are Henry A. Page, Chas. E. Souther, Bleck-

er Van Wagenen, Solomon H. Howe, South Orange, N. J.; Walter D. Jameson, Frank Brewer, West Orange, N. J.

**Philadelphia, Pa.**—The Aramingo Avenue Passenger Railway Company has been organized with a capital stock of \$12,000. The promoters are: Jos. C. Lugar, Hyland C. Murphy, Nelson Sailer, Philadelphia, Pa.

## NEWS OF THE WEEK.

**McKeesport, Pa.**—The *Times* announces that the Glenwood and Dravosburg Street Railway Company has secured all the right-of-way between Homestead and Dravosburg for the tracks, and the work will begin on the line at once. The right-of-way through Dravosburg has been secured and passage across the bridge is practically assured. The company wants to reach McKeesport, and it proposes to do it by purchasing the McKeesport and Reynoldton lines, if possible, and to make them a part of the system. Already work has begun on a bridge at Homestead to connect the road with the Second avenue line, which will carry passengers into the heart of Pittsburgh. The plans of the company contemplate the starting of a 20 foot electric car with 60 H. P. motors, from the corner of Fifth avenue and Walnut street, for Pittsburgh, every 15 minutes; and to have a car arrive there from Pittsburgh every quarter of an hour. The company contemplates a rate of fare of 10 cents a trip between McKeesport and Glenwood, and from there into Pittsburgh the fare is five cents, thus making the round trip rate 30 cents.

**Albany, N. Y.**—The *Argus* makes the following prediction regarding the construction of a trolley line connecting inland towns between New York and Albany: "There is reason to believe that a formidable trolley enterprise, of which Albany will be the northern terminus, has begun to take form. It is stated on what appears to be excellent authority that the electric road between Poughkeepsie and Wappinger's Falls, which is approaching completion, is only one link in a chain of trolley systems connecting all the inland towns between New York and this city. A road connecting Wappinger's Falls with Fishkill will next be constructed. Mr. Hockley, the President of the road, it is definitely stated, is one of the representatives of certain influential capitalists who are putting this great scheme through."

**Niagara Falls, N. Y.**—The horse railway on the Canadian side has passed into the hands of a syndicate composed of: Alexander Manning, ex-mayor of Toronto; Senator Aikins, Col. C. S. Gzowski, James A. Lowell, M. P., W. M. German, M. P., and others. The company will at an early date discard the horse car system and change to the electric system. Where the power is to be obtained has not been fully determined on, but it is reported that the Canadian Power Company has such faith in the enterprise that it has declared its readiness to subscribe to the stock. The ultimate intention of the new company is to extend the railway to Chippawa thus making a connecting link between the Grand Trunk railway station to Chippawa and thence by boat to Buffalo.

**Anderson, Ind.**—Upon the application of N. J. Clodfelter, of Crawfordsville, and A. N. Painter and V. C. Quick, of Alexandria, the Madison County Commissioners have granted a franchise for an electric line through this county. The line projected by the company, which will have a paid-up capital stock of \$200,000 and be bonded to the amount of \$100,000, is similar to that which Pennington mapped out last year and which collapsed so effectually. The proposed line will run from Indianapolis to Marion, a distance of 75 miles, passing through Ingall, Fortville, Pendleton, Anderson, Alexandria, Jonesboro and Gas City. It will be known as the Indiana Gas Belt Electric Line.

**Brooklyn, N. Y.**—There has been very rapid work done during the last week by the building of the Nassau Railroad, and there is little doubt now that the branch to Canarsie will be in operation by Sept. 1. Arrangements have been made with Harry Adams of the Brooklyn & Rockaway Beach Railroad so that there will be no delays in crossing the tracks of that company. An installment of 36 cars is expected from the Stephenson Company the early part of next week, and the South Brooklyn Terminal Company has given permission for them to be stored in its depot until the carhouse of the Nassau road is completed.

**Lancaster.**—On Aug. 22, Senator J. J. Patterson, President of the Pennsylvania Traction Company, accompanied by Col. B. J. McGrann and William B. Given, left for Coatesville, from which place they intended driving to Philadelphia over the route surveyed for the Pennsylvania Traction Company between Philadelphia and Coatesville. The object of the trip is to definitely locate the route of the line, which is to be built without delay.

**New Orleans, La.**—Regular service was commenced on Canal street by electric cars recently.



Eight cars are operated, and the number will soon be increased to 10. The line is  $3\frac{1}{2}$  miles of double track. The Judah line will be operated at once, and the Prytania street road will be started in September. The track of the latter is laid with 100-lb. girder rail, and the construction is excellent in every respect.

**Philadelphia, Pa.**—In a few days the contractors for the People's Company will commence laying feed-wire conduits on Germantown avenue for the Chestnut Hill extension. Tracklaying will begin very soon after. On the Old York pike about 2,000 feet of track are being laid a day. It is expected that this road will be completed to Jenkintown and Willow Grove about Dec. 1.

**New York, N. Y.**—Plans have been filed with the Building Department for a seven story brick power house, to be erected on East Thirty fifth street near Third avenue, by the Metropolitan Street Railway Company. The structure will cost about \$600,000, and will be used as the power house for the new Lexington Avenue Cable road.

**St. Augustine, Fla.**—The St. Augustine Electric Railway Company, with E. M. Homes, president; J. K. Rainey, vice-president; Charles Sperry, secretary and treasurer, and T. W. Jackson, general manager, will begin the construction of the road as soon as estimates for the work are completed, and which are now being made.

**San Antonio, Tex.**—The motormen on the lines of the San Antonio Street Railway Company struck last week, and the system was tied up for five days. The company then acceded to the terms of the strikers, who demanded that they be paid \$1.50 per day and that no boy conductors be employed.

**Trenton, N. J.**—The South Jersey Street Railway Company is securing a right of way from Bay Head to Lakewood. It is understood that the company intends to cut straight across the country from Lakewood to Trenton.

**Princeton, N. J.**—The New York and Philadelphia Traction Company has made application to the Princeton Council for permission to construct and operate an electric railway through the borough.

**Brooklyn, N. Y.**—The police of Long Island City last week arrested six firemen of the Long Island Railroad Company for violating the orders of the Health Board in burning soft coal in their locomotives.

**Lincoln, R. I.**—The Moshassuck Valley Railway Company has asked the Town Council for a franchise for an electric railway to be built from Sayleville to the Pawtucket line.

**Baltimore, Md.**—Seventy-eight car horses, the last lot owned by the Baltimore Traction Company, were disposed of last week, the prices averaging about \$45 a head.

**Muscataine, Ia.**—W. A. Seever is the new manager of the Muscataine Electric Railway Company. The line is to be extended and improvements are to be made.

**Pottsville, Pa.**—The Borough Council has granted the petition of the Schuylkill Electric Railroad Company for permission to make a number of extensions.

**Syracuse, N. Y.**—Belden & Seeley have been awarded the contract for building the electric road to Solvay. Mather & Allen are the engineers.

**Syracuse, N. Y.**—The Syracuse, Eastwood Heights & De Witt Railroad Company has been granted a franchise by the City Council.

## PERSONALS.

Superintendent Holmes, who recently disposed of his interest in the Belle City Street Railway Company, of Racine, Wis., to take the management of the railway at Green Bay, was presented a gold watch and chain recently by the employees of the Racine company.

**J. V. Quackenbush** has been elected president and treasurer of the Herkimer & Mohawk (N. Y.) Street Railway Company.

**Brainard Rorison**, of the Fort Wayne Electric Company, sailed for Europe on the steamship "Paris" last week.

**Thomas H. McLean**, general manager of the Citizens' Street Railroad Company of Indianapolis, is in New York.

**E. J. Robinson**, of the Laclade Car Company, of St. Louis, was in New York this week.

## TRADE NOTES.

**Edward P. Thompson and Prof. Wm. A. Anthony.**—Edward P. Thompson, of 5 Beekman Street, New York, announces that he has associated with himself Prof. William A. Anthony. The latter's professional record is familiar. For 15 years (1872 to 1887) he was professor of physics at Cornell University, where he planned and equipped the physical laboratory building, and organized and had charge of the department of electrical engineering. He is past-president and member of the American Institute of Electrical Engineers, and Fellow of the American Association for the Advancement of Science. Since the time of his resignation from Cornell University he has had experience in designing and building apparatus and machinery for electric lighting and power transmission, and as a consulting electrical engineer and expert in technical and patent matters. For the greater portion of this period he was engaged as the consulting electrician of the Mather Electric Company. He is the author of papers presented before technical societies and in scientific periodicals, and, with Prof. Brackett, of Princeton, a textbook of physics.

**The Aultman & Taylor Machinery Company**, of Mansfield, O., has installed a battery of two 150-H. P. boilers in the station of the Citizens' Street Railway Light and Power Company, of Mansfield, which is giving excellent satisfaction. It is announced that the saving in fuel with these boilers in comparison with an excellent battery of horizontal tubular boilers that were in use in the neighborhood of 15 per cent. The company will soon build quite a large plant in Mansfield for constructing these boilers. An arrangement has recently been made with H. E. Collins & Co., of Pittsburgh, by which the firm will have the exclusive sale agency of the boilers for the United States. This firm comprises among its members William C. Temple, formerly the agent for the Babcock & Wilcox Company, at Pittsburgh, whose success in that line is well known. The Aultman & Taylor company has recently closed contracts with large manufacturers in Philadelphia, among which is one for a battery of six 200-H. P. boilers.

**The Hoppes Manufacturing Company**, of Springfield, O., is now installing four of its live steam feed-water purifiers of 3,000 H. P. total capacity in the new electric station of the Lindell Railway Company at St. Louis, Mo. The Hoppes company naturally feels somewhat elated in securing this contract, as it was only awarded after a hard fight and in the face of very strong competition. Among other recent sales are the following: Live steam feed-water purifiers of 500 H. P. to the Procter & Gamble Co., at Ivorydale, O.; 1,500 H. P. to the Indianapolis (Ind.) Light and Power Company; 150 H. P. to Wm. Coombs, of Coldwater, Mich.; 400 H. P. to the National Milling Company, of Toledo, O.; 150 H. P. to the Cincinnati (O.) Street Railway Company; 150 H. P. to Chas. H. Suppes, of Johnstown, Pa.

**The Mather Electric Company**, of Manchester, Conn., reports the closing of an important contract with the Phelps Publishing Company, of Springfield, Mass., for the complete equipment of the latter's extensive plant with electric power. The new slow-speed motors of the Mather Company will be used throughout, in sizes from 20 to 50 H. P., the power being supplied from the Springfield station of the United Electric Light Company.

This installation, when completed, will be one of the largest of its kind in New England. The Mather company is now represented on the Pacific Coast by the following contractors: H. B. Gregory & Co., Portland, Ore.; The Will and Finck Co., San Francisco, Cal.; Machinery Supply Company, Los Angeles, Cal.

**The Berlin Iron Bridge Company**, of East Berlin, Conn., has received the contract for the new plant of the Fairfield Copper Company, at Monroe, Conn. The plant will be entirely of iron and steel, no woodwork being used about the construction. The new power station for the Hartford Street Railway Company, at Hartford, Conn., will be designed and built by the Berlin Iron Bridge Company. It will be 66 feet wide and 233 feet in length, with a steel frame covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron covering. When completed, it will be one of the most complete stations of the kind in the country, and will be absolutely fireproof.

**H. J. Medbery**, of the Fiberite Company, of Mechanicsville, N. Y., has been in Chicago this week looking after the interests of Medbery insulation. The factory is being run day and night in order to keep up with the orders. This company not only manufactures fiberite, but has its own brass foundries and shops, and manufactures everything that it puts on the market. This is a great advantage to the buyer, particularly if in a hurry and some of the goods happen to be out of stock, as the company is prepared to manufacture them at once and thus insure the slightest possible delay.

**The Dodge Manufacturing Company**, of Mishawaka, Ind., has just issued a very complete catalogue of appliances for the transmission of power. The volume contain 200 pages, and it is profusely illustrated with cuttings showing the great variety of apparatus, used in the transmission of power, manufactured by the company. The catalogue is one that should prove of interest to every power user. The company's branch houses are at 43-45 Dey street, New York, and 166-174 South Clinton street, Chicago.

**The Sterling Supply & Manufacturing Company**, of 97 Bank street, New York, has recently enlarged its factory so that its capacity is about doubled. Its new fender is attracting no little attention and already the business for this device is becoming large. The company will soon put on the market a new gate which it is believed will meet the needs of street railway companies. The company is receiving constantly good orders for its fare registers and other supplies.

**The Sterling Supply and Manufacturing Company**, of New York, has just received an order from the Nassau Street Railway Company, of Brooklyn, for its entire equipment of sand boxes and fare registers. The company has also received an additional order from the Metropolitan Traction Company of New York for fare registers to be used on the Columbus Avenue line.

**The Walker Manufacturing Company**, of Cleveland, has just issued two catalogues, the one devoted to direct current power generators and the other to electric railway equipment. The catalogues are thoroughly illustrated, and the machines are adequately described.

**The Mason Electric Company**, Chicago, is gradually filling up its large storeroom with street railway material and adding new specialties to its list. The company is agent for Medbery insulation, and reports some large sales of these goods.

**The Peckham Motor Truck and Wheel Company** has sent an announcement to this office stating that it is no longer represented in Chicago by P. S. Bemis, Jr.

**The Westinghouse Electric & Manufacturing Company** has just issued a new catalogue, descriptive and illustrative of its multipolar generators and motors.

**Curtis Electric Works Closed.**—The works of the Curtis Electric Manufacturing Company, of Jersey City, have been closed.

# RECORD OF STREET RAILWAY PATENTS.

## U. S. Patents Issued Aug. 14, 1894.

**524,316. Car-Fender;** James T. Duff, Pittsburg, Pa. Filed May 14, 1894. The fender or pilot comprises a frame having its rear edge pivotally connected to the car and adapted to have its forward end lowered into a position adjacent to the rails. An apron is carried by said frame, and a second apron is arranged transversely of the car in the rear of the fender, and means are provided for operating the fender.

**524,329. Brake-Operating Mechanism for Cars;** Thomas F. Kenney, Darby, Pa. Filed Dec. 14, 1892. The brake operating mechanism consists of a fixed grooved member, an eccentrically controlled rotating member mounted in a frame provided with a stud-pin and bell cranks operated by a foot lever for

controlling said brakeshoes by the frictional contact of said rotatable member with the fixed member. (See illustration.)

**524,343. Electrical Conductors;** Edwin D. McCracken, Alpine, Assignor to the Norwich Insulated Wire Company, Harrison, N. J. Filed Nov. 29, 1893. This conductor has a covering consisting of a strip or strips of paper composed of pure vegetable fiber, applied in its unchanged, fibrous condition, the paper forming of itself an insulating covering being dry and coated to render it practically anhydrous.

**524,352. Wire Stretcher;** Levi Roadhouse, De Kalb, Ill., Assignor to Abram Ellwood, same place. Filed April 20, 1894. This device consists of a notched bar, a lever carried thereby and longitudinally movable thereon, and pawls pivotally mounted on the lever and

adapted to engage with the notched bar. There are links pivotally mounted on the pawls and provided with a cam adapted to grip a wire.

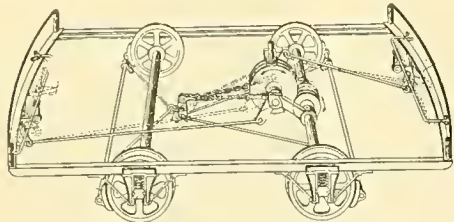
**524,366. Electric Railway System;** Theodore B. Wilcox and Henry Wilcox, Newark, N. J. Filed Aug. 1, 1893. The patent relates to a surface plate for electric railways, provided with a box in which a magnetic contact maker is adapted to reciprocate, in combination with a magnet, operating outside the plate, for causing the reciprocation of the said contact-maker, the exposed portion of said plate consisting of parts made respectively of magnetic and of non-magnetic material insulated from each other.

**524,367. Electromagnetic Contact-Making Device for Electric Railway Systems;** Theodore B. Wilcox and Henry Wilcox, Newark, N. J. Filed



Aug. 1, 1893. This device is detachably mounted upon an endless chain, the electromagnet being inclosed in a suitable casing, of which are supported suitable circuit terminals for the said magnet.

**524,368. Electric Railway System;** Theodore B. Wilcox and Henry Wilcox, Newark, N. J. Filed Aug. 16, 1892. Renewed Aug. 1, 1893. The system comprises an insulated main conductor, in combination with a series of exposed insulated contact plates arranged



No. 524,368.

along the track and normally disconnected from the said main conductor, a motor car, and electromagnets carried by the car for connecting the said contact plates to the said main conductor, the said electromagnets having a continuous movement with relation to the car while the said car is in motion, and the said electromagnets being just as far apart as the said contact plates are distant from each other. (See illustration.)

**524,373. Regulation of Dynamo-Electric Machinery;** Edward M. Bentley, Boston, Mass. Filed Dec. 26, 1890. The method of regulating the speed of an electric motor on a constant potential circuit consists in varying the number of active armature coils included in series in the circuit to correspond with changed conditions of running, and thereby effecting and maintaining an adjustment of the counter-electromotive force of the motor resulting in the desired speed at a given load.

**524,376. Compounding Motor-Generators;** James Burke, Schenectady, N. Y., Assignor to the General Electric Company, Boston, Mass. Filed June 5, 1891. The motor-generator has its armature motor-winding in series in the primary circuit and its field-magnets in shunt to the motor winding, and a second or auxiliary counter-electromotive machine force has an armature distinct from that of the main machine, such armature being in series in the primary circuit, and its field-magnets having a winding in shunt to its armature and a differential series winding in the secondary circuit.

**521,381. System of Power Distribution and Regulation;** John W. Gibboney, Lynn, Assignor to the General Electric Company, Boston, Mass. Filed Oct. 21, 1893. The system covers the combination with two or more independently operated plants, such as mills or factories, of a dynamo electric machine installed at each of said plants and adapted to co-operate therewith, and an electric circuit connecting said dynamo electric machines in parallel.

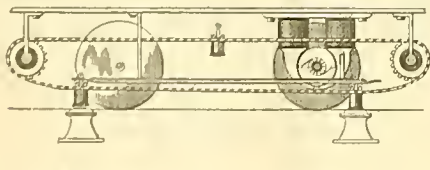
**524,382. Rheostat;** Albert B. Herrick, Schenectady, N. Y., Assignor to the General Electric Company, Boston, Mass. Filed May 22, 1893. The rheostat has a series of coils of resistance wire wound upon tubes, a plurality of coils being superposed upon each tube and insulated from the tube and from each other, the tubes being carried in a frame and insulated therefrom, and one of the coils being provided with a fuse of greater current-carrying capacity than the wire of the coil.

**524,383. Bus-Bar Switch for Central Stations;** Albert B. Herrick, Schenectady, N. Y., Assignor to the General Electric Company, of New York. Filed June 9, 1894. This is a system of bus bar switches for a central station comprising bus-bars, switches adapted to connect the bus-bars in different combinations, switch-boards located in a gallery, and mechanical connections between the switches on the bus-bars and the apparatus located upon the switch-boards in the gallery.

**524,384. Double-Throw Snap-Switch;** Edward M. Hewlett, Schenectady, N. Y., Assignor to the General Electric Company, of New York. Filed July 2, 1894. The jack-knife switch comprises a central blade, two outer blades, and a spring connected from one of such outer blades to the other, the outer blades having cut-away portions pivoted to the central blade and adapted to make positive contact therewith after a definite arc of movement.

**524,385. Controller for Electric Motors;** Joseph H. Jenkins, Lynn, Assignor to the General Electric Company, Boston, Mass. Filed Feb. 3, 1894. The controller for electric motors comprises a set of fixed contacts, a cylinder carrying contacts adapted to engage said fixed contacts, an inclosing case for said parts, an actuating shaft or spindle having a bearing in said case, and means for attaching said cylinder to or detaching it from said shaft at will.

**524,396. Controller for Electric Motors;** William B. Potter, Lynn, Assignor to the General Electric



No. 524,396.

Company, Boston, Mass. Filed Dec. 21, 1893. This is the combination, in an electric controller, of a switch having a series of contacts, and a blow-out magnet provided with a pivoted pole-piece reaching to points adjacent to the points of contact between the respective parts of the switch.

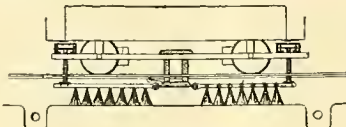
**524,402. Radial Car Truck;** William Robinson Boston, Mass. Filed May 12, 1892. The combination covered by the patent consists of a car frame, a main truck frame, a radial frame pivotally connected to said

main truck frame, and one or more radiating pins or equivalent mechanical devices secured to said car frame outside of the longitudinal centre thereof, said pins or devices engaging said radial frame and guiding and controlling the swiveling movement thereof relatively to said main truck frame.

**524,407. Electric Motor;** William L. Silvey, Dayton, O. Filed March 2, 1894. The field magnet consists of two wire-wound electromagnetic rings having pole-pieces of alternate polarity projecting from their sides between the coils of the rings, the two rings united together by rods passing through lugs which form part of the pole-pieces of the two rings.

**524,434. Conduit-Cleaning Device;** Charles O. Ehler, New York, N. Y. Filed Aug. 22, 1893. This device is designed for cleaning or sweeping the interior of slotted underground conduits suitable for electric railways, and is carried by an electrically propelled vehicle adapted to move above said conduits, consisting of one or more sweeping brushes or brooms suspended within the conduit from points upon the car, remote from each other, and connected thereto by self-adjusting connections whereby the said sweeping brushes or brooms are or can be adjusted to curved sections of said conduit. (See illustration.)

**524,440. Car-Jack;** William Jewell, Cleveland, O. Filed April 6, 1893. The jack has a casing having an interiorly screw-threaded bore and has at its lower end a contracted solid neck and a ball of larger diameter than said neck. A stem having a screw-threaded lower portion is adapted to screw into said bore of the casing, said socket plate and ball being provided with trans-



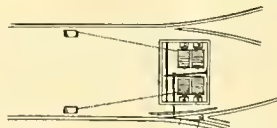
No. 524,440.

verse coinciding apertures adapted to receive a pin, whereby said ball and socket plate may be locked together.

**524,467. Insulating Turnbuckle;** Henry H. Luskomb, Hartford, Conn. Filed June 5, 1894. The insulator comprises a holder having a socket or cavity therein, a revoluble connection having at one end thereof a head or enlarged portion fitting within said socket or cavity in the holder, and provided with a metallic body having at the other end a threaded bushing and a screw bolt fitted to said bushing.

**524,503. Car Fender;** Joseph F. McDonough, Providence, R. I. Filed May 28, 1891. The appliance consists of the vertical members provided with means for securing the fender to a car, the frames formed by the sidebars and crossbars, and the netting secured to the frame, of the arms and braces for securing the frame to the vertical members.

**524,517. Trolley Wheel and Support;** David R. Thomas, Baltimore, Md., Assignor of one-half to William F. Harendt, same place. Filed May 26, 1894. The trolley support has the outer end bifurcated or formed into a yoke; a wheel is journaled therein; a plug in each end of the bore of the wheel, the outer ends of which plugs are each provided with a shoulder to fit against the side of the wheel, and the inner ends of the plugs being at a distance from each other, each plug being provided with an axial opening, and a pin adjust-



No. 524,517.

ably secured in the outer end of each arm of the yoke, the inner end of which pin fits within the outer end of the axial opening of its respective plug and forms a support or journal for the wheel.

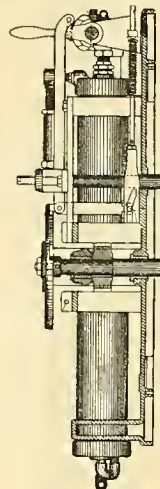
**524,532. Switch for Electric Railway Cars;** Timothy A. Rensen, Brooklyn, N. Y. Filed June 2, 1893. This is the combination with a railway having a main track, a branch track and a switch tongue, of a casing located between the rails of the main track, electromagnets arranged in said casing with their poles opposite each other, an armature lever pivoted within the casing and having lateral play between the inner ends of the electromagnets, a rod connecting said armature lever to the free end of the switch tongue, a cross bar arranged in said casing and supporting the free end of the armature lever in the same horizontal plane as the switch tongue, and means for energizing said electromagnets to operate the armature lever and connected switch tongue. (See illustration.)

**524,533. Dynamo-Electric Machine or Electric Motor;** Alonzo B. See and Walter L. Tyler, Brooklyn, N. Y. Filed May 10, 1894. The machine is provided with a box-shaped field magnet frame, having interiorly projecting field magnet cores, a removable cover on one side of the frame, lateral openings to permit the introduction and withdrawal of the armature, and standards for the armature bearings below said openings.

**524,540. Device for Operating Street Railway Switches;** Carl E. R. Christensen, Brooklyn, N. Y. Filed Nov. 15, 1893. The switch is adapted to be mounted on the platform of a car and comprises a guide socket, with a laterally flared bore, a stem mounted non-rotatively in the bore of the guide, a head-piece on the upper end of said stem, a wedge of clamshell form on the lower end of said stem, and a retracting spring.

**524,541. Pneumatic Controller;** Edward H. Dewson, Jr., Lynn, Mass., Assignor to the General Electric Company, Boston, Mass. Filed Sept. 11, 1893. This patent covers, in a pneumatic device for operating motor controllers, a source of substantially constant pressure, a piston actuated thereby, a valve controlling the pressure medium and determining the direction of movement of the said piston, a regulating or stop-by-step device for limiting and controlling the movement of said piston, and common means for operating said valve and stop-by-step device.

**524,542. Pneumatic Controller;** Edward H. Dewson, Jr., Lynn, Mass., Assignor to the General Electric Company, of New York. Filed July 13, 1893. The device comprises pressure cylinders and transmitting cylin-



No. 524,542.

ders substantially as described, pistons in said pressure cylinders respectively connected to pistons in said transmitting cylinders, non-elastic or incompressible fluid acting as the transmitting medium between said transmitting cylinders, and a cock for controlling the passage of said fluid from one of said transmitting cylinders to another. (See illustration.)

**524,548. Automatic Electric Signaling Device;** Edward A. Hermann, St. Louis, Mo. Filed April 16, 1891. In a device of the class described the patent relates to the combination of the signal trolley wire, the conductor wire leading therefrom, the incandescent lamps in circuit with the conductor wire, the solenoid in circuit with the conductor wire, the shaft adjacent to said solenoid, the semaphore mounted upon said shaft, the drum mounted upon said shaft, the connections between the solenoid and drum, the slides mounted upon the semaphore, and means for operating the same in combination with the main trolley pole and the signal trolley brace.

**524,615. Motor-Regulator;** Joseph F. Sheahan, New York, N. Y. Filed May 28, 1894. The apparatus comprises the combination, with the motor, the single rheostat arranged in the motor circuit, and the automatically operated weighted rheostat arm, of the pull knob operatively connected with the arm to raise it against the weight and thereby render it operative by hand as well as automatically.

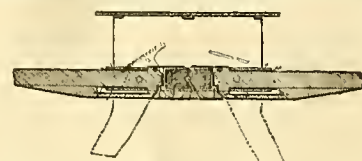
**524,630. Automatic Circuit-Breaker;** Anatole C. Carles, Portland, Me. Filed April 14, 1894. When wires are broken a metallic bridge is supported in a suitable case and insulated therefrom, a pivoted carrier mounted in said case, a circuit breaking rod having an inclined end set in said carrier and insulated therefrom, the inclined end of said carrier having a plate pivotally attached thereto and adapted to rest loosely upon said metallic bridge, but adapted to be disconnected therefrom by the breaking of the wire. (See illustration.)

**524,646. Electric Heater;** Charles H. Newbury, St. Paul, Minn., Assignor of one-half to John J. Borum, same place. Filed April 19, 1894. The patent relates to a support for the incandescing filament of an electric heater, composed of two similar parts, each consisting of a bar having a cross-head the edge of which is provided with half-round seats adapted to register with those in the other similar part to form substantially circular openings for said filaments, and perforated supports adapted to receive and hold said parts in juxtaposition.

**524,656. Electrical Storage Battery;** Burton C. Van Emon, San Francisco, Cal., Assignor to George H. Roe and Gustav Suro, same place. Filed Nov. 6, 1893. The electrodes or plates are in combination with elastic non-conducting and non-porous grids or forms to receive and sustain the active material, overlapping and embracing the electrodes at the bottom and sides; and ribbed separating forms interposed between positive and negative plates, the whole so combined and arranged that the electrodes are protected from contact with the liquid solution or electrolyte in which the battery is immersed.

**524,659. Insulator;** George H. Winslow, Pittsburg, Pa. Filed Dec. 8, 1893. This is a combination of an insulating body, an oil cup co-operating therewith and means for supporting said oil cup directly from said insulating body.

**524,672. Trolley Wire Switch;** Johan M. Andersen, Boston, Mass., Assignor of one-half to Albert Anderson, same place. Filed April 26, 1894. The support for electric conductors is the combination with side walls forming a groove, channel or way for the reception



No. 524,672.

of the electric conductor, and provided on their inner side with screw threads co-operating to form a threaded socket for the reception of a threaded clamp pin bolt, between the said side walls of the said threaded clamping bolt inserted into its socket to secure the electric conductor in the said groove.

**524,681. Insulating Turnbuckle;** Louis McCarthy, Boston, Mass. Filed June 13, 1894. The insulator comprises two shells having oppositely projecting connections placed within the same and insulated therefrom, a turnbuckle device having the opposite ends of the same placed within the respective shells and insulated from each of the said connections by an interposed mass of insulating material.



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**No Municipal Control** It is already announced that in Milwaukee, the scheme for the municipal acquirement of the Milwaukee street railway lines has gone glimmering. The project was conceived by members of the City Council in the hope that the movement would prove so popular that it would be advantageous to them politically. The suggestion has fallen flat, however, and nothing will come of it.

**Proposed Amendment of Franchises.** The City Council of Seattle, Wash., recently proposed to interfere with the affairs of the local street railway companies in an exceedingly high-handed fashion. A resolution was introduced providing that all existing street railway franchises be amended by the addition of a clause compelling the companies to pay their employees not less than 20 cents an hour. It is unnecessary to state that the proposed measure has not gone into effect; the Corporation Counsel declared it unconstitutional as it abrogated contracts, and it was effectually squelched.

**The Revival in Business.** There can no longer be a question that the long-predicted business revival has now commenced. Reports from all quarters prove the truth of this assertion, and the feeling is certainly one of great hopefulness. The improvement is bound to be especially marked in the street railway field. Even during the months of severe depression there has been great activity in planning railway projects, and the execution of the plans has only awaited the return of better times. We may now confidently look forward to a vast increase in construction, and all branches of the supply and manufacturing interests should profit accordingly.

**Decrease in the Number of Stops.** It is possible that one of the next expedients adopted to increase the rapidity of travel on surface lines will be to reduce the number of points at which cars stop. When rapid transit was introduced by cable and electricity the old practice of stopping cars at any place to accommodate patrons was promptly abandoned almost universally, and now it is likely that further progress will be made along this line in response to the very general demand for better time. A great many signs announcing that cars may be stopped in the middle of blocks are likely to disappear within the next year or two. On a great many suburban lines better service could be given regular passengers if stops were made every two blocks instead of at every corner. Such a change might at first create some dissatisfaction, but in a great many cases it would meet general approval.

**Trolley Mail Service.** Postmaster Hesing, of Chicago, has recently been investigating the trolley mail service in Brooklyn, and he speaks of it in terms of unqualified approval. He only finds fault because Brooklyn has got the start of Chicago in utilizing street railway systems for the distribution of mail. In his enthusiastic report on the trolley mail cars, Mr. Hesing says: "I have been studying up such a scheme myself for some time. But, of course, we in Chicago couldn't put up with a car half mail and half smoker; the whole outfit would have to be devoted to the mails. But I tell you, it's a big thing, and I think the trolley will yet be adopted by the

government for short mail hauls, especially between cities and their suburbs. It seems ridiculous to me to see the great lumbering, slow-going mail wagons in use in our larger cities passed in a flash by the trolley cars, and I wonder how long it will be before the government impresses the trolley into such service. It is the motive power of the future; and the sooner the department recognizes that fact the better it will be for the service."

**Collisions of Street Cars.** During the last ten days there has been an unusual number of street railway accidents, several of which have been attended by serious results. In the list of casualties those resulting from the collision of cars seem to occupy a prominent place, and yet these accidents, under proper conditions, should be comparatively few. When they are frequently happening the conclusion that carelessness is at the bottom of most of the trouble is almost irresistible. Certain classes of accidents cannot be considered preventable so long as cars run through crowded city streets, but, if trainmen are careful and car inspection is thoroughly attended to, cars should certainly not often run into each other with disastrous results. It is probably the fact that in many cases cars are allowed to run in dangerous proximity to each other in the centers of cities, with the result that if one car is suddenly stopped, and the motorman on the following car happens to be inattentive or is running at too great speed, a collision is inevitable. It is obviously out of the question to attempt the introduction of an arbitrary block system in which the motorman must judge by his eye alone of the proper length of blocks, but a regulation necessitating the maintenance of a safe distance between cars, and the slackening of speed on the approach of cars, could be enforced in many cities far better than it is at the present time. Without taxing our memory very severely we can call to mind roads where the apparent absence or disregard of some such rule is decidedly noticeable. Whenever, in certain districts where lines of these roads converge, the cars are farther apart than fifty feet the motormen evidently deem it their duty to reduce the distance to as many inches in as short a time as possible. Cars are started with a jerk, make rapid time for the fifty feet and are as suddenly stopped. This practice is to be condemned for more than the one reason that interests us in this connection. A great number of collisions occur at crossings or switches, and are due generally either to misunderstanding regarding right of way, defective brakes, poor eyesight, bad judgment or gross carelessness. It should be possible to render collisions due to these causes of extremely infrequent occurrence. The danger of collision is greatly enhanced at night, and one company in a New England city has deemed it advisable to hang signal lamps on the rear platforms, with the object of preventing collisions when trolley wheels slip off the wire, and the cars are no longer brilliantly illuminated. This practice may be worth following a number of places in cities where cars are like to meet each other on badly lighted streets, but evidently the best means for reducing accidents due to collision lies in the strict enforcement of regulations relating to the approach of cars at crossings, at switches and on the same track.



**DEATH OF GEORGE B. SHAW.**

George B. Shaw died in Eau Claire, Wis., on Aug. 27. Mr. Shaw was formerly manager of the National Electric Manufacturing Company, of Eau Claire, and it will be remembered that last year he was in charge of the World's Fair Information Bureau of the Electrical Supply Company, of Chicago. He was born in Allegany County, N. Y., in 1854, and went west to engage in lumber manufacturing. He was mayor of Eau Claire in 1888 and 1889; was a delegate to the National Republican Convention at Chicago in 1884, and was elected to the Fifty-third Congress as a Republican last year. He was supreme chancellor of the Knights of Pythias of the world from 1890 to 1892.

**KANSAS CITY SUIT.**

Minority stockholders of the Grand Avenue Cable Railway Company in Kansas City, Mo., last week brought suit for a receivership of the property. The action was simply a new move on the part of the petitioners to attack the consolidation which led to the organization of the Kansas City Cable Railway Company. This consolidation was effected on April 11 and 12, 1894. On the first named day the properties of the Kansas City Cable Company were united with the Kansas City, Independence & Park, or the "Independence dummy line." The next day the Grand Avenue cable system was absorbed by the consolidated company.

Some weeks later action was brought by minority stockholders in the Supreme Court of the State of Missouri to dissolve the agreement by which the consolidation was brought about. The plaintiffs asked to have the consolidation dissolved on the grounds that large bonuses had been paid the promoters of the deal, and that under the laws of the State such a consolidation was technically illegal.

The principal new claim made in the suit just begun is that the Kansas City, Independence & Park property was worthless and insolvent when it was taken into the consolidation. The saddling of its obligations on Grand Avenue and Kansas City cables, it is claimed, depreciated proportionately the value of the Grand Avenue's plant.

**ELECTRICITY ON COMMON ROADS.\***

The hopes cherished by some electricians as to the possibilities of electrical traction on ordinary railroads are not likely to be fulfilled by the adoption of any known system of electrical working. The most that can even reasonably be claimed for existing appliances is the possibility of running a through train from point to point; but the general application of electric traction—involving the fitting up of station yards and branch lines—cannot be entertained by any sober thinking man, and even the partial application to through express passenger traffic is very improbable, for there is not much hope in any system involving a double motive power, electricity for a few special trains and steam for the remainder. There would be no money in such a double outlay.

There is, however, a field for the employment of electricity that appears to present certain possibilities of success and usefulness. We refer to its use on the common roads. Any objections that may be felt to the use of the overhead system in towns lose much of their force when the country roads are considered, and there are numerous good roads in the country where, by means of the overhead system, a very considerable traffic could be conducted between towns and villages or outlying places and the nearest railway. The very onerous charges made by the railways of this country for the carriage of farm produce have had the effect of very seriously curtailing the agricultural production of the country in favor of the foreigner, whose product is almost invariably carried by our own railroads for very much less than home produce. . . . What we should like to see tried is an overhead electrical conductor along some main road to London that is traveled by the market gardeners' vans, such, for example, as the roads from Orping-

ton. The farmers would bring their vans to the line at the home end, and on arrival at the city boundary other horses would take off the vans to their destination, the miles between being covered by electric haulage. A suitable motor would be somewhat upon the lines of the present steam traction engine with the engine removed and an electric motor substituted. The current for such a line could very well be furnished by some existing electric light station, for the haulage is performed, we believe, in the early hours of the morning after the lights are out. The empty vehicles would be hauled back to the country as a day load, reaching home before dark, and thus being entirely a source of profit to a lighting station. Should such a scheme appear to contain the elements of success in its crude form, there is little doubt but that very shortly special motor vans would be built to replace the separate motor. A motor geared down to the axles of the van itself would involve none of the extra weight inseparable from the independent motor, while at the same time a loaded van would have ample tractive weight to draw after it other vehicles. Our English roads are so good that the traction upon them is by no means heavy, and we do not see any very insuperable difficulties in the way of realizing such an idea. Farmers must have horses, and so there would be no difficulty in bringing the loads up to the line any more than there now is in bringing loads to the railway. In many cases, too, there would be nothing to prevent a farmer having a conductor right into his farm when near the main line and so entirely dispensing with horse traction at the home end. Obviously, the first application of the idea would be upon roads leading out of the large cities some few miles only, but the rapid extension of electric lighting to towns along the roads offers such possibilities of relays that it would frequently happen that a pole line could be carried many miles without such a gap occurring as would demand a special generating station. The outlay on such a scheme would therefore be limited to the poles and conductors, and its financial possibilities would be favorable by reason of the fact that the only power required would come in as a day load and therefore serve to reduce the cost of the electric light stations fortunate enough to be called on to supply the current.

**BEGINNING WORK ON THE HADDONFIELD N. J., RAILWAY.**

The commencement of work at Haddonfield on the new electric road of the West Jersey Traction Company took place under unusual auspices, last Wednesday. The occasion was regarded as one of marked importance by the citizens, and it was celebrated by speechmaking and a ceremony introduced by the Haddonfield temperance element. Before ground was broken, George Horter, of Haddonfield, made an address, in the course of which he said:

"I look upon this breaking of ground for the building of the first trolley road to our beautiful town of Haddonfield with great interest. Some 42 or 43 years ago a steam railway had great difficulty and legal obstacles in making its roads through this section, to a terminal called Atlantic City, it then having less than half-dozen fishermen's cabins, but finally the road reached its destination, and now in that short space of time that city has become the greatest summer resort on the American continent. In breaking ground now for this trolley road, where upward of 6,000 people are knocking at the doors of Camden city for an entrance through its streets to its stores and houses and ferry landings, you will see in less than 48 hours our Camden friends with a majority giving us a hearty welcome, and that some day soon, with the frequent trains of the Pennsylvania road and a 10-minute service on the two electric roads, the boundary lines of our borough must be at the gates of Camden."

At this juncture a delegation of ladies, representing the Women's Christian Temperance Union, of Haddonfield, stepped forward and tendered the following inscription, which was attached by Miss May Willard to the gold-leaf covered bar with which ground was formally broken:

"The Haddonfield Women's Christian Temperance Union congratulate you, gentlemen of the

Traction Company, upon your intended entrance to the town which has no saloon. We tender you the emblem of the White Ribbon, which we attach to the golden bar with which you have formally broken ground, and trust that the influences for good which it represents may not only be preserved to our town, but extend to the thousands who will come to us upon your tracks."

Superintendent Thomas A. Wilson then put to work a gang of laborers on the turnpike, where the first tracks will be laid.

**GREAT INCREASE IN CONSTRUCTION PREDICTED.**

The following paragraph from the *Philadelphia Stockholder* seems unusual in these times. Fear of over-construction and depression in the street railway field scarcely seem consistent the one with the other. According to the paragraph quoted it would appear that we are about entering upon a boom period:

The present year will witness the incorporation of a greater number of electric railways in this state than at any time since the adoption of electricity as a motive power. Whether these roads will all be constructed is another question, but it is probable that many of them will not, as some of the charters taken out have been purely for speculative purposes. It is certain, however, that the mileage actually built this year will largely exceed that already in operation before the beginning of the year. This activity is not pleasantly regarded by investors, for the reason that there are already evidences that the matter is being overdone. In several localities duplicate or parallel roads are contemplated, and in case they are built it will mean a fight to the finish—a "survival of the fittest." The fear that too many new lines are being built has already had an effect upon capital at interior points; it is less ready to go into such schemes, and efforts are now being made to secure outside capital. At present this is a comparatively easy matter, because electric railway securities are just now regarded as safe investments. Caution, however, should be used in supporting these new roads, as electric railways pay only where the traffic exists.

**SENTIMENT AGAINST STRIKES.**

President W. D. McMahon, of the National Association of Street Railroad Employees, was recently interviewed in Columbus, O., in reference to strikes on street railways. He had just returned from a visit to unions in different parts of the country. He stated that there seemed to be a growing sentiment against strikes among members. As a result of this feeling an amendment to the constitution of the order will probably be adopted at the next national convention at Milwaukee early in October. This amendment will provide that the national officers must first be consulted and arbitration attempted before a strike is declared. After all peaceable remedies have been exhausted a strike may be declared with the national officers' consent.

**A UNION AGREEMENT IN LEAVENWORTH.**

The street railway company of Leavenworth, Kan., and the Trades and Labor Council of that city have been at loggerheads for some little time. Peace has been patched up, however, and the representatives of the two conflicting interests have signed the following iron clad agreement:

"This agreement is entered into this 15th day of August, 1894, between the Trades and Labor Council of Leavenworth and L. M. Erb, as manager of the Leavenworth Electric Railway Company, witnesseth:

"That the Trades and Labor Council, as party of the first part, agrees to cease all efforts to withdraw union patronage from the electric railway or Tanner's Park.

"The said L. M. Erb, party of the second part, in consideration of such action, agrees first to hereafter employ none but union labor whenever the trade at which the labor is employed has a union.

"Second—Said party of the second part agrees not to sell or allow to be sold anything but union home made cigars at Tanner's Park.

"Third—That said party of the second part further agrees that he will cease his persecution of the members of the present police board; and which board of police commissioners will be officially notified by the Trades Council that all grievances have been amicably settled and recommend the support of said board of police commissioners to said electric railway company."

\* *London Electrical Review.*



**DEVICES FOR KEEPING THE TROLLEY WHEEL ON THE WIRE.**

If simple means can be devised for keeping the trolley wheel on the wire at all times except when it is desired to shift the pole, one of the objections to the overhead system will be overcome. The slipping of the wheel from the path it should follow is not only a cause of frequent delay and annoyance, but under certain circumstances it may be a source of actual danger. When the conductor is in front of a crowded car collecting fares, it is not desirable that he should be obliged to leave his work and run back to the rear platform to fish

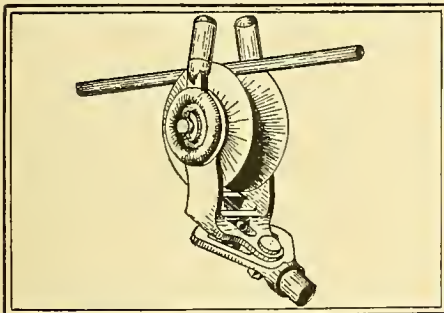


Fig. 1. Swivel Trolley and Spring Guides.

dency of the wheel to run off the wire at these points is reduced to a minimum. The fork rides on the swivel guide on two rollers, one above and one below, so that the motion is free, and it follows the wire perfectly, but the lateral strain is almost entirely removed. The guides may be attached to any style of trolley pole now used, as is shown in Fig. 2, but the swivel pole is regarded as an important adjunct. The only change necessary is a new trolley pin, slightly longer than that ordinarily in use, to accommodate the use of the spring cases. It may be observed that when these devices are used, a shallow-grooved trolley wheel may be adopted and in this way the tendency toward the

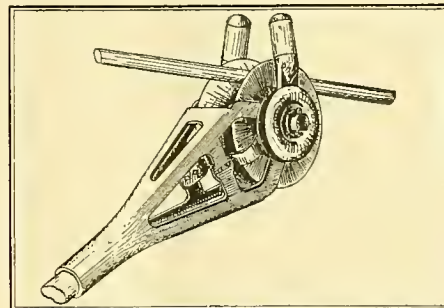


Fig. 2. Spring Guides Attached to Ordinary Trolley.

for the trolley wire. When the car passes over the tracks at a grade crossing, the trolley wheel is especially likely to leave the wire, particularly if the rails are not cut. The car and its passengers then may be in danger if the crossing is so wide that the conductor must precede his car the entire distance. When trains are constantly passing, there may be a collision if the car is stalled as a consequence of the sudden removal of its source of power. A number of accidents from this cause has been narrowly averted.

A variety of devices has been invented to prevent the trouble due to this cause and to keep the wheel in continual contact with the wire, but objections have been found to almost all of them by practical railway men. The most common fault found with attachments to the trolley harp has been that the means for holding the wheel in position are likely under certain conditions to tear

cramping and wear of the wire is materially lessened.

To permit of the use of the guides on trolley poles used on existing roads, the only change necessitated on the overhead construction would be in having brackets and switches deep enough so that they would not interfere with the passage of the upright pieces. As these are only three-quarters of an inch above the edge of the wheel, the allowance need not be great. The advantage which will follow the use of the devices, however, will be sufficient, it is claimed, to compensate many times over for the slight cost of a change. In new construction a form of switch illustrated in Fig. 3, which has been designed by Mr. Lord, may be adopted. This provides abundantly for the clearance of the guides. Fig. 4 illustrates a means that may be adapted for bracing the trolley wire so that the upright pieces on the wheel will not strike the



Fig. 3. Overhead Switch.

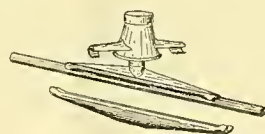


Fig. 4. Device to be Used Under Hanger.

down the overhead construction. Other objections relate to the probability that the auxiliary devices would interfere with switches, etc.

In the accompanying cuts is illustrated a combination of devices which, it is believed, is free from the objections noted, and yet will keep the trolley wheel on the wire. The invention, which is that of C. B. Lord, of Astoria, Long Island, combines a swivel trolley fork and spring guides attached to the pin of the wheel. When the devices are employed it is stated that no attention will be required for the trolley pole during a trip, no matter how many curves may be encountered. The guides, projecting three-quarters of an inch above the wheel, have, it will be seen by reference to Fig. 1, a slight inclination toward each other and thus tend to keep the wire in place. These upright pieces are controlled by firm but flexible spiral springs inclosed in protecting cases which permit of a movement either forward or back as far as may be necessary so as to pass under any obstructions in the way. The guides are provided with revolving sleeves above the edge of the wheel so that when the trolley wire strikes them friction and strain are greatly reduced.

The swivel fork, the construction of which is shown in Fig. 1, is an important part of the combination. It can conform to every curve and angle so that in conjunction with the guides the ten-

der. This auxiliary may be made of copper and soldered on the wire.

**A NEW TROLLEY DANGER.**

A motorman in Grand Rapids encounters no little excitement during his night trips, according to one of the local papers. The following paragraph describes one of the incidents of life on the front platform:

For several nights past young hoodlums have made it very unpleasant for street car motormen on Scribner street by hanging flour sacks filled with water to the trolley wires. The sacks are first oiled and they hold water nearly as well as a leather bag. They are hung on the trolley by a cord at about the height of a motorman's head and when struck they are broken by the speed of the car and the motorman is drenched with a half dozen gallons of cold water from the sack. They are suspended in dark places and the motormen do not see them before they come in contact with them. A few nights since some of these hobos stretched a strong cord across the track and a motorman who was running a car at full speed was knocked down by it and severely injured. Last night a motorman who had been drenched by a sack of water stopped his car and succeeded in catching one of the miscreants, and after giving him a maternal spanking let him go. The matter will be referred to the police, and if any more boys are caught in the act they will be turned over to the officers. It is a dangerous pastime, and the motormen will ask for protection.

**LESSONS OF THE RICHMOND ELECTRIC RAILWAY.**

BY FRANK J. SPRAGUE.

The year 1887 marked an epoch in one of the most important of modern industrial revolutions, and curiously enough a city in the southern United States was the place selected, largely by chance, for Northern capital and enterprise to carry out a grave experiment. There were altogether perhaps a dozen electric railways of various types in existence; none was so satisfactory as to warrant general adoption, and all were handicapped by their special experimental character. Capitalists, car builders, railway officials, engineers, offered no encouragement; electricians themselves were in the main doubtful. The electric motor was limited in its applications. It was looked upon as a piece of complicated machinery to be carefully housed and suspiciously watched. It was hydrophobic in character, eccentric in operation. Its construction was crude, its design unsatisfactory, its functions more or less mysterious. The vagaries of the electric current were many, its evasiveness surprising.

When it was proposed to use this agent to overturn the existing tramway systems of the United States—to put a motor under a car, exposed to dust, moisture and all the evils of negligent treatment—there were thought to be good grounds for insanity. To connect it to the wheel by gearing was to violate the laws of mechanics. To govern two or more such machines out of sight was "playing" a lottery. To tempt a wayward current of comparatively high pressure by using the ground as a return was enough to disturb the ghost of Ben Franklin. The ordinary conditions of a street car service were pronounced an insuperable obstacle to any self-propelled car; a greater than 6 per cent. grade was declared to be prohibitory. The investment of copper for a multiple-arc system of supply was financially forbidden. Four hundred and fifty volts potential threatened unknown terrors of torture and death, and a bare overhead wire promised innumerable holocausts. Even nature, with its mud, snow and ice, was to rise in rebellion.

Such was the condition of affairs when, in the spring of 1887, a contract was made between the capitalists representing the Union City Railway of Richmond, Va., and the Sprague Electric Railway and Motor Company, of New York City. This contract was unique. It called for the completion in 90 days of the equipment of a road at that time unlaunched and with a route determined only in part. It provided for a complete steam and electric plant of 375 H. P. capacity, the furnishing of 40 cars with 80 motors and all appurtenances necessary for their operation, and a complete overhead system. Thirty of the cars were to be operated at one time, and grades as high as 8 per cent. to be ascended. The price for the equipment was \$110,000, to be paid in cash after 60 days "satisfactory" operation.

At the time of taking the contract, the Sprague company had only a blueprint of a railroad machine and some experimental motors used on the elevated road. The hundred-and-one details essential to success were undetermined. Such a contract is one which no business man would ordinarily assume, especially in view of the entirely unprepared state of the company. It was justified by subsequent events because of the pioneer character of the work. Considering all the difficulties which confronted the company, it is probable that, had they been known beforehand and the solution of them unforeseen, this contract would never have been made. Fortunately for the future of electric railways the difficulties could not all be foretold and did not have to be met simultaneously. The road cost before completion not less than \$160,000, and only \$45,000 was paid in cash, with a like amount in bonds. Enormous as this expense was, as grave the risks, the results have entirely justified them all. For the Richmond road stands as

\* Synopsis of an article in the *Engineering Magazine* for September.



the prototype in almost every essential detail of the modern electric trolley system. There was met every difficulty which could be encountered in an overhead system on heavy grades and with sharp curves, and there was settled for all time the question of the economical operation of a large system of street railways by methods of direct supply.

Briefly speaking, the equipment was what is known as a single overhead trolley system with ground return. The main features are those which are common to every trolley system of to-day. Some of them, more particularly those relating to motor mounting, had been shown in 1886 in an experimental equipment on the Thirty-fourth street branch of the elevated railroad in New York City, on some individual cars used for storage battery tests in New York, Philadelphia and Boston, and on the initial equipment of the Union passenger railway of St. Joseph, Mo., which contract slightly preceded that of Richmond, but generally they saw their first application on a commercial scale in the latter city.

A brief inspection of the map of this road and the curve and grade characteristics will give some idea of the difficulties to be overcome, but these formed only a part, and it is fortunate that in the development of this road the writer had the assistance of two young officers, Lieutenant Crosby, a graduate of West Point, and Ensign S. Dana Greene, of Annapolis (which was my own alma mater), who, though entirely inexperienced in electric street-railway work, had energy, pluck and endurance.

Our contract was made in May, and in July I was laid up with an attack of typhoid fever, which, with my period of convalescence, kept me away for nine weeks, leaving almost the entire burden on those who were associated with me. Returning to duty about Oct. 1, I hastened to Richmond to go over the route and note the condition of the work. Up to that time I had never seen the road. Much of the trackwork had been finished, poles had been set, some of the machines constructed, the central station was well under way, and considerable experimental work was in hand.

The track was simply execrable, laid for profit, not for permanence, and with no adequate idea of the necessities. It was a flat 27 pound tram rail of antiquated shape, poorly jointed, unevenly laid in red clay, and insecurely tied together. The total trackage was about 12 miles; it ran in the most irregular way over about nine miles of streets. Part was double and part was single track, a part laid on paved streets, but the larger balance on macadam or unpaved streets. There were 29 curves, five being of less than 30 feet radius. On these sharp curves were grades as high as 8 per cent.; there were straight grades as high as 10 per cent. The outer rails were often inches below the inner ones, and the whole track at times would disappear into the red clay which froze over it and stuck with remarkable tenacity. As I have said, the sight of the main grade was one of my most unpleasant sensations. There were two things which seemed probable. The first was that the car, for lack of track adhesion, would not ascend the grade at all, no matter how powerful the machines, and the second was that I knew the latter were lacking in capacity.

Our first machines had been built with one reduction of gearing, to which all street railway practice is now gravitating. An 8-per cent. grade would strain them, and a 10-per cent. grade was probably fatal. Hastening back to New York we held a consultation as to what should be done.

The easiest way out of the difficulty seemed to be to run on heavy grades with a cable operated by electric motors in pits sunk beneath the track—a feasible plan if the car could not by its own adhesion mount a 10-per cent. grade; on the other hand, if it did have sufficient adhesion, then a change in the machines was necessary. The most direct thing which suggested itself was the introduction of an intermediate gear, and, as it

was constructed, this proved to be a most serious problem.

Before deciding upon this, the laconic advice of the president of the company, Mr. E. H. Johnson, was "to find out whether the car can get up the grade at all"; this advice was sound enough, and I returned to Richmond to try the experiment. The first test was when we stopped in the middle of a sharp curve with the car apparently locked. I told the manager, Mr. George Burt, formerly of the Panama Railway Company, that I would pull the car out of the curve if it wrecked the machines, and, when called upon, they responded nobly. This was a very convincing experiment to him, although not entirely so to me, because it did not settle the question of track adhesion. Having got out of our temporary difficulty, we made a run to the foot of the Franklin street hill, our course being distinguished by a free fight in which an eccentric inhabitant, somewhat the worse for liquor and politically excited, nearly cleaned out our party, until one or two of our best fighting men got into trim, after which we proceeded peaceably.

Arriving at the foot of the hill, we stopped to survey the enemy. When I expressed doubt of the ability of the machines to make the ascent, Burt said: "If you can get out of such a curve as that we just left, you can go up the side of a wall." I knew that even if we succeeded the machines would probably be wrecked, but there was nothing to do but to try it, so, putting on the current, we steadily climbed up this hill, then another, and another around several curves, finally reaching the highest point in the heart of the city. By this time the machines were boiling hot, and we stopped in the center of an admiring crowd in the hope that they would cool down so as to allow us to proceed. No sooner had we started than there was a peculiar movement, then strange but afterward very familiar, due to a crossed armature, and I knew that we were disabled. We ran on for a block in our crippled condition surrounded by a howling mob who seemed bent on taking possession. Not caring to confess serious trouble, I told Greene in a tone so that I was generally heard that there was some slight disarrangement of the circuits; meanwhile I put out the lights and stretched out in the bottom of the car for a rest. The crowd dispersed, and, after a long time, Greene returned with his "instruments"—four big, powerful mules, at that moment the most effective we could get. We soon began our retrograde journey, at first with the mules in the rear, because by cutting out one machine I hoped to get back with the other. Being on the wrong track and with severe grades and curves, I knew it to be a doubtful feat. On approaching one of them on a slight down grade I shouted for every one to jump and give the car a push, put on the full current, and, before I could realize it, the car had left the curve and run into the foundation-stones of a hotel. There was no question this time about our being disabled, and we had reluctantly to turn to our mules for assistance. This is but one of many similar night experiences, but, despite our damaged condition, we had settled once for all one problem, and that was that with all the weight of the car used for traction, a 10-per cent. grade could be ascended; but having settled this, we were face to face with the necessity of introducing an intermediate gear with a distance between the armature shaft and car axle of only 12½ inches on machines entirely unprepared for any such change.

Troubles with gear reduction, serious as they were, formed only a small part of our difficulties. Field magnets, hastily wound in sections with crude insulation, frequently grounded and crossed. The armatures had a commutator on each end, and were so connected as to bring the brushes at each end on top for easy inspection. Our overhead work was most unsatisfactory. No less than from 50 to 60 designs of trolleys of almost every conceivable shape and character had been brought out. The work of mounting the machines and changing them

was conducted practically out of doors, subject to all the inclemencies of a wet Richmond winter.

About the end of the month we prepared to open the road with 10 cars. At this time matters were going more smoothly, the overhead work had been gotten into fair condition, the central station was all right. The new gearing was apparently a success, many of the difficulties with machines and switches had been overcome. As a preliminary we spent a day carrying the children of the town, and on Feb. 8, 1888, in a drizzling rain, we opened the line for regular service. The day was one of disappointment. The cars, crowded with passengers, would one after another suddenly stop in the street and refuse to move, or to be moved, because of locked gears. A man would go under the car, take off one gear, and continue, if possible, with the other machine, or bodily haul the car off the track so that another could go by. Opinions as to the difficulty were not agreed, but one reliable man, Pat O'Shaughnessy, who has been engaged at work with me for many years, and who is possessed of a most happy mechanical judgment, speedily detected the trouble and was not long in finding the remedy.

Of all the difficulties met one of the most exasperating was that connected with running with fixed brushes. For a long time it seemed almost as if this would prove a failure. The armatures were continually grounding or crossing, and one of the commutators was particularly badly burned, the mica itself being charred and the copper blistered. After a time we found that this was largely due to the fact that the current always went into one brush and out at the other, and then we adopted the practice of reversing the armature circuits instead of the fields for a change in direction.

It seemed, however, that we had no copper commutator good enough, and there followed a change of every commutator on the road. Not only special forms of commutators were made, but special materials were made in various places. Before the final adoption of carbon, the variety of brushes tried was without number; sometimes flat ones, solid and laminated, which would wear through, double over and hug an arc of the commutator, or oblique, solid and laminated brushes which would catch in the bars, reverse or split and straddle the commutators, with the direct result of ruin to commutators, crossed armatures and burned-out fields. It was a daily occurrence to see a loaded car climb a grade with a lurid green glare lighting up the track, but with no possibility of getting at it, although I knew that \$100 worth of damage would be the result of the trip. Then we tried tilting brushes and variously-shaped pieces of copper, bronze and brass set on end and pressed down by all sorts of springs, and, finally, solid bars of brass set on end.

About this time \$9 worth of brass per day, milled off by the rough bars of the commutator, lined the track with a glittering path; not a single trip was made without inspection, with generally a change of brushes or some other repair. But this was not all. Every armature was unwound, the bodies shortened, and then rewound. Disabled armatures were numberless, and to keep the road in operation tons of machinery were shipped by express. Frequent change of parts were necessary, and, since the machines had not been built on the interchangeable principle, in a few weeks they were of the most heterogeneous character.

We managed, however, to keep the cars going, and gradually we saw our difficulties lessening, although new ones would crop up, and little by little the number of cars in operation was increased from 10 to 20, then to 30, and finally one of our most reliable men, David Mason, put 40 cars into operation, or 10 more than the station or line equipment called for. In the three months of operation from February until May, 1888, despite innumerable changes and troubles inconceivable, no car in Richmond was pulled a foot by animal power, for if any accident occurred to a motor the car went along with the crippled machine or with one good one, oftentimes with the heaviest loads and on the sharpest grades, and in some cases in tow



of another car. One hundred and forty men, often with only a day's training, were soon broken in to handle the various parts of the system.

#### CLAMBAKE OF THE AMERICAN ELECTRICAL WORKS.

The sixteenth annual clambake, given by the American Electrical Works, at Providence, R. I., to its many customers and friends, was held on Saturday, August 25th, at the country house of the Union Club, at Haute Rive, a charming spot on the Providence River. Over 200 were in attendance, and the occasion was, like all the preceding ones, exceedingly enjoyable. Various games and sports were indulged in by the guests and an appetizing lunch was served at 11.30. At 2 o'clock over 200 hungry mortals sat down to such a dinner as can only be served in this famous country. Mr. Charles W. Price, editor of the *Electrical Review*, of New York, acted as toastmaster, and several entertaining speeches were made and a warm welcome was extended to all by Mr. Eugene F. Phillips, the president of the American Electrical Works. A number of street railway men were present and heartily enjoyed themselves, as did every one else. One of the features of these clambakes was the souvenir; for every year Mr. Phillips manages to introduce something of this kind that is novel. This dinner served to introduce the new article called the "electro-fate," which consists of a top of octagonal shape, and which, when it falls over after spinning, displays a number, where upon a card is to be consulted and the fate of the spinner is disclosed. It is needless to say that this souvenir caused no end of amusement.

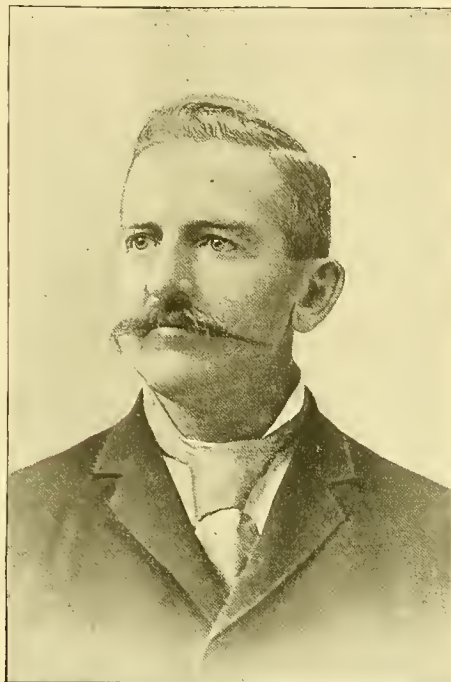
#### ELECTRIC RAILWAY FROM GETTYSBURG TO BALTIMORE.

There is little doubt now that an electric line of railway will shortly be in operation between Gettysburg and Baltimore. The road, according to present plans, will be a sectional one; that is, it will be composed of four distinct and separate companies, the divisions to be as follows: Pimlico & Pikesville line, from Druid Hill Park to Pikesville, seven miles; Pikesville, Reisterstown & Emory Grove, from Pikesville to Reisterstown, nine miles, with an extension of a mile and a half to the Emory Grove camp grounds; Westminster & Union Mills Railway, from Reisterstown through Westminster to Union Mills, seventeen miles, and the Gettysburg Electric line, from Union Mills through Littlestown, Pa., to Gettysburg, seventeen miles. The distance from Baltimore to Gettysburg over this route will be, therefore, just 50 miles, while the shortest route between the two points by steam railroad is 72 miles. The Pimlico & Pikesville line, which is a part of the Baltimore Traction system, was opened in 1892, and contracts for the Pikesville, Reisterstown & Emory Grove road were awarded last week. The Westminster & Union Mills Company has been already chartered, and subscriptions are now being taken for its construction, with every prospect of raising the amount required, as the new company will have the financial support of President Brown of the Baltimore Traction Company, and his friends. The Gettysburg line already extends southward from Gettysburg for several miles, and the building of the gap between the southern terminus and Union Mills is assured. President E. M. Hoffer, of the Gettysburg company, having announced that \$45,000 had already been subscribed toward the project by residents of Littlestown. The route of the combined lines forms almost an air line between Gettysburg and Baltimore, as the tracks will be carried along the turnpike roads between the termini. The benefit to accrue to the Baltimore Traction Company from the construction of this chain of roads is incalculable, says the Philadelphia *Stockholder*. There is a large volume of traffic between Baltimore and the suburban towns which will be reached by the building of the proposed links, and which is now carried wholly

by the Western Maryland Railroad. In addition to this, new through traffic will be built up, and while the greater part of the revenue from this source will go to the companies comprising the chain, the Baltimore Traction Company will be called upon to deliver passengers to all parts of the city.

#### "ELECTRIC MOTORS: THEIR CONSTRUCTION, OPERATION AND MAINTENANCE" IN BOOK FORM.

Within the next few weeks the STREET RAILWAY GAZETTE will publish in book form the series of articles on "Electric Motors: Their Construction, Operation and Maintenance" that for several months past has been appearing in the columns of this paper. The articles have attracted no little attention from practical street railway men throughout the country, and the publication in book form has been decided upon in response to a very general request. Those who have read and profited by the papers as they appeared, desire to preserve them in a collected form for convenient reference. Many others have decided to await the completion of the series, so that the articles could be studied in connected form. It is believed that the book will meet a very general demand that



Nelson W. Perry, E. M.

for a long time has existed among those interested in electric street railways. The volume treats of its subject in a practical way, and does not in any way presuppose a knowledge of the principles underlying the operation of electrical machinery. In this respect it differs from all the volumes on electric railways that are now obtainable. It appeals to every one who desires a practical, as opposed to a theoretical, conception of electric railway apparatus, and of the best means of operating and keeping it in repair.

It appeals also to the general business man or student who, while wishing to keep up with the times, desires to obtain an intelligent idea of electrical apparatus and has no time to study the subject exhaustively.

The book is written not only clearly and simply, but it will be found interesting in manner and matter, especially as it embodies the important results of an extensive practical experience. A word in regard to the author, Mr. Nelson W. Perry, E. M., may not be amiss in this connection. Mr. Perry's name is familiar to all readers of periodical electrical literature, to which he is a frequent and able contributor. He has a high reputation as an electrical engineer, and for his invention of a system of series electric railway traction,

he was recently awarded the John Scott legacy and medal by the Franklin Institute, of Philadelphia. Mr. Perry was educated at Harvard University and afterward was graduated as Engineer of Mines at the School of Mines, Columbia College, in 1878. In physics, which included all that was then known of electricity, he took the highest honors in his class—his nearest competitor being several points behind him. On graduation he was at once appointed and served through one campaign as Economic Geologist and Mineralogist to the United States Geological and Geographical Survey of the Territories; F. V. Hayden, Geologist in Charge. For nine years he practiced his profession of mining engineering in the various portions of the Rocky Mountain region and in the Republic of Mexico, making a specialty of mine examinations and the metallurgy of the precious metals. In 1880 he was called to organize a department of metallurgy at the University of Cincinnati, and he occupied that chair for a little over a year, resigning to accept a position of great responsibility and trust in the field.

In 1887 he turned his attention wholly to the subject of electricity, in which branch of science he has had a somewhat unusually broad range of practical experience. He has at different times been connected with the Thomson-Houston Company, of Boston; the Brush Electric Company, of Cleveland; the Short Electric Railway Company, of Cleveland; and the Edison General Electric Company, of New York.

He has made a number of important electrical inventions and has appeared as an electrical expert before the courts in some of the most important electrical cases that have been tried in this country. While engineer and electrician of the Cincinnati Electrical Subway Company (an organization formed for the purpose of bidding for a franchise), though representing interested parties, he was appointed by the President of the Board of Administration of Cincinnati one of a committee of two to draw up a series of recommendations which should form the basis of a municipal subway ordinance. At the present time Mr. Perry is the editor of *Electricity*, of New York.

#### THE HEILMANN ELECTRIC LOCOMOTIVE.

The railroad company on whose lines the Heilmann electric locomotive was tried has been so well satisfied with the results of the experiment that it decided to order two equipments. The locomotives will be similar in appearance to that illustrated in the last issue of the STREET RAILWAY GAZETTE; but changes will be made in the boiler and engine. The latter will be of the Willans type of 1,500 H. P.

#### AGREEMENT OF QUEEN & CO.'S CREDITORS.

The creditors of Queen & Company, of Philadelphia, have decided to grant an extension of three years, in the hope of thus getting their claims in full. This course was suggested by the management. If at any time the business shows an actual loss the creditors may then cancel their extension agreement and have a receiver appointed to wind up the company's affairs.

The debts are about \$200,000, with bills receivable and book accounts of about \$80,000.

#### KNAPP ELECTRICAL WORKS, CHICAGO, CLOSED.

The Knapp Electrical Works, of Chicago, were closed by the sheriff last Monday on a judgment by confession for \$29,834, in favor of Frederick M. Knapp. The judgment was taken on a note executed last September, payable on demand. Myron A. Knapp is the president of the company, and the money was advanced by his father. The company has done a large business, and it is said that the assets equal the liabilities, the closure being due to slow collections and a sudden demand on the company for money.



## CORROSION OF IRON PIPES BY THE ACTION OF ELECTRIC RAILWAY CURRENTS.\*

### II.

MR. SCHNABEL: I would like to ask what objection the companies have to putting in this return wire.

MR. ABBOTT: It is simply a question of the cost of the copper.

PROFESSOR JACKSON: The actual cost of circuit is increased about three-fold. It requires four times as much power of the same potentiality in the circuit and four times the amount of copper. Of course the labor of insulation is considerably cheaper.

MR. SCHNABEL: How often would that have to be connected with the rail?

PROFESSOR JACKSON: The oftener the better; in fact when we come to the double trolley road, they have a continuous connection.

GEORGE WESTON: You do not depend upon the rail at all?

MR. ABBOTT: In the double trolley you do not depend on the rail at all. Depending on the rail succeeds perfectly so far as distribution of energy to the cars is concerned, but does not prevent the current from leaving the rail and passing to other metallic structures. The difficulty is due, as Mr. Jackson has shown, to the small amount of electric pressure that is enough to start and continue the corrosion. If there is a railway extending along a street and a thousandth of a volt on a pipe three feet away from the rail is going to start corrosion on the pipe, it takes a great deal of copper to protect the pipe. If the railway circuit is independent of the earth, there can be no danger; if there is sufficient metal in the return circuit, other underground structures may be protected.

MR. WESTON: In the case of independent return wire carried on a pole the same as a feeder, would a rail connection every 500 or a 1,000 feet protect it?

MR. ABBOTT: That would be a great protection; but it is questionable if 500 or 1,000 feet would be often enough. Without experiment I should say that it would be well to connect the rail to the return wire at every pole, say every 100 feet. The expense of the connection alone would be very small.

PROFESSOR JACKSON: I think that the more frequently connections are made, within the danger district especially, or the district in which the action is most severe, the better will be the result.

MR. DAVIS: We would infer that you consider that it is a necessity in all roads that have return circuits through the rail, to connect with the water pipe also.

PROF. JACKSON: Within the district where the pipes are positive, where the currents are returning. As long as the current is flowing into the pipes there is no damage done whatever; but in any portion of the railway system, any portion of the district served in which the current flows from the pipes to the railway, then the greatest care must be exercised. That danger district can be very readily determined by proper measurements carried out carefully, and the connections can be made in such a way that I think undoubtedly in almost every case—and it is true in some cases that I have seen where the work has not been done well—that in almost every case the conditions can be carried out in such a way as to avoid damage. In a large city, such as Boston or Brooklyn, the currents to be carried are so enormous that the amount of copper is appalling when looked at in tons or carloads; but, as I said, the cost of the total amount of copper is a small matter compared with the total amount of the cost of the road.

MR. ABBOTT: Generally speaking, not more than 10 per cent. of the cost of the road.

PROFESSOR JACKSON: You double that by preventing any damage that will in future add to the capital charge.

R. P. BROWN: I would like to ask if you expect the lake sand around the pipes to do away with the difficulty? Might we not expect that after you get the nitrates from the circuits, the same difficulty will arise?

MR. RAU: We have carried on most of these experiments in yards and around service pipes which lead from the water mains, so it has generally been in places protected from the foreign substances which are collected from the roadway. From the depth a water main is laid, I do not think they would penetrate through to the pipe.

MR. BROWN: If it was from that cause, I can see how that might answer for a little while, but it seems to me it would be only a short time.

PROFESSOR JACKSON: In a portion of a district that would be simply a temporary relief.

MR. RAU: In most cases this has overcome the trouble to such an extent that where formerly a new pipe was needed every six to eight months we have not had to replace one in two years. And in these places I believe the relief to be quite extended.

At any rate if drainage is fair this plan is to be recommended.

MR. APPLETON: The matter of using electricity on elevated railroads I think was mentioned by Mr. Abbott, who referred to the danger of the return current running down the column to the ground. In talking with others on that point I have maintained that the circumstances were entirely different from an ordinary surface railroad; that in one case the rails were laid in the ground surrounded by earth, and in the case of the elevated railroad the rails were laid on dry wood ties that were in no way connected with the earth, and the insulation of the tie would prevent anything of that kind. Hence there would ordinarily be no danger except in case of prolonged rains when the ties might become water-soaked.

PROFESSOR JACKSON: Taking the traffic on the average railway the rails would be nominally of sufficient capacity. There are quite a number of street surface railway plants in this country in which the rails, which concentrate toward the power station, are not sufficient to carry back the current. Having designed such a circuit originally led me to put in track feeders. I think I was probably the first one to put them in the ground some years ago. The result is that on elevated railways it will probably be policy to connect the rails with the iron girders. These iron girders, of course, are electrically connected by means of rivets to the posts, and these stand in the earth. On the other hand the concrete footings of the posts will cause a very high resistance in the path of the current, and I think, if the girders are properly connected by bonds and the tracks are properly bonded, that very little trouble would occur from elevated roads. It is a question of having metals of sufficient capacity so that the current will have no desire, as it were, to seek a path through the higher resistance, which is necessary to get into the earth. But the insulation of the tie, of course, is out of account, because the rails are likely to be connected to the iron girders electrically. On the Intramural road at the World's Fair the girders were placed on wooden posts and excellent work was done, but in actual city practice the girders are placed on iron posts. I believe it would be a mistake to put two wires overhead. I believe the return current can be taken care of underground. In large cities we are bound to come to it, and we will sooner or later overcome this difficulty by using the double trolley in conduits. But I do not agree with Mr. Abbott that we will ever use this double trolley overhead except under exceptional conditions. I have made that remark in the light of experience with both types of roads.

MR. RAU: The universal opinion is that the return circuit of a road is too small and that the road is built too cheaply. I do not think that has been the case in a good many places where trouble from electrolysis has been experienced. The road in Milwaukee has fully three inches in diameter of copper coming into the station for a return circuit, and although we are overcoming our trouble by connecting the pipes with the rails, I do not think any amount of copper added to the system would have avoided it.

Putting more copper into the ground is a very expensive method, and when a loss of  $\frac{1}{10}$  volt, as shown by Professor Jackson's paper, will affect the pipe, it would require an enormous amount of copper to prevent so small a loss. To thoroughly overcome this action from railway currents, I think if proper connections are made wherever the difference of potential is of such proportion as would cause electrolytic action, it would entirely overcome this trouble with very little expense, and certainly would be more satisfactory than to rely upon the street railway company to increase the return circuit until it overcomes it.

I am pleased to see that this idea of each company protecting its own system is being accepted by the telephone companies. At present in Milwaukee the company is making a series of connections to overcome the difference of potential between its cables and our tracks.

The return feeder is laid in a wooden molding, which is filled with a mixture of pitch and tar; this is pliable, and will not get too hard in cold weather or soft enough to run in warm weather; this practically makes a cheap insulator for the wire, and we find that it preserves the wire very well. After three years' use the wire was found in as good condition as when first laid.

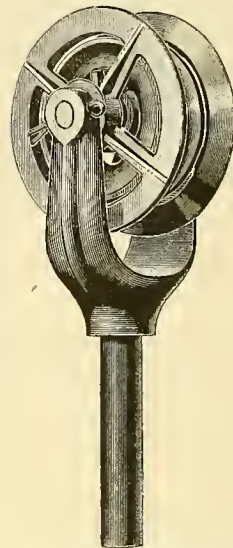
### CITY LIGHTING BY A RAILWAY COMPANY.

The report has been revived that, upon the return of Messrs. Widener and Elkins from abroad, an attempt would be made by the Philadelphia Traction Company to secure the contract for lighting by electricity the streets through which its trolley lines extend. It is stated that the company could, with its present plant, supply the necessary power at small additional cost. When this report was first published some months ago it was offi-

cially denied. Recent attempts to secure information have failed. The question has been raised whether the company's charter would admit of its engaging in the electric lighting business, and various opinions are expressed on the point.

### NEW TROLLEY WHEEL.

The new type of trolley wheel illustrated herewith is made in three parts, all of which move separately. The pulley or contact ring, which is independent of the flanges, is made of bronze, and is equipped with the best graphite bearing. The

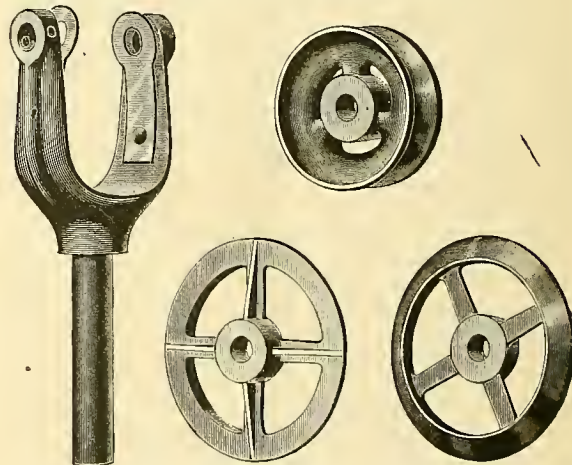


Trolley Wheel with Three Revolving Parts.

flanges are made of steel or brass, and the harp of bronze material with contact springs.

The wear is centered upon the contact ring which is the only part to be replaced, as it is in no way connected with the flanges. The cost of repairs for each wheel is reduced to a minimum, as the center has as long a life as the ordinary wheel. It is claimed that the maximum cost for repairs per year is fully two-thirds less than with the use of the ordinary wheel.

This wheel needs no oiling, but if it desired to use oil as a lubricant hollow axles to admit of



Three Parts of the Wallace Trolley Wheel.

oiling will be provided. It will run smoothly on the trolley wire without sparking, and it requires, it is stated, less power to turn it, as but one part revolves at a time. It will not tend to jump the trolley wire on sharp curves, as the flanges are each separate, revolving independently. It will run true at all times, the wear on the contact ring being uniform and smooth. The parts are easily accessible, and contact ring can be replaced in a very short time. The wheel is introduced by the Wallace Electric Company, of Chicago.

Youngstown, O.—The Youngstown Park & Falls Street Railway Company has been granted the privilege of constructing a street railway upon Hillman street and Warren avenue.

\* Discussion of D. C. Jackson's paper by the Western Society of Engineers.



**A SIMPLE TIME RECORDER.**

The New National Time Recorder Company, of Milwaukee, Wis., has put on the market, in addition to the "Bolte Automatic" and Autographic recorders, its latest style of recorder, which the firm has called "The American."

Fig. 1 shows the complete recorder, which will

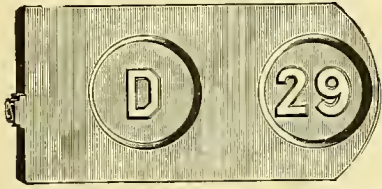


Fig. 3.—Key or Check of Time Recorder.

take a 21 inch record dial. Fig. 2 shows a portion of the record dial after a day's registrations have been made. The heavy lines are hour lines, and the lighter ones five-minute lines. Thus, it may be seen at a glance at any time during the day, by the employer or any one interested, that No. 2 is 15 minutes late, No. 9 10 minutes late, and No. 10 is absent, not being registered.

By a novel arrangement the numbers come

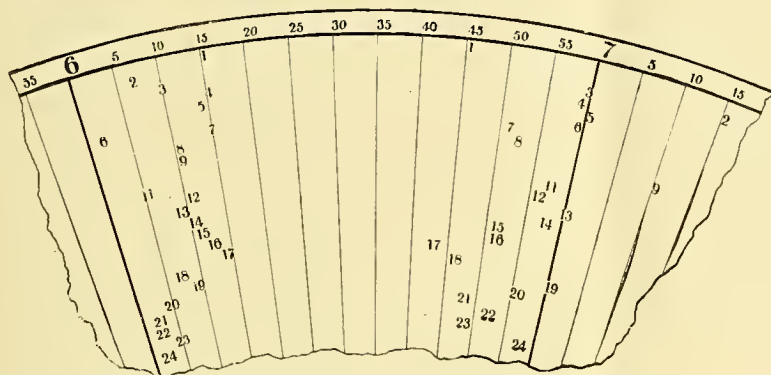


FIG. 2.—RECORD DIAL.

consecutively on the record dial; and the key, or check, Fig. 3 will enter only the hole for which it is intended. A slight pressure on the key will ring the bell and indicate that a registration has been made. The arrival of employees is indicated by the numbers appearing in red, and their departure in blue. This is accomplished by moving a small lever above the keyholes at the front of the clock, either to "In" or "Out." This lever shifts the record ribbon through which the registrations are made. This recorder will register 100

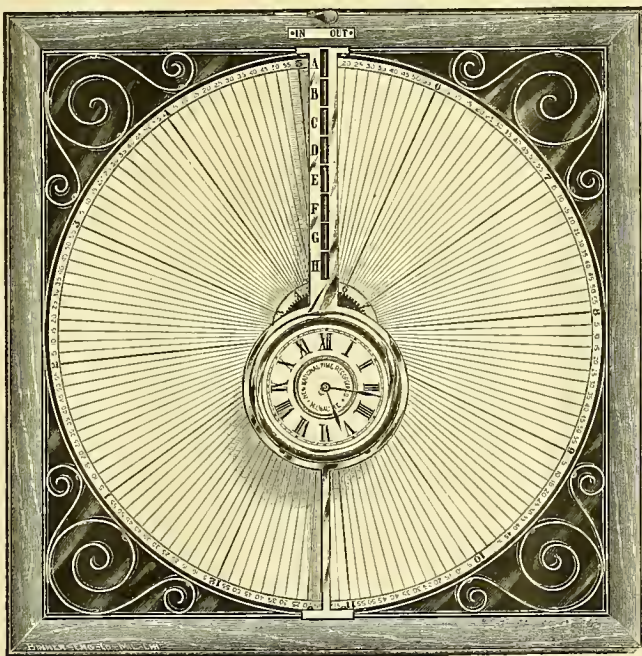


FIG. 1.—AMERICAN TIME RECORDER.

employees, but by using a number of recorders, which is generally preferable in large establishments, as many as 1,000 can register, the numbers coming consecutively.

**MUNICIPAL RAILWAY OF BLACKPOOL, ENGLAND.**

Municipal street railways are not always conducted in a praiseworthy fashion in England, although the tendency is toward the acquirement of the local transportation service by the cities. At a recent meeting of the town council of Blackpool an extraordinary statement was made regarding the electric tramway by Councilor Pearson. The London *Electrician* gives this account of an investigation instituted by a committee:

In company with Mr. Holroyd Smith the committee examined the shed, and found a state of things that was positively disgraceful, and for which somebody was greatly to blame. The tubes of the boilers were so choked with dirt and filth that it took two men six days to clear them out. The dynamos were in a similar condition; the foundations and framework were rotten; in fact, the whole plant was giving way for want of attention and proper repair. The armatures were in a bad condition and the fireboxes of the boilers were 10 inches deep in thick mud. The cylinders themselves were in a similar condition, and the steam pipes were so thickly coated with oil paste that they could not possibly have been cleaned out for 12 months. The dampers were all stuck fast and rusted up, and the main shafting was badly worn and not to be depended

upon. Those things had now been remedied. Four practically new cars had been placed on the track, with motors fitted with Mr. Holroyd Smith's worm-gearing, and they had ordered two new bogey-cars. Mr. Pearson then went on to say that it was to their certain knowledge that they had had enemies on their track almost the whole of the time they had been trying to remedy these defects; some one with a knowledge of electrical matters had tried to interfere, not only with the tram lines but with the electric lighting. Only the previous day he had brought to him a chain which had been placed round the copper rod (in a

scientific way), which conducted the current entirely to earth. That was not the first time they had discovered such interferences. They had a multitude of evidence in the shape of spades, nails, small pieces of iron and copper, which had been

laid in a proper manner by people who knew what they were doing. It was their intention to ask the Watch Committee, along with the Chief Constable, to try and detect these malicious persons.

**NEW ENGLAND NOTES.**

(From our Special Correspondent.)

**UNDERGROUND WORK IN BOSTON.**—An immense amount of work is now in progress on the West End railroad system in Boston in placing all electric feed and return wires underground. Sometime ago the Board of Aldermen passed an order necessitating the burial of overhead wires, and the work is to be done promptly. A commissioner of wires, an entirely new office, has been created, and already that official has made public his policy and program for the first year, which will include the burying of all wires throughout a very busy and important section of the city. Several years will elapse before the entire work is completed. Meantime the West End Railroad Company, to meet the demand for the change, is pushing ahead with the work already, and has buried the wires and conductors in one of the very busiest districts of the city.

**PARALLELING RAILROAD LINES.**—On Tuesday in the Superior Court at Hartford, Conn., a hearing took place upon the complaint of the New York & New England Railroad Company that its track between Bristol and Plainville, Conn., is being paralleled by the Bristol & Plainville Tramway Company. An important point is involved in the dispute. The complainant alleges that the statute regarding electric roads prohibits the paralleling of steam railways. This hearing also involves the question whether, under the law, a tramway can be built from one town to another without public necessity being first shown. As this is the first case that has come up under the new law it is regarded as a test case. On the same day and in the same court a hearing took place in a similar case, the Hartford, Manchester & Rockville Tramway being charged with paralleling the New England Railroad through East Hartford and Burnside to Manchester. The decisions in these cases, it is expected, will affect many like cases throughout the country.

**DEMAND FOR RAILWAY MATERIAL.**—The various new electric railways that are now under construction in New England are calling for large quantities of supplies of all kinds. This demand is giving quite an impetus to the Boston companies handling railway material, the result being that they are doing quite a good trade, while some other branches remain exceedingly inactive.

**A SPECIAL PERSONALLY CONDUCTED PARTY TO THE ATLANTA CONVENTION.**

A special personally conducted party via Seaboard Air Line will leave New York via Pennsylvania Railroad, "the standard railway of America," Oct. 15, 1894, at 3:20 P. M., arriving in Atlanta at 4:00 P. M. next day. Dining and buffet cars; vestibuled train. Party under personal escort.

The route is through the capital cities, Washington, Richmond, Raleigh, over the smoothest, finest and best-equipped road in the South.

For space in special cars, tickets, and all information, apply to the following agents of the Seaboard Air Line. It is respectfully suggested that early application be made to secure advantageous location in sleepers.

C. Ironmonger, Eastern Passenger Agent, 287 Broadway, New York; Wm. W. Tull, New England Agent, 211 Washington street, Boston, Mass.; H. L. Elkins, agent, 33 South Third street, Philadelphia, Pa.; P. B. Thompson, agent, 207 East German street, Baltimore, Md.; Wm. B. Clements, District Passenger Agent, 601 Pennsylvania avenue, Washington, D. C.; J. J. Anderson, General Passenger Agent, Portsmouth, Va. \* \* \*

**AN INNOVATION IN GEORGIA.**—Another Yankee notion has been introduced in Georgia, and there is no pitch hot. A street railway company of Atlanta, composed largely of Boston capitalists, has issued an order that conductors and motormen shall not discriminate between white and black women, but shall assist both on and off the cars of the company regardless of race, color or previous condition of servitude. That the greatest indignation prevails among the employees of this company we need hardly take the time to state. There are war and rumors of war and boycott all along the line —*New York Commercial Advertiser.*



## FINANCIAL DEPARTMENT.

## Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

Now that the uncertainty regarding tariff legislation has been eliminated from the existing financial situation, it is expected that business on every hand will soon show signs of uninterrupted progress toward normal conditions of prosperity and activity. Financial fields are generally the first of all to reflect prosperous conditions outside of their own circles, and the street railway stock and bond market will be sure to participate to a marked degree in the benefits accruing from the renewing demand for prime investments. The steadiness with which local street railway issues—to confine one's self to particular instances—have held their quotations during the depression of values so noticeable in all financial circles during the summer months of 1894 has advertised more than ever their eligibility as investments that secure their own against loss through fluctuations. Only one stock has betrayed weakness—Long Island Traction, and this is an issue of recognizedly speculative traits, so that sudden ups and downs in its value are to be expected, while steadiness of quotations would be quite discommoding to the trading fraternity that hopes to make money out of its variability. But good securities like Second Avenue, Third Avenue, Dry Dock, Sixth Avenue, Broadway, etc., are at least just as high now as six months ago, while in many instances an advancing tendency is demonstrated. This being so, more attention than ever is being attracted to these issues, so that the prospects for a big business are encouraging.

The annual report of the Third Avenue Railroad Company, just published, verifies the comments hitherto made in these columns as to the growing business of the company since the introduction of the cable. Gross earnings for the year ending June 30, 1894, were \$1,777,971, an increase of \$129,433; operating expenses were \$1,040,258, decrease, \$113,637; net earnings, \$737,713, increase, \$234,070. After paying charges of \$30,282, which were \$84,978 more than the year before, there was a balance of \$428,203, an increase of \$76,064. Dividends called for \$420,000, or nearly double what was paid in the previous year, so that there is a decrease in surplus of \$104,936. The total surplus is \$232,093, and the cash on hand is \$154,323. The last dividend at 4 per cent, was declared in May; none will probably be declared this quarter, as the management desires to accumulate a surplus account in the '94-'95 year. The showing reported above is splendid, disclosing as it does, as a result of cable operation, increased receipts and decreased operating expenses, so that the boast of the management that 20 per cent, can be earned on the common stock is in a fair way to be realized. Right here it may be well to mention that the hearing as to the franchise for a cable or underground trolley road on St. Nicholas and Manhattan avenues, for which the Third Avenue and Metropolitan Traction companies are contending, will be held in a few days. Both sides are prepared to show popular support of their projects and are making efforts to have a decision rendered in their favor.

Sometime ago it was exclusively announced by the STREET RAILWAY GAZETTE that the Long Island Traction was about to increase its bonded indebtedness. The fact is now made public that it is to issue \$3,000,000 6 per cent, collateral trust notes. A syndicate has already expressed its intention to purchase \$1,875,000 of the issue at 80. The directors of the company, however, and several banking institutions have agreed to buy \$750,000 at 85, and \$2,500,000 of the bonds are to be offered to stockholders at this figure. The money is needed to extend the lines, between 80 and 90 miles being at the company's disposal.

Street railway men will be interested in what Mr. W. J. Clark, head of the street railway department of the General Electric Company, had to say this week relative to business prospects: "The business of electric street railways is beginning to show renewed signs of life. The General Electric has orders in this department for 61 generators, eight of which are enormous machines. Small orders are again being received from the West and South, where business in this branch has been so dead for a year past that it has practically amounted to nothing. Special attention is being paid to the development of large surface motors for suburban traffic. Astonishing results have been achieved with the experiments in the Schenectady yards of the 110-ton locomotive recently constructed."

Westinghouse Electric matters are quiet. The company is busy getting ready to move into the new works at Brinton, when something may be made public relative to Mr. Westinghouse's experiments with his underground trolley system.

## Financial Notes.

**Elevated Roads.**—Under this caption, the *Boston News Bureau* says: Opinion is being freely expressed by leading Boston business men that when it comes to the supreme moment the Boston elevated railroad will not be built, as it has been fully demonstrated in other cities that elevated roads do not pay, with one exception, the Manhattan, in New York; and when roads in cities with over 1,000,000 inhabitants can barely earn interest charges, it cannot be expected a road in Boston, tributary to hardly 500,000 inhabitants, can be profitably operated. In Chicago there are three elevated roads all apparently doing a non-paying business. The Alley "L," the one longest in operation, and which ran to the World's Fair grounds, is not earning fixed charges, and its first mortgage bonds are selling at 68 and second mortgage bonds at 32. The Lake Street "L" first mortgage five per cent, bonds are quoted at 61. The Metropolitan "L" is not yet in operation, and its first mortgage bonds sell at 63. In Brooklyn, N. Y., there are two elevated roads, which, when street cars were operated by horses, were able to show fair earnings, but since the introduction of the trolley, combined with a poor business year, the roads have barely been able to earn operating expenses and interest on their bonds, let alone dividends. Brooklyn Elevated 1st mortgage 6s are quoted at 94½ and 2d 5s at 64½, and Brooklyn Union Elevated 1st guaranteed gold 6s \$6,148,000 outstanding are quoted at 90½. Kings County Elevated 1st mortgage 5s are selling at 76. The Manhattan Elevated Railroad Company, of New York, is the only elevated road that has paid, and this is due to the peculiar shape of Manhattan Island, making anything but rapid transit impracticable for people living above Twenty-third street; but now that New York has taken unto itself cable cars a big cut is being made in Manhattan traffic. The result is that Manhattan stock tumbled from 174½ early in 1893 to par, and is now selling for \$117½, although this low price is partly due to the financial depression.

**Brooklyn Elevated Annual Report.**—The Brooklyn Elevated Railroad Company has filed its annual report with the Railroad Commissioners for the year ending June 30 last. It shows as follows:

	1894.	1893.
Gross earnings.....	\$1,755,262	\$1,935,683
Operating expenses.....	1,076,662	1,691,713
Net earnings.....	\$678,600	\$843,970
Other income.....	5,917	11,447
Gross income.....	\$684,517	\$855,417
Fixed charges.....	\$11,135	744,309

Deficit for year, \$126,618; surplus, \$111,108; surplus to June 30, 1893, \$236,345; total surplus June 30, 1894, \$109,727.

The betterments for the year were \$65,640, all of which was spent on the road. The cost of the road and equipment to date has been \$26,483,105. The cash on hand is \$60,263. The capital stock is \$13,283,600 and bonded debt \$12,968,000. During the year the road carried 34,233,697 passengers. The company operates 95 locomotives and 290 passenger cars. Its average number of employees is 1,059, who received in salaries and wages \$678,088. The accident record shows 21 injured and 3 killed during the year.

**Purchase of the Metropolitan Electric Road, San Francisco.**—The purchase of the Metropolitan Electric road by the Market Street Railway Company is one of the most important occurrences in rapid transit for San Francisco since the consolidation of the cable lines. The Metropolitan road runs from Powell and Eddy streets, opposite the Baldwin Hotel, to the south side of Golden Gate Park. Under the new management it will be connected at the park with the present steam line to the ocean. This steam line will be converted into an electric road, so that one may ride from the heart of the city to the ocean beach for five cents. This road will open up much fine residence property and will increase the growth of the region lying to the east and south of the park.

**Mortgage on the Lowell, Lawrence & Haverhill.**—A mortgage covering nearly \$2,000,000 has been recorded at the registry of deeds in Lawrence between the Lowell, Lawrence & Haverhill Street Railway Company and the American Loan and Trust Company, of Boston. The mortgage covers all the real and personal property, assets and franchises of the railway company, and is in trust to secure payment of the principal and interest of a series of mortgage bonds amounting at their par value to \$1,900,000.

**Fort Wayne Company's Purchase.**—A Baltimore dispatch to the New York *Sun* says the Wenstrom Electric Company of Baltimore, which has a capital stock of \$1,000,000, has sold out to the Fort Wayne Electric Corporation of Fort Wayne, Ind. This deal puts the Fort Wayne Company in control of patents which, it is said, are being infringed by other electric manufacturers, and the Fort Wayne company will, it is said, immediately begin an active fight upon all who are reported as infringing.

**Business of the General Electric.**—A Boston financial journal says the General Electric Company is billing goods to the amount of over \$1,000,000 a month, and the outlook is that it will do more gross business this fiscal year than last year, but the amount of net profit is yet an uncertain problem. The company is out of debt, is in splendid financial shape, and expects to resume dividends on the preferred within a year. A director says, "The company is sawing wood and not talking."

**Receivers in Kingston.**—Judge Parker, in the case of Dubois G. Atkins vs. The Colonial Electric Railway Company, has appointed as receivers John E. Kraft of Kingston, and Arthur E. Wairadt of New York. Mr. Wairadt is the assignee. The order directs that the money collected be deposited in the State of New York Bank.

**Boston West End Earnings.**—The increase in the gross earnings of the West End for August is at the rate of about \$20,000 per month. The company is now more conservative in its charges to construction, it is said, and puts into expense considerable that would formerly have been charged to construction.

**Long Island Traction.**—Long Island Traction Company books close Sept. 15 to allow stockholders the right to subscribe pro rata for \$2,500,000 6 per cent, collateral trust notes of the Long Island Traction & Brooklyn Heights Railroad Company at 85 per cent, of their par.

**Street Railway & Illuminating Properties.**—Trustees of Street Railway & Illuminating properties purchased and canceled last week 658 shares of preferred stock, paying an average price of \$95.65. This makes a total of 14,682 shares purchased to date.

**Manhattan-Metropolitan Rumor.**—A rumor was in circulation that the Manhattan Elevated and the Metropolitan Traction interests were to be consolidated. The result of the report was a slight boom for Manhattan. The rumor was not generally believed.

**Worcester Traction Company.**—During July the gross earnings of the Worcester Traction Company increased \$5,496, to \$37,495, while operating expenses decreased \$7,546, to \$16,636, thus leaving net earnings \$20,859, an increase over July, 1893, of \$13,042.

**Buffalo Railway Earnings.**—The gross earnings of the Buffalo Railway Company for July were \$139,797, a decrease of \$7,490. The operating expenses showed a decrease of \$8,125, and the net earnings an increase of \$634.

**Brooklyn Traction Earnings.**—The statement of operations of the Brooklyn Traction Company for the month of July shows: Gross earnings, \$110,978; increase, \$7,577; operating expenses, \$48,938; net earnings, \$55,424.

**Reported Purchase Denied.**—The rumor that the North Hudson County Railway Company's property had been purchased for \$13,000,000 by the Paterson Traction Syndicate is denied.

**Easton, Pa.**—It is announced that the Easton & Bangor Electric Railway Company has decided to extend its line to Martin's Creek at once.

## NEW INCORPORATIONS.

**Atchison, Kan.**—The Atchison Railway, Electric Light and Power Company has been incorporated; capital stock \$300,000. The promoters are: H. A. Odell, Geo. W. Riggs, A. E. Cullingworth, Chicago, Ill.; W. P. Waggener, Ellsworth Ingalls, C. S. Hetherington, S. E. Harburger, Atchison.

**Mayfield, Cal.**—The Mayfield & Stanford, Jr., University Street Railway Company has been organized. The capital stock is \$10,000. The promoters are Jos. P. Ponce, Alex. Peers, Bernard Mayer, Mayfield; Gordon Wight, Palo Alto; Bainbridge Ryder, San Jose.

**Columbus, O.**—The Columbus & Buckeye Lake Street Railway Company has been incorporated with \$10,000 capital stock. The promoters are: Jas. H. Anderson, C. B. Cowan, Dewitt C. Jones, T. J. Keating, Geo. L. Converse, R. R. Dubois, Wm. H. Simonton.

**Pottsville, Pa.**—The Pottsville & Reading Railway Company has been incorporated with a capital stock of \$250,000. The following are the promoters: W. A. Barritt, Jr., Wayne, Pa.; Elias Davis, Broad Mountain; Jno. F. Finney, Shenandoah, Pa.

**Philadelphia, Pa.**—The Willow Grove & Hatboro Street Railway Company has been incorporated, with a capital stock of \$18,000. The promoters are: John H. Fow, Philadelphia, O. E. C. Robinson, A. D. Markley, Hatboro, Pa.

**Chicago, Ill.**—The Chicago & Grand Avenue Street Railway Company, capital stock \$50,000 (incorporators, John Gnaedinger, H. F. Kolze, Lesser Franklin, Cassius C. Clark and Elwyn D. Seaton), has been incorporated.

**Milwaukee, Wis.**—The Peterson Electric Conduit Railway Construction Company has been incorporated by A. E. Smith, William Meyst and H. Samuel Esch.



## NEWS OF THE WEEK.

**Philadelphia, Pa.**—The Market Street, Richmond & Frankford Elevated Electric Railroad Company, which made application to the Board of Highway Supervisors last week for permission to begin the construction of the road, has filed a bond for \$1,000,000 with the city solicitor, and will commence work as soon as the plans are approved by the committee of the highway supervisors. The surface road in the country districts will be first completed. The company, it is said, has purchased or obtained options upon all the necessary property between Market and Race streets, and has complete right of way between these points. From Race street the road threads through a number of small streets until it reaches the open country beyond Frankford. The handsome eight-story terminal building, for which the plans have been completed, is to occupy the site of the Central Avenue Hotel, Nos. 825 27-29-31 Market street. It is to be similar in style of architecture to the Reading Terminal, and will have a frontage on Market street of 86 feet, with a depth of 146 feet.

**Sayre, Pa.**—At the annual election of the Waverly, Sayre & Athens Electric Traction Company, at Sayre, Pa., the following officers were elected: President, A. N. Broadhead; vice-president, F. M. Stevens; secretary, A. C. Wade, treasurer, F. K. Harris. At a meeting of the Susquehanna Valley Electric Traction Company these officers were elected: President, A. N. Broadhead; vice-president, W. L. Watrous; secretary and treasurer, A. C. Wade. At a meeting of the W. S. & A. Electric Traction Company, upon request of several committees, the company consented to sell workmen's tickets on the following plan: Between the hours of 6 and 7:30 A. M. and 5 and 6:30 P. M. tickets will be accepted for passage which will be sold 60 for \$2, or at the rate of 3½ cents each.

**Reading, Pa.**—The Pennsylvania Traction Company, whose object is to have a continuous line of electric railway from Philadelphia to Harrisburg, is still reaching out, and will probably gain an entrance into the city of Reading. For several months work has been in progress to extend the Reading & Southwestern Electric road, which has its terminus at Reading, from Mohnsville to Adamstown. Several miles of track have already been laid, and it is expected the entire distance will have been covered before winter. The Pennsylvania Traction Company has already decided upon a line from Lancaster to Terre Hill, and it is now understood it will extend the road to Adamstown, where it will connect with the Reading and the Southwestern.

**Ambler, Pa.**—The borough Council of Ambler has passed an ordinance granting the franchises of the principal streets of the borough to the Ambler Electric Railway Company, which is to extend from Hammontonville to Ambler, a distance of about five miles. At Hammontonville connection will be made with the Conshohocken & Norristown Electric Railway. Mr. Shepp, of Philadelphia, one of the owners of the line, has stated that the line would be in working order probably by the 1st of January. An interested person says the proposed trolley line from Chestnut Hill to Spring House will also be built at once. It will extend through the villages of Flourtown, Fort Washington and Ambler, terminating at Spring House or Penllyn.

**Philadelphia, Pa.**—The contract for the erection of the new carshed at the northeast corner of Ninth street and Susquehanna avenue, for the Fourth and Eight streets line of the People's Traction Company, has been awarded to Charles McCaul, who last week secured permission from the Building Inspectors to start work on the structure. The new structure, which will be 22 feet in height, is to have a frontage on Ninth street of 530 feet, extending almost to Dauphin street, and on Susquehanna avenue it will be 164.6 feet. The whole lot is 400 by 600 feet, which takes in the entire block. Repair and other shops of the company will be included in the new shed. It is to be of stone, brick and wood.

**Chester, Pa.**—The Media, Middletown, Aston & Chester Trolley Company, which has been almost a year trying to get through Chester township, has commenced operations. The contract for surveying the road has been given to Engineer Howland and the work has been commenced. The new road will open up a valuable portion of Delaware County. The opposition to the road has been made by one of the supervisors of Chester township, through which it passes. The people of the township want the road, and it is said the company will have no trouble getting it through when the work is advanced that far.

**Pottstown, Pa.**—A corps of engineers is surveying for the extension eastward of the Pottstown Passenger Railway from Sanatoga to Royersford, a distance of five and a half miles; the extension will be built this fall or early next year. The company will also extend westward from Stowe to

Bramcote, nearly half a mile, this fall, to reach the new textile fabric works. There is considerable talk of the Ringing Rocks Electric Railway Company extending its line to Falckner Swamp, and thence to Boyertown; it is expected that this will be done next year.

**Pottsville, N. Y.**—The Tamaqua & Pottsville Electric Railway Company, whose charters cover territory from Tamaqua to Pottsville, via Middleport, New Philadelphia and Port Carbon, has filed a declaration of its intention to extend its main line from Port Carbon to St. Clair, and thence to New Castle and Frackville and down to Maizeville in the Mahanoy Valley.

**New York, N. Y.**—The Union Railway Company is obtaining consents from property-owners for a branch line through 161st street from McCombs Dam Bridge to Westchester avenue. This line would be of great benefit to people living above 150th street, as it would connect them with the 155th street station of the Eighth avenue elevated road.

**Brooklyn, N. Y.**—The use of electricity on the Broadway line has had so great an effect upon the business done by the elevated railroad over the same route, that the Brooklyn Elevated Railroad Company has been forced to increase its accommodations by running express trains, in an effort to retain its long distance business.

**Kansas City, Mo.**—A permit has been given the Metropolitan Street Railway Company to remodel and enlarge its power-house at Ninth and Wyoming streets. New foundations for machinery and an iron smokestack will be added at a cost of \$6,000. When this is done the electricity for the elevated road will be supplied from this power house.

**Santa Cruz, Cal.**—It is announced that the East Santa Cruz Street Railway Company is now ready to extend its line to Capitola, and to operate the same with electricity or with a noiseless steam dummy, on condition that the right of way can be secured and a bonus of \$10,000 granted.

**Orange, N. J.**—A car from Eagle Rock on the Suburban Traction Line jumped the track on a curve last Sunday. It fell on its side and 18 persons were injured. The car had become unmanageable on account of the breaking of the brake chain.

**Jackson, Miss.**—In the case of the State vs. The Vicksburg City Street Railway Company, brought to forfeit the charter, Judge Chrisman has rendered a judgment in favor of the State, and declared the charter forfeited. An appeal will be taken.

**Allentown, Pa.**—The Lehigh Valley Railroad has decided to cut rates as a result of trolley competition. The railroad now charges only five cents for a round trip from Allentown to Catasauqua, while the electric railway charges just double that sum.

**Pittsburg, Pa.**—The Second Avenue Traction Company will soon erect a new power station at Glenwood, which will supply power to the entire system between Market street and Turtle Creek. The power-house at Soho will be abandoned.

**Elmira, N. Y.**—In the matter of the application of the West Side Railway Company for permission to use tracks of the Elmira & Horseheads Railway Company, the referee has given a decision granting the petition.

**Northampton, Mass.**—The contract for building the Conway electric railroad from Conway village to the railway station has been awarded to Daniel O'Connell & Son, of Holyoke. Work will be commenced soon.

**Depew, N. Y.**—The Street Railway Company has completed its tracks in the tunnel which passes under the Erie lines. The line is now complete between Depew and Lancaster.

**Montclair, N. J.**—The New York & Philadelphia Traction Company has petitioned the Town Council for permission to construct and operate an electric railway in Montclair.

**Atchison, Kan.**—H. A. Odell, of Chicago, arrived in Atchison last week, and has signed a contract with B. P. Waggener to build the electric railway.

**Philadelphia, Pa.**—The Seventeenth and Nineteenth streets line of the Philadelphia Traction Company is now operated by electricity.

**Cortland, N. Y.**—The Cortland & Homer Railroad Company has been granted a franchise for an extension of its line on Homer avenue.

**Philadelphia, Pa.**—The Lombard and South streets branch of the Electric Traction Company is now operated by electricity.

**Milwaukee, Wis.**—The Milwaukee Street Railway Company has lost \$2,125, which was stolen from the safe.

**Washington, D. C.**—E. Saxton has been awarded the contract for building the Columbia cable road.

**Toledo, O.**—The contract has been signed for the construction of the Maumee Electric Railway.

## TRADE NOTES.

The Mather Electric Company, of Manchester, Conn., reports a marked and very satisfactory increase in orders since the passing of the new tariff bill was assured. Its sales for lighting apparatus alone since then are as follows: New Davidson Theatre, Milwaukee, two 1,000-lighters; A. W. Perry, Boston, Mass. (fifth order), one 350; Hotel Minot, New York City, one 650; Hoboken Quartet Club, Hoboken, N. J., one 150; Henry Reinhart, New York City, one 100 and one 150; E. P. Gleason Manufacturing Company, New York City, one 250; Piscataquis Woolen Company, Guilford, Me., one 600; Danvers Insane Asylum, Danvers, Mass., one 250; Newport Gas Light Company, Newport, R. I., one 250; State Almshouse, Tewksbury, Mass., one 600; Whittenton Manufacturing Company, Taunton, Mass., one 100 and one 50; Weise Bros., Moline, Ill., one 250; Chambers Electric Light and Power Company, Truro, N. S., one 300; Union Central Life Insurance Building, Buffalo (third order) one 250; Beck Brewing Company, Buffalo, N. Y., one 600; Comstock Construction Company, Chicago, Ill., one 250; Gallagher Bros., Meridian, Miss. (third order), one 100; New Ford's Opera House, Washington, D. C., one 450; Jones Bros., Electric Company, Ciocmatti, O., (seventh order), one 50-H. P. 200-volt generator; New Pittsburgh Coal Company, New Pittsburgh, O., one 60-k. w. 220-volt generator; Morris Coal Company, Sand Run, O., one 60-k. w. 220-volt generator; Harry S. Smith & Company, Philadelphia, Pa., two 45-k. w. direct connected generators; J. Holt Gates, Chicago, Ill., one 250-light dynamo, two 60-k. w. belted generators, one 60-k. w. direct connected generator. The company also reports a very large sale of its new Manchester type slow speed stationary motors, in sizes from 3 to 50 H. P. It has had so much success in the introduction of these motors that it has so far been unable to keep up with orders for this class of apparatus.

**A New Drawn-Steel Trolley Pole.**—The United States Projectile Company of Brooklyn, N. Y., the manufacturer of the patent hot-pressed motor pinion, which has met with such marked success, has, after much experimenting, perfected an improvement in trolley poles. The process is unique and original. They are made in the same way that the company makes bicycle tubing, and of the same material. The pole is started from a solid block of steel 3½ inches in diameter and 7 inches long, and is gradually drawn out until it is the standard length, i. e., 12 to 13 ft. It is then tapered, making a neat-looking pole, very smooth and clean. The steel is a fine grade of Swedish and very tough and strong. The poles are 25 per cent. lighter than those ordinarily in use, and, it is said, are very much stronger. This alone is quite an item, as it relieves the tension on the wire just this much, which will certainly make the life of the wire greater. The Brooklyn Heights Railroad Company, which operates one of the hardest roads on trolley poles in this country, on account of the elevated structures, reports that while with the common poles it often has a breakage of from six to ten a day, with these poles during all the time they have been in use, which is now about six months in service, and it has upward of 200, only one pole has been broken so that it could not be used again. The reason of this is that, on account of the tough and tenacious material which the poles are made from, if a pole is bent it is very easily straightened without injuring the metal.

The Ohio Brass Company, of Mansfield, O., is manufacturing motor bearings, of which the workmanship and quality of the metal are superior, and large sales are reported among many of the larest roads in the country. These bearings are made of a guaranteed bell metal, and are turned and trued up, and milled by special machines lately installed for this purpose. The extraordinary care taken with the finish of these insures a perfect fit, and an even and smooth bearing for the shaft. The company has prepared a revised price list of bearings, and the figures at which these are now offered to the trade will no doubt largely increase their output.

Frank A. Rogers, for the past 12 years connected with the Brush Electric and the Short Electric companies, of Cleveland, O., as special sales agent, has been engaged in the same capacity by the Fulcen Truck and Foundry Company, of Mansfield, O., Mr. Rogers' connection with the Brush and Short companies having ceased some few weeks ago. Mr. Rogers' headquarters will be in Cleveland. Mr. Rogers has had a wide experience in the electrical and street railway field, and without a doubt he will meet with ample success in his new position.

**Philadelphia, Pa.**—The People's Traction Company's first order of 300 cars, most of which have been delivered by the builders, the St. Louis Car Company and the Lamokin Car Company, is being



supplied with the General Electric and S. W. ...

The Sterling Supply and Manufacturing Company, of 27 Park street, New York, has received an order from the Nassau Electric Railway Company of Brooklyn, for its equipment of registers and seal boxes. The company has also received an order for additional registers from the Metropolitan Traction Company, of New York, and Consolidated Traction Company, of Jersey City.

P. M. McLaren, the general agent of the Abendroth & Root Manufacturing Company, of New York, has returned from a trip through the East and reports the business of his company on the increase. The Boston office of this company has been removed from the Mason Building to No. 8 Oliver street, where C. E. Ashcroft is in charge.

New Cars for Lancaster, Pa.—The Philadelphia Traction Company has received an order with the St. Louis Car Company for five new motor cars to be delivered in six months. They will be 40 feet in length. They will also contain seating and heating accommodations. Some of the details will be placed in the Engineering and Construction. Five cars will be run on the Lancaster & Lehighett line and on the Harrisburg line. The remaining cars will be placed on the Harrisburg line.

Berlin Iron Bridge Company's Contracts.—The Union Metallic Cartridge Company, of Bridgeport, Conn., has placed the order for three large buildings with the Berlin Iron Bridge Company, of East Berlin, Conn. The Larchmont Electric Company, of Manhattan, N. Y., placed the contract for the power station with the same company. The building will be 50 feet wide and 90 feet long.

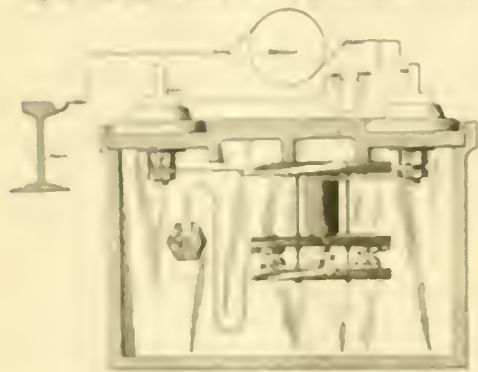
The American Electrical Works, of Providence, R. I., have received several large orders recently from street railway companies, and find their new works none too large for their present volume of business.

The Standard Paint Company, of New York, reports a good business and an increasing demand for P. & H. compounds and its celebrated armature varnish and motor curtain cloth.

# RECORD OF STREET RAILWAY PATENTS.

## U. S. Patents Issued Aug. 21, 1891.

21,734. Street Car Fender; Thomas C. Lee. Filed July 2, 1891. This is a fender for a street car consisting of a wire net or mesh of wire netting stretched outwardly



there around the other set of curved sheaves thence around the adjacent outside sheave and finally around the opposite inside sheave and back.

21,793. Commutator-Cylinder; Alton J. Shaw, Moxley, Mass. Filed June 7, 1891. The conducting bars are provided with collars at the ends, one or both of them being formed of resilient material and adapted to yield under the pressure due to longitudinal expansion of the bars.

21,808. Circuit-controller; Edward J. McEvoy, New York, N. Y. Filed July 7, 1891. This is the combination of a box or casing, a pair of terminals provided with sliding parts, a rotatable rock shaft mounted in said box or casing, a yoke of conducting material carried by said shaft a spring the operation of which is to move the yoke out of contact with the terminals, an operating shaft journaled within the casing and projecting therefrom, a cam upon and rotating with said operating shaft, and a cam for springing from the rock shaft and bearing upon the cam.

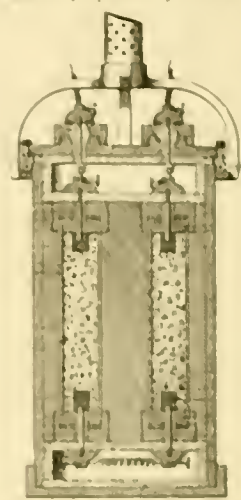
21,823. Electric Railway Car; John C. Henry, Westfield, N. J. Filed Aug. 7, 1891. The car has at one end a switching bogie and at the other end a swivel bogie truck. The motor is mounted on the latter truck, and a bogie projecting from said pony truck is connected with the bogie by an attachment allowing it to have lateral play. (See illustration.)

21,841. Car Fender; James Russell, Boston, Mass. Filed April 11, 1891. The fender is provided with spring actuated grating and retaining devices, the latter being mounted at the ends to slide in the arms of the fender. (See illustration.)

21,844. Electrical Testing Switch; Henry Scott, Buffalo, N. Y. Filed March 2, 1891. This is a special arrangement in a testing switch.



21,883. Fender for Trolley or other Cars; Elmer Hockman and Joseph E. Hagan, Philadelphia, Pa. Filed Feb. 21, 1891. The fender is provided with a roller in front, the frame of the fender having slots therein for vertical play of the journals of the roller.



21,735. Sawing Device for Logs; Henry J. ...

21,773. Electric Railway Supply System; James I. Cummings, Detroit, Mich. Filed July 1, 1891. This is a system of operating street railway cars, which consists of a series of electric motors placed at intervals along the line, and connected to a central station by a system of distributing conductors. The independent source of electricity has one terminal grounded, and means are provided for connecting the other terminal with each trolley line and a galvanometer in circuit with the test line.

21,774. Commutator for Electric Cars; ...



21,815. Automatic Regulator for Dynamo; Henry J. ...

21,820. Insulator; Charles S. Hammett, Boston, Mass. Filed Dec. 3, 1890. The insulator comprises a mass of glass of a substantially spherical form with a wire receiving groove or channel and leads in opposite



21,881. Commutator for Dynamo-Electric Machines; George J. Card, Covington, Ky., Assignor to the Card Equipment Company, Mansfield, Ohio. Filed Jan. 8, 1891. The commutator combines with the armature shaft and cap plates mounted thereon, a series of segments carried by the cap plates, and a packing interposed between said plates.

21,918. Car-Fender; Robert Thomson, Brooklyn, N. Y. Assignor of one fourth to Joseph Norwood, same place. Filed Feb. 8, 1891. The fender has two braced arms rearwardly extended from standards on the tender. There are two sets of clamping bars at the ends of the car along its sides, and keeper wedges are adapted to slide into slots of the front boxes and clamp upon collars on the arms.

21,961. Street Railway Motor; William H. H. Stinson, Hicks, Md. Assignor of one half to Edward I. Clark, Baltimore, Md. Filed Feb. 21, 1891. This is a system of operating street railway cars, which combines friction wheels arranged in a tunnel, sprocket wheels and chains for actuating the same, a series of electric motors placed at intervals to actuate the sprocket wheels and bisected shuttles operated by a shaft to force them in contact with said friction wheels. (See illustration.)

21,970. Electric Railway Supply System; James I. Cummings, Detroit, Mich. Assignor of one half to George M. Engel, Milwaukee, Wis. Filed Sept. 27, 1890. Reopened Jan. 1, 1891. There are two insulated main conductors, two distributing conductors divided into sections independently connected by feeders with said main conductors, respectively. There are safety fuses in the feeders and test lines extending from a central station independently to each section of the distributing conductors. The independent source of electricity has one terminal grounded, and means are provided for connecting the other terminal with each trolley line and a galvanometer in circuit with the test line.

21,980. Electric Wire Coupling; Charles K. Haas and William H. Leard, New Orleans, La. Filed Dec. 1, 1890. The first side reads as follows: In an electric wire coupling



21,775. ...

means of which pressure is transmitted. The wire receives the action which is intended to open the valve. A link connected between the wire and the valve in the direction of the pressure, and also an insulating support connected to the wire, the latter and insulating support being applied to the valve.

21,991. Electric Heating Tap; W. Young, ...

the wire combination with the wire insulated from each other by a non-conducting paper band having one of the wires connected to a central terminal, a metallic spring being connected to said spring band and insulated therefrom, the second wire being electrically connected to said spring and an electrical conductor extending from said spring toward the side of said coupling band and connected to complete the circuit when said spring is pressed inwardly.



# Street Railway Gazette.

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**Death of W. J. Stephenson.** It is with great regret that we announce the death of Mr. W. J. Stephenson, of the Metropolitan Company of Washington. Mr. Stephenson was first vice-president of the American Street Railway Association, and was one of the most active managers in the country; in fact to his indefatigable activity his death is attributed. A biographical sketch of Mr. Stephenson appears elsewhere in this issue.

**Two Street Railway Conventions.** On Sept. 19 the New York and Michigan street railway associations will be held. The former meeting will take place in Syracuse, and a large gathering and an interesting session are expected. The Michigan association holds its first meeting in Grand Rapids and as a number of experienced and wide-awake managers are active in the organization the convention should prove highly interesting and profitable.

**Pennsylvania Street Railway Convention.** In this number we present a report of the third annual convention of the Pennsylvania Street Railway Association in Reading. The meeting was successful in all respects; the attendance was large, the papers were good, and the exhibit of street railway apparatus was extensive. The street railway men of Pennsylvania should take even a greater interest in the association than they have hitherto manifested. There is a prospect of considerable street railway legislation in the State within the next year, and whether it is favorable or unfavorable to street railway interests will depend to a great extent upon the exertions of the members of the association. If the street railway men of the State join in a compact body ready to oppose unfavorable measures, and promote favorable legislation, they will be in a far more advantageous position than if they allow the burden to rest wholly upon the shoulders of a few individuals, as is usually the case.

**Accumulators in Railway Power Plants.** A feature of interest in the power station of an electric railway recently installed in the Isle of Man and described elsewhere in this issue, is a battery of accumulators which is to serve an important purpose during the winter months. The road was built to accommodate tourists during the summer, and if the company had its own way operation would cease at the close of the season. According to the terms of its franchise, however, it must run cars during the entire year, but during the winter the number of trips will be so few in number that it will not pay to keep the power station in operation. To overcome the difficulty the company introduced the battery of chloride accumulators which will, when charged once a week, furnish all the power needed by the cars. Some such a plan would readily be adopted in this country if it were not so generally believed that the storage battery was such a delicate apparatus. The advantages that would attend the use of accumulators in a great many railway power stations, if they should prove reliable and long-lived, are evident enough, but until the belief that they must always "be attended by physician and nurse" is overcome they are not likely to be installed in many electric railway power plants on this side of the water.

**Delays Caused by Teamsters.** The delays which obstinate teamsters inflict on street railway passengers is becoming an intolerable nuisance. There is probably not a street railway

line of importance in the country that is not subject to constant blockades due to this cause. It seems incredible that heavy coal wagons or drays loaded with stone or structural iron should be permitted to delay car after car, first turning out to let one pass after two or three minutes' wait, and then returning to the tracks immediately ready to delay the following one. The police seldom interfere as they should in the interests of the public, and the conductor has become so accustomed to the occurrence that he makes less effort than he should to clear the track, but becomes reconciled to the outrage as one of the inevitable incidents of his life. When the cable and electric cars were introduced a few collisions convinced the teamsters that they had a dangerous foe to deal with in the person of an angry gripman or motorman, and for a while they were inclined to show the latter greater respect, but their fear of the heavy car is growing less. The rapid transit car is now handled more skillfully than when it was introduced, and the danger of an accidental collision is therefore greatly decreased. The teamster has learned that the street-car employe dreads to inflict any sort of damage, lest he involve himself in trouble; so the teamsters have become as bold and as offensive as ever. They are bound to suffer the punishment for their offenses one of these days. The public is waking up to the fact that there is little to gain and much to lose by prolonging its long-suffering course. Public sentiment will eventually demand in unmistakable terms the abatement of the nuisance. When this time comes one of two things will happen: Either city ordinances will be adopted forbidding the use of heavy teams on certain streets, or provision will be made so that heavy teaming must be done during the night in certain city districts. Something in this line has been recently suggested in Boston, and while the teamsters are far from taking kindly to the recommendation that they be deprived of the use of certain streets, their wishes will be disregarded, ultimately, if not immediately. When such regulations are in force passengers on street cars can depend with much greater confidence upon reaching their destinations on schedule time. An incident occurred in Jersey City a few days ago that led a justice of the peace to make a few remarks that meet our unqualified approval. We wish there were many similar men on the justice bench. The circumstances were these: A drayman refused in a spirit of obstinacy to drive off the street railway tracks, and his refusal so exasperated the motorman that he caused his car to touch the vehicle, and then moved his controller handle a notch or two. This may have been in disregard of the rules, but it is hard not to wink at the violation. The drayman and his horse were soon pushed at a faster rate than they enjoyed. When the teamster extricated himself from his predicament he proceeded to assault the motorman, and was arrested in consequence. The justice took no sort of account of his plea that he had been justified in making the assault, but in imposing the fine made these very proper remarks: "It is a favorite practice of you teamsters to delay cars. You think it's lots of fun, and finally get out of the way with a broad grin on your faces. The only fault I find is with the police, who wink at this trick. They should bring 40 or 50 of you, who delay cars purposely, up before a police justice, and the practice would cease."



**DEATH OF W. J. STEPHENSON.**

William J. Stephenson, president of the Metropolitan Railway Company, of Washington, and for many years identified with street railway interests of that city, died at his home on August 31st. The news of Mr. Stephenson's death was entirely unexpected, and the announcement was a shock to his friends in the street railway world. Until about two weeks before his death he was enjoying his usual good health. A short time ago he went west with several directors of the Metropolitan road, for the purpose of investigating different street railway systems. He became seriously ill on August 22d in Chicago. He rallied, however, and was able to return to his home. His illness, which was diagnosed as inflammation of the bowels, was not considered dangerous until the day before his death. Hemorrhages then set in, and were the cause of his death at seven o'clock on Friday evening.

Mr. Stephenson was fifty-three years old and was born in Washington, where he passed the most of his life. His father, Joseph Stephenson, was a respected resident of Washington, and was for many years connected with the local express service of the Baltimore & Ohio Railroad. The son was educated in the common schools, and just before the war entered the office of the Quartermaster-General, where he remained in the shipping department till late in the sixties. He rose to positions of trust in this service and was at one time chief clerk to Quartermaster-General Rucker. For a few years he worked in the freight office of the Baltimore & Ohio Railroad, and in 1870, with his only brother, Ambrose, established the wood and coal business which they have conducted since that time, and which is now located near the Seventh street wharf. For several years he was a trustee in the public schools.

For a long time Mr. Stephenson had been an investor in street railway securities, notably the Belt Line, the Columbia Street Railway, and the Metropolitan. His ability in the management of properties of this kind was readily recognized, and several years ago, on the retirement of President Clagett, of the Columbia Street Railway, Mr. Stephenson was chosen as his successor. This position was filled acceptably by him until one year ago last July, when President George Pearson, of the Metropolitan Railway, was compelled to relinquish his office on account of his poor health.

Mr. Stephenson was already the owner of a considerable interest in this road, and his signal success in the management of the Columbia Railway brought to him the offer of the presidency of the Metropolitan. Mr. Pearson and Mr. Stephenson were brothers-in-law, and the latter took up the duties of his predecessor with all the energy characteristic of the man.

It was these heavy duties, it is thought, that finally broke him down. He gave a large share of his time out of extensive business interests to the solution of the motor difficulties which confronted the road, and it was due to his personal efforts, more than to any other cause, that the bill allowing the underground system of electricity to be adopted was passed. A law was passed by Congress requiring the road to change its motor power within a given time on penalty of forfeiting its charter, and it was largely Mr. Stephenson's wise management, when the limit of time had expired, that saved the charter.

Mr. Stephenson was first vice-president of the American Street Railway Association. He was a prominent Mason, being a member of Dawson Lodge, of which he was a past master, and of Washington Commandery of Knights Templar, of which he was past eminent commander.

Mr. Stephenson was a very genial man, and devoted himself to enterprises of public moment with energy.

Ashland, Wis.—In a recent fire the offices of the Ashland Street Railway Company were damaged to the extent of \$2,000.

**CANNOT CARRY LETTERS.**

The Electric Railway Company of Glens Falls has been accommodating enough to allow its employees to carry letters between the three towns through which its tracks extend—Sandy Hill, Fort Edward and Glens Falls, N. Y. The practice was stopped last week upon instructions from the post-office authorities. The company had been violating the following provision of the postal law :

No stage coach, railway car, steamboat or other vehicle or vessel, which regularly performs trips at stated periods on any post route, or from any city, town or place, between which mail is regularly carried, shall carry, otherwise than in the mail, any letters or packages, except such as relate to some part of the cargo of such steamboat or other vessel, or to some article carried at the same time by the same stage coach, railway car, or other vehicle, except as provided in Section 3,993, and for every such offense the owner of the stage coach, railway car, steamboat or other vehicle or vessel, shall be liable to a penalty of \$100, and the driver, conductor, master or other person having charge thereof, and not at the time owner of the whole or any part thereof, shall for every such offense be liable to a penalty of \$50.

**FIRE IN THE LA ROCHE ELECTRICAL WORKS, PHILADELPHIA.**

A fire occurred August 31 in the building occupied by the La Roche Electric Works in Philadelphia. The flames were confined to the sixth floor, which was not used and contained no machinery. The only damage to the company's apparatus was that caused by water. The fire was discovered soon after six o'clock, and 50 men were at work, as the press of orders of late has necessitated the running of the establishment night and day. The flames spread rapidly throughout the entire length of the sixth floor, starting, it appeared, in about the center of the room, and soon found their way to an unused loft above, which ran the entire length of the structure. Before the fire was quenched it ate its way in several places through the roof. The loss on the building was estimated at \$2,500.

**RECEIVERSHIP FOR H. WARD LEONARD & CO.**

H. Ward Leonard has been appointed temporary receiver of H. Ward Leonard & Co., of New York city. The receivership was the result of a friendly suit brought by the Interior Conduit and Insulation Company at the request of H. Ward Leonard & Co. Wise & Flannagan, attorneys for the complainant, have made a statement for the information of creditors and stockholders, in the course of which they say: "The step has been taken for the protection and not the injury of the creditors and stockholders of the company. While the assets nominally amount to \$177,641.10 and the liabilities of the company are only about \$64,000, it was necessary for the company to go into liquidation, because \$109,000 of the assets of the company is impounded in a suit against the Cayadutta Electric Railway Company, and the remaining assets were insufficient to meet the accruing liabilities which are in the form of promissory notes and accounts payable. Any other course would have resulted in a scramble among the creditors for precedence and the squandering of assets in attachments and costs. This course will, we think, result in the payment of the debts in full. The appointment of Mr. Leonard is temporary, but we hope you will concur in the view of the Board of Directors that he is the proper person for permanent receiver. His familiarity with the business, and especially with the suit against the Cayadutta company, necessitates his services in the task of collection. Those services are indispensable, whoever may be appointed receiver, and to appoint anybody else will result in double expense. We hope you will concur in this view and unite with us in favoring his appointment as permanent receiver. The court will require bond of him sufficient to protect everybody for his administration. The assets carefully handled will be more than sufficient

to pay all creditors, and will provide a considerable amount for distribution to stockholders."

**MEKARSKI COMPRESSED AIR SYSTEM IN PARIS.**

The Mekarski compressed air system has been adopted for three lines operated by the General Omnibus Company, Paris. The lines in question are among the most important of the whole Paris system. The longest is that from the Louvre to Sèvres and Versailles, a distance of about twelve miles. The two other lines are those from the Louvre to St. Cloud, and from the Cours de Vincennes to St. Augustin, distances of 6.3 and 5.7 miles respectively. The first two of these lines will be worked as one system. Trains of three cars, seating 51 persons each, and drawn by a compressed-air locomotive, will start from the Louvre every quarter of an hour. These trains will be broken up at the junction of the St. Cloud and Versailles lines, one car going on to St. Cloud, and the other two to Sèvres and Versailles. The locomotives to be used will be supported on six wheels, all coupled. They will weigh 18 tons each, considerable adhesion being required to mount the incline of 1 in 23, which occurs on the Sèvres line, when towing three cars, each of which in the loaded condition, weighs 8 tons. Twenty-three of these locomotives are to be built, of which six will be kept in reserve. A sufficient quantity of air will be carried to enable the locomotives to run twelve miles without recharging.

**RAILWAY LEGISLATION IN WASHINGTON.**

Chairman Heard, of the Committee on District Affairs of the House of Representatives, states that the most important District legislation recently passed by Congress was that included in the Metropolitan bill. "Under the provisions of that bill," he said, "any street railway company now existing, or hereafter authorized, which connects directly, or by means of connection through another road, with the Metropolitan line can run its cars over the tracks of the Metropolitan line into the heart of the city.

"There will be no further trouble about it, for if amicable arrangement cannot be made the court will compel an agreement. This means not only that other roads, and prospective suburban lines especially, will be enabled to reach the heart of the city, but it means, also, that there will be no necessity for using more of the city's streets for new roads.

"That in itself is an important matter. I think that with the possible exception of a crosstown line we don't need any more city lines. I have been struggling for years to keep a few north and south streets, Sixth and Tenth, for instance, free from street car tracks, so as to furnish an outlet to the country. We are now in a position to say to new companies who may ask for charters on city streets that they can connect with existing lines and come down over the Metropolitan line.

"Washington will soon have the most complete system of street railways in the country, by means of the transfer and connection scheme thus afforded. We now have the cheapest system, and a man can ride on more roads for less money than anywhere else. The plan of selling six tickets for 25 cents saves the people of this city \$400,000 annually, that amount being the difference between six tickets for a quarter and a straight five-cent fare."

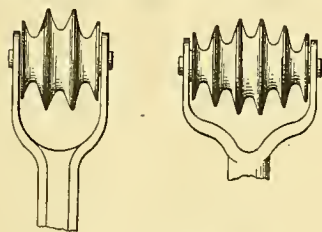
**BALTIMORE CAR FENDER COMMISSION.**

Engineer Cohen, of the Car Fender Commission of Baltimore, last week presented his report on the merits of the eighty odd devices that were submitted to him. The report will not be published, however, until it is prepared in pamphlet form. It is reported that Mr. Cohen has recommended four different fenders that the companies shall be free to adopt. Mayor Latrobe is quoted as saying that the report of Mr. Cohen is admirable, as the latter investigated the fender question exhaustively. He said he was confident that the problem would be solved satisfactorily.



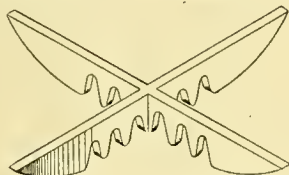
**GROOVED TROLLEY WHEEL AND SWITCH.**

Patents have just been issued to Naaman W. Haskins, of Brooklyn, for a grooved trolley wheel and an overhead switch adapted for use in connection with it. The cuts illustrate very clearly the character of the devices. The inventor claims that the ordinary type of trolley is apt to leave the wire under the influence of sudden jar or vibration or while going around a curve, and the conse-



Grooved Trolley Wheel.

quences are always annoying if not dangerous. With the style of trolley wheel shown in the cut this danger, it is stated, is reduced to a minimum, as the flanges of each groove constitute an independent contact holder for the wire. One statement, however, that is made in the specification will probably be questioned. After stating that the dangers and delays of travel will be mainly obviated by the employment of a wheel of this description the inventor remarks, "It is possible to utilize electricity from the main wire in both



Crossing for Grooved Trolley Wheel.

heating and lighting the car—a desideratum not heretofore practicable on account of the uncertainty of the contact between trolley and wire."

The second cut shows the form of switch and crossing to be used in connection with the many-grooved trolley wheel. The flanges upon the corner or cross plates are made with notches which coincide in position with the several flanges upon the wheel, so that the latter will pass over a cross conductor, or over a branch of the same conductor, without touching either, its contact with its own conductor being preserved and maintained.

**THE DOUGLAS AND LAXEY ELECTRIC TRAMWAY.**

The Douglas and Laxeley Electric Tramway on the Isle of Man, which was opened at the end of last month, is for many reasons the most noteworthy undertaking of its kind in Great Britain. The promoters modestly call it a tramway, but to all intents and purposes it is a railway. Certainly, the difficulties of roadmaking and bridge building which were met are more comparable to the conditions found in railway work than to those of a tramway undertaking. Every foot of the road over which the cars travel has been made by the Tramway Company. The scheme has involved cutting through cliffs: it has in one place necessitated a concrete bed, 18 feet thick, on which the road has been built, and at Groudle it has been imperative that a wide and deep gully should be spanned. The total length of the line is slightly less than seven miles, and at no point was the road built on the public highway. The steepest grades averages 1 in 24. The road is double-tracked throughout and the gauge is three feet.

There are two power stations, one at Portevada, Douglas, one extremity of the line, and the other at Laxeley, the other terminus. The former station is equipped with three Lancashire boilers 20 feet long and 6 feet diameter, which work at a steam pressure of 120 lbs. There are three compound side-by-side vertical engines with high-pressure cylinders 10 inches diameter, and low-pressure cylinders 20

inches in diameter, the stroke being 18 inches. Each engine will indicate 100 H. P., and is fitted with special adjustable governor and heavy fly-wheel. They work on to a separate condenser, and also to a by-pass for the exhaust to the chimney. The steam pipes are duplicated throughout, from the boilers to the engine cylinders, as well as to the donkey pump and injector.

The condensing water is obtained from a large underground tank, made by building a concrete wall across the creek filled with shingle. An enormous cooling surface is obtained, and, probably, the tank is one of the cheapest ever made.

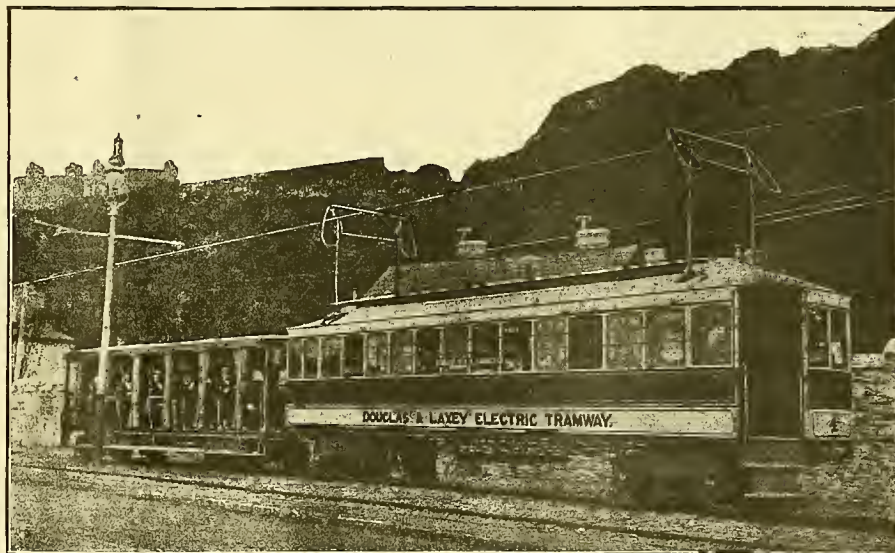
There is room in the engine-house for two more engines. There are two dynamos of the Manchester type, and one machine of the Mather & Platt type. Each machine has an output of 500 volts and 100 amperes, and is driven by link belts with jockey pulleys.

The station at Laxeley is in most respects similar to the one at Douglas. There are, however, only two boilers and two engines, which drive Mather & Platt dynamos of the same output as the ones at Douglas. Ample room is allowed for extensions, and two more boilers, engines and dynamos can be comfortably housed.

The feature about the Douglas & Laxeley line which will be of most interest to traction men will be the use that is made of accumulators. At Groudle, which, as we have already said, is distant some 2½ miles from Douglas, the accumulator station is placed. There are 240 cells of the patent chloride type, made by the Chloride Electrical Syndicate. The battery consists of 120 unprotected cells and 120 protected cells with teak and asbestos separators. It is capable of being discharged at

have previously mentioned that to all intents and purposes the line has been designed for the purpose of carrying pleasure passengers during the three or four months of the year when the island is given over to visitors. But the Isle of Man authorities in their wisdom insisted that the company should run two cars each way every day of the year. This obligation, while a necessary one, introduced the difficulty of working the system for an infrequent and light demand. Under these circumstances it would have been very expensive, if not prohibitive, to keep a large power generating station running. The accumulator seemed to offer the only method of economically furnishing occasional power, and this is one reason which has led to the Groudle accumulator station. It is proposed during the winter months to rely wholly on the accumulators for supplying power to the line, the battery being charged up about once a week. This will enable a complete shutting down of the plant at the power stations, save for the occasional charging purposes. The working of these accumulators will be watched with the closest interest, both by reason of the comparative newness of chloride cells, and the fact that fixed accumulators have been rarely used to supply power for traction purposes.

The working conductors are high conductivity copper wires, No. 0, B. W. G., suspended from steel poles at a height of about 16 feet above the rail level. The poles, fixed midway between the two tracks, have cross arms carrying a conductor on either side over the center of the track. The working conductor is fed from an underground feeder cable. Boxes are fixed at suitable points of the line to cut out any section, or to connect the feeder



CAR ON DOUGLAS &amp; LAXELEY LINE EQUIPPED WITH NEW COLLECTOR.

the rate of 500 volts at 140 amperes for three hours, or 90 amperes for six hours, or 70 amperes for nine hours. It could also in an emergency discharge at 300 amperes, that is, 200 H. P., for about 45 minutes, without detriment to the plates. The battery is usually connected in parallel with the two generating stations on to the line, and charges or discharges according to the requirements of the traffic. It can be brought up to the full charge at any time by a motor generator which is placed in a corner of the accumulator station. It is obvious that only under exceptionally heavy traffic is full benefit derived from the accumulator station. On the occasion of our visit when, perhaps, fewer passengers than usual were being carried, says a writer in the *London Electrical Review*, it being Sunday morning, comparatively little current was leaving the station, and, generally speaking, we should not expect when the power stations at either end are working that there will be much call for power from the accumulator house. But the real utility of the storage arrangements is obtained during the winter months. We

as may be required. The return is by the rails, which are bonded by copper strips riveted to the under flange.

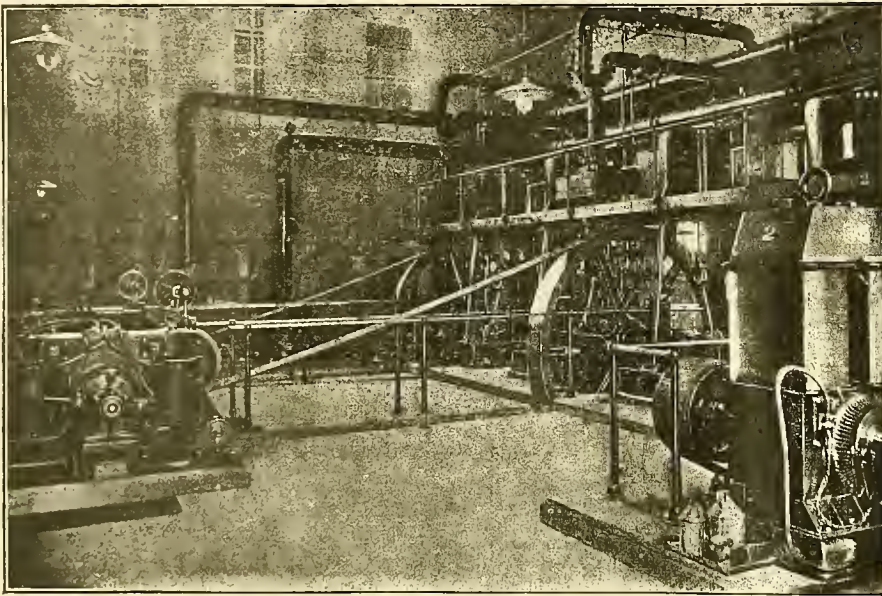
The current is taken from the conductor by collectors consisting of two rigid bars carried above the roof of the car; this is a system patented by Dr. John Hopkinson many years ago, but not hitherto applied on any extensive scale. It has the great advantage over the American trolley system, says the writer already quoted, that the working conductor can be swung at a less tension, and that the position over the line is of small importance, as the collecting surface is at least six feet. In action it has been found desirable to give the collecting bar some freedom of angular motion to reduce noise and wear and tear. This is done in accordance with a plan patented by Messrs. Mather & Platt, by which the collecting bar can move backward and forward through a limited range controlled by springs, thus insuring continuous contact with the wire, except just at the points when passing under the insulators, when the other collector takes up the current. An



illustration of a car provided with this hinged collecting bar is presented. On no occasion did the visitor detect the slightest sparking from the collectors, even on a dark night.

It is the contention of the engineers of the plan that with a trolley system it would have been an utter impossibility to complete the line in four months. A trolley wire on the American plan, they assert, needs most careful erection in order that successful working shall result. The side trolley does not require such nicety of arrangement; but on the whole, the bar collector, it is claimed, is perhaps the best form that could have been adopted under the circumstances.

There are 9 motor cars and 12 open trailing cars with light roofs. The motor cars have longitudinal seats, and seat comfortably 38 passengers; the trailers have transverse seats and carry 44 people. All the cars are fitted with powerful brakes controlled from either end. There is also an emergency brake, available in case of accident to the main brake. This is automatic in its action; and if a trailer, when going



PORTEVADA STATION OF THE DOUGLAS & LAXEY ELECTRIC RAILWAY.

up a gradient, should part from the motor car it will instantly be brought to a standstill.

There are two motors on each car with helical steel single reduction gear. The motors are designed together to give 3,000 lbs. tractive force at the periphery of the wheels. The motors are of the usual series type; carbon brushes are used, and are said to give little trouble, save that which occasionally arises from an undetected inferiority in the carbon. The regulating and reversing switches are fixed at each end of the car, the resistance frames being carried underneath the bogies. The reversing switches are for the most part of the barrel shape; that is, they consist of a wooden cylinder, having contact pieces placed on the surface. They are worked by a handle in the usual way. There is, however, no uniformity in the switches, the intention being, no doubt, to test the various forms. For some reason or other the authorities insist that the speed shall not exceed eight miles an hour.

#### POSTAL TROLLEY CARS FOR PHILADELPHIA.

The postal officials of Philadelphia are considering the advisability of utilizing trolley cars for the conveyance of mails from the post-office to the substations in different parts of the city and county. It is stated that no conclusion has yet been reached in the matter. It is probable that the postal officials will investigate thoroughly the working of the system in Brooklyn before any innovation is made. There are substations located at a distance where the wagon service could be beaten, if the trolley will reach them.

## Pennsylvania Association.

### MEETING OF THE STREET RAILWAY MEN IN READING.

#### Large Attendance - Extensive Exhibition of Street Railway Apparatus - Officers for Next Year - A Successful Convention.

The annual convention of the Pennsylvania Street Railway Association, which was held last Wednesday and Thursday in Reading, was in every respect a successful meeting. The arrangements were admirable and the plans for the entertainment of visitors in fact, all the features of the programme—were carried out to the letter. The attendance was large and the delegates and guests found that they had fallen into the hands of unusually hospitable hosts. The association desires to increase its membership so that it may exert in various directions a stronger influence, and if it

Second vice president, G. A. Greenwood, Pittsburg.

Secretary, S. P. Light, Lebanon.

Treasurer, W. H. Lanins, York.

Executive committee: Chris. L. Magee, Pittsburg; B. F. Myers, Harrisburg, and J. J. Patterson, Lancaster.

In the evening the delegates and visitors boarded a special car provided by the Neversink Mountain Railroad Company, and made the trip to Reading. The view from the car as it neared the city brilliantly lighted by arc lamps was beautiful in the extreme. Upon reaching the city the party visited the power station of the Reading Traction Company on Seventh street. The visitors were shown about the plant by J. L. Boyer, superintendent of the Metropolitan Electric Company, and John A. Rigg, president of the Reading Traction Company. The railway current is generated by an M. P. General Electric generator of 375 k. w. capacity, coupled direct to a Lake Erie 600 horse-power vertical engine and a 300 k. w. M. P. generator, made by the General Electric Company, belted to a M. A. Green engine. The lighting plant consists of Wood and Thomson-Houston arc and Edison incandescent dynamos, power for which is furnished by six Ide engines and one 1,000 H. P. Hamilton-Corliss.

The party again boarded a special car of the Reading Traction Company and visited the Mineral Springs Park, where a band concert was enjoyed and the performance of a tight-rope walker was watched.

On the following day the visitors enjoyed a number of excursions arranged by their Reading hosts.

As it has been stated the attendance was unexpectedly large. Among those present were the following:

#### DELEGATES AND VISITORS.

Ash, E. W., Schuylkill Traction Company, Ashland, Pa.

Aulenbach, M. C., Reading Traction Company, Reading, Pa.

Allen, E. H., Allen Electric & Supply Company, Philadelphia, Pa.

Allen, A. H., Westinghouse Electric & Manufacturing Company, Philadelphia.

Bibber, Charles E., Cutter Electrical and Manufacturing Company, Philadelphia, Pa.

Blake, H. W., *Street Railway Journal*, New York.

Breese, C. P., Philadelphia, representing Walker Manufacturing Company, of Cleveland.

Breneman, B. F., Pennsylvania Traction Company, Lancaster, Pa.

Bragg, C. W., Philadelphia, representing Westinghouse Electrical and Manufacturing Company, Pittsburgh, Pa.

Billinger, Geo. S., York Street Railway Company, York, Pa.

Brightbell, S. L., Lebanon & Anville Street Railway Company, Anville, Pa.

Beatty, W. H., Hubley Manufacturing Company, Lancaster, Pa.

Boyer, J. L., Metropolitan Electric Company, Reading, Pa.

Crowley, H. J., Philadelphia, General Electric Company.

Clark, Newton, representing C. G. Smith, New York, N. Y.

Curwen, Samuel M., J. G. Brill Co., Philadelphia, Pa.

Clitz, Paul R., Philadelphia, representing the Johnson Company, of Johnstown, Pa.

Darlington, F. W., Pennsylvania Traction Company, Philadelphia, Pa.

Dickersoo, J. W., *STREET RAILWAY GAZETTE*, New York, N. Y.

Dewitt, E. F., E. F. Dewitt & Co., Lansingburg, N. Y.

Ellis, Harvey, Ellis Manufacturing Company, Philadelphia, Pa.

Field, Arthur W., Boston, representing Peckham Motor Truck and Wheel Company, of Kings-ton, N. Y.

Fales, T. M., York Street Railway Company, York, Pa.

Foisy, W. F., Okonko Company, New York, N. Y.

Fothergill, H. R., representing Benjamin F. Shaw, Wilmington, Del.

Field, John M., Berlin Iron Bridge Company, of East Berlin, Conn.

Fisher, Philadelphia, Charles A. Schieren & Co.

Faugh, L. R., A. Whitney & Sons, Philadelphia.

Ferree, Samuel P., *Street Railway Advertising Company*, New York, N. Y.

can succeed in making its conventions as attractive as that in Reading it should experience no sort of difficulty in swelling its membership roll.

The place of meeting was wisely chosen if the attendance of members at business sessions is to be considered of importance. The situation of the Neversink House at the summit of the mountain is so isolated that the members when once they reached the place were not likely to leave, but were always on hand when the meetings were called to order.

The trip to the hotel by the Neversink Mountain Railroad is of itself worth a visit to Reading. The journey enables one to enjoy a succession of charming views of the surrounding country as the electric car travels up to a height of 1,000 feet above the sea level.

The meeting was called to order by the vice-president, Robert E. Wright, of the Allentown & Bethlehem Rapid Transit Company. In the course of his annual address he made a feeling allusion to H. R. Rhoads, the president, who died within the last year. Papers were read by Lincoln Nissley, of the Citizens' Passenger Railway Company of Harrisburg, on "Street Railway Motors," and by L. H. McIntire, of the People's Traction Company, of Philadelphia, on "Power Stations."

A discussion followed regarding the advisability of admitting the supply men to membership. It was voted to receive them as honorary members.

The following officers were elected for the ensuing year:

President, John A. Rigg, Reading.

First vice-president, Robert E. Wright Allentown.



Given, W. B., Columbia & Donegal Railway Company, Columbia, Pa.

Gahagan, A. T., Warren Webster & Co., Camden, N. J.

Haldeman, Thomas W., Pottsville, Pa.

Hirons, Wm. F., Lamokin Car Works, Philadelphia, Pa.

Hayes, William H., West Chester Street Railway Company, West Chester, Pa.

Huntington, D. L., Philadelphia, General Electric Company.

Hoagland, C. A., John H. Graham & Company, New York, N. Y.

Hammond, C. H., Delaware Hard Fibre Company, Wilmington, Del.

Jones, Richmond L., Reading Traction Company, Reading, Pa.

Jennings, W. C., The Fairbanks Company, Philadelphia, Pa.

Jerome, R. S., Central Electric Heating Company, New York, N. Y.

Kenfield, F. S., *Street Railway Review*, Chicago, Ill.

Kunkle, H. T., H. T. Kunkle & Co., Reading.

Lawless, E. J., of New York, representing American Car Company, of St. Louis.

Lanius, W. H., York Street Railway Company, York, Pa.

Light, S. P., Lebanon & Annville Street Railway Company, Lebanon, Pa.

Lox, F. A., A. Whitney & Sons, Philadelphia, Pa.

Luramy, W. L., Reading Wood Pulley Company, Reading, Pa.

Le Van, W. B., Jr., Brooklyn Car Wood & Veneer Works, Brooklyn, N. Y.

McIntire, L. H., People's Traction Company, Philadelphia, Pa.

Moore, B. E., Philadelphia General Electric Company.

Mather, Edmund, Reading, Pa.

Magee, F. A., The E. S. Greeley & Co., New York.

Macan, Macao & Co., Philadelphia, Pa.

Nisley, Lincoln, Citizens' Passenger Railway Company, Harrisburg, Pa.

Nagle, James W., *The Car*, Philadelphia, Pa.

Ostrom, John F., Philadelphia, representing the Middletown & Highspire Railroad Company, of Steelton, Pa., and the Pennsylvania Steel Company, of Steelton, Pa.

Owen, Benj. F., Reading & Temple Railway Company, Reading, Pa.

Padley, James C., Wissahickon Electric Light and Passenger Railway Company, Wissahickon, Pa.

Patterson, John J., Pennsylvania Traction Company, Lancaster, Pa.

Price, James M., Price Railway Equipment Company, Philadelphia, Pa.

Pratt, Mason D., Pennsylvania Steel Company, Steelton, Pa.

Perry, James W., H. W. Johns Company, New York, N. Y.

Ransom, H. N., Consolidated Car Heating Company, Albany, N. Y.

Rupp, D. A., York Street Railway Company, York, Pa.

Rigg, John A., Reading Traction Company, Reading, Pa.

Raudenbush, J. K., Eureka Sand-Box Company, Lebanon, Pa.

Smith, Charles H., Lebanon & Annville Street Railway Company, Lebanon, Pa.

Smyser, Geo. P., York Street Railway Company, York, Pa.

Taylor, S. H., Street Railway Advertising Company, Philadelphia, Pa.

Vosburgh, A. C., New Process Rawhide Company, Syracuse, N. Y.

Webb, H. E., Solar Carbon Company, Pittsburg, Pa.

Wright, Robert E., Allentown & Bethlehem Rapid Transit Company, Allentown, Pa.

Wiley, Jay, Western Electric Company, New York, N. Y.

Yardley, John H., Philadelphia Car Wheel Company, Philadelphia, Pa.

#### THE EXHIBITS.

In connection with the convention an excellent exhibit of street railway apparatus was given in Metropolitan Hall, corner of Fifth and Chestnut streets. The exhibit was an extensive one and was a genuine surprise to the great majority of visitors. At the best only a few samples of devices and apparatus that could easily be shipped were expected, but those in charge made a great effort to make this feature of the convention one of marked interest, and manufacturers co-operated in a generous spirit. The result was an exhibit that compared in point of interest with some of those arranged under the auspices of the American Street Railway Association. For the

success of the exhibit a great deal of credit should be given to John A. Rigg, president of the Reading Traction Company. A large hall was engaged, and the floor space was well occupied. The great distance from the hotel where the meetings were held was objectionable as the visitors did not have the opportunity to run into the hall for a few minutes' stay, but were obliged to confine their visits to the hours arranged on the programme. The isolated situation of the hotel was advantageous in certain respects, as it has already been pointed out, but it did not work to the advantage of the exhibit which really deserved more attention than the limited time of the visitors enabled them to devote to it.

The hall was elaborately decorated with bunting and draped flags of all nations, and was brilliantly illuminated by arc and incandescent lamps. The former were supplied with current from the street railway circuit in front of the building. The exhibit was visited by hundreds of residents of Reading, who thronged the hall in the evening.

#### THE EXHIBITORS.

THE GENERAL ELECTRIC COMPANY made an extensive exhibit, which occupied the most prominent position in the center of the hall. The company had on exhibit two of the G. E. 800 motors mounted on a Peckham truck. The latter was blocked up, and as the motors were connected, the latter were shown in operation. The fields were thrown open so that the working of the apparatus could be readily seen. This part of the exhibit was the great attraction to the crowds that thronged the hall. When the wheels were in motion it was hard work to push one's way into the hall. The motor equipment was shown complete with the type K controller. The company also displayed on tables, where it could be readily examined, a full line of its overhead material, the general features of which are familiar. The company's improved trolley base, pole and harp complete were also exhibited. The brilliant illumination of the hall has already been referred to. The light was furnished by 10 Thomson 93 arc lamps, which were on a circuit cut into one of the trolley lines of the Reading Traction Company. The lamps burned excellently, without a trace of a flicker, and were admired by the street railway men who were greatly interested in their operation. The company was represented by the following gentlemen from the Philadelphia office: H. J. Crowley, D. L. Huntington and R. E. Moore.

BENJAMIN F. SHAW, of Wilmington, Del., exhibited an assortment of pipe for high pressure fittings in power stations; also a line of superior trolley brackets, and the Spencer damper regulator. This concern has installed its devices in the power stations of the Steinway Railway Company on Long Island, and the Scranton Traction Company, and in the new addition to the station of the Metropolitan Electric Company of Reading. The representative was H. R. Fothergill.

THE FAIRBANKS COMPANY, of Philadelphia, showed a line of valves and steam specialties, among which the Jennings high-pressure gate valve was particularly noticeable. The company's representative was W. C. Jennings.

WILLIAM E. HOOPER & SONS, of Baltimore, exhibited a line of driving ropes of various sizes. These were arranged in a handsome frame and attracted no little attention.

E. F. DE WITT & CO., of Lansingburg, N. Y., showed their Common-sense sandbox. Two of these were mounted on a platform representing a car, and the devices were shown in operation. The latest type was exhibited, which occupies a space of only two by three inches in the floor. These sandboxes are now used on forty roads and are giving great satisfaction. E. F. De Witt was present.

THE READING WOOD PULLEY COMPANY, of Reading, Pa., showed different sizes of its wood pulleys. W. L. Luramy was the company's representative.

H. T. KUNKLE & SON, of Reading, made a very showy exhibit of their lubricating oils and greases.

F. W. HANOLD & CO., of Reading, had an exhibit showing the various kinds of coal that the firm handles.

WARREN WEBSTER & CO., of Camden, N. J., made an exhibit of their specialties for steam plants, and called the attention of street railway men to their peculiar merits. Among the devices exhibited were a feed-water heater and purifier, oil separator and live steam separator. The firm was represented by A. T. Gahagan.

THE CONSOLIDATED CAR HEATING COMPANY, of Albany, N. Y., had one of the most interesting as well as one of the most extensive exhibits. The company sent a considerable number of electric heaters, and made a representation of their appearance in a car. The first night of the exhibit was slightly too warm to make the heater exhibit thoroughly appreciated. Those who examined it carefully found that it was distributing an immense amount of heat. At one side of the space was a long car seat, about the length that would be found in a 20 foot car body. This was equipped with three of the company's standard electric heaters, the faces of which extended through the riser and were flush with the surface of the latter. On tables near by were shown electric heaters of the different types made by the company. These included those designed to be screwed on the face of the riser and smaller ones intended for use on cars equipped with transverse seats. One of the interesting parts of the exhibit was the temperature regulating switch, by which five different intensities of heat can be delivered. To illustrate how the heaters are constructed, one of the resistance heating coils was taken out from a heater for exhibition purposes. This coil, by the way, had been used in a heater in service for two seasons on an electric railway. An interesting feature of the exhibit was an assortment of testimonials from those who had used and been well satisfied with the company's heaters.

THE E. S. GREELEY & CO., of New York, brought to the convention an exhibit of headlights, but they were not shown long, as the company's representative F. A. Magee sold them.

THE OKONITE COMPANY, of New York, was represented by W. F. Forby, who discussed the merits of Okonite wire with the visitors, and distributed among them the Okonite pocket-books which only the initiated can open.

THE EUREKA SANDBOX COMPANY, of Lebanon, Pa., had on exhibition its sandbox, which was shown in operation. It can be worked by stationary or lock treadle or hand lever. Wet or dry sand, gravel or salt can be handled by this device. The sandbox was shown in operation on Car 1 of the Reading Traction Company. J. K. Raudenbush represented the company.

MACAN & COMPANY, local agents in Philadelphia of the Magnesia Sectional Covering Company, of Ambler, Pa., showed samples of the latter's magnesia for covering steam pipes. This material is in use in a great number of places, and is giving great satisfaction. The firm was represented by Mr. Macan.

THE MARK RAILWAY EQUIPMENT COMPANY, of Chicago, made an exhibit of its material for track construction. These include chairs, joints, tie plates, brace plates, etc.

THE CUTTER ELECTRICAL & MANUFACTURING COMPANY, of Philadelphia, had on exhibition several of its well-known C-S automatic cutouts. This reliable device has now been in use for three years and is regarded with great favor by street railway companies. Charles E. Bibber was the company's representative.

EDMUND MATHER, of Reading, Pa., exhibited the Locke damper regulator.

A. WHITNEY & SONS, of Philadelphia, made an exhibit of car wheels and axles for street railways. L. R. Faugh represented the company.

THE SAFETY CLUTCH-BRAKE COMPANY, of Phila-



delphia, exhibited two of its brakes designed for use on electric cars. The brakes were mounted so that they could be examined and tested by visitors. The brake is simple but strong: the ratchet feature is strengthened by strong coupled clutch bearings. It has been indorsed by many practical railway men.

THE DELAWARE HARD FIBRE COMPANY, of Wilmington, Del., exhibited samples of its fibre. The company's representative was C. H. Hammond.

THE PRICE RAILWAY APPLIANCE COMPANY, of Philadelphia, had on exhibition its well known material for track construction. James M. Price was present and explained the features of the several devices. Special attention was directed to the joints.

C. G. SMITH, of New York, made one of the most attractive displays in the hall. The booth was tastefully decorated and arranged and the lamps and reflectors made a brilliant showing. Among the goods that were shown were combination lamps, electric clusters, patent electric clusters with glass reflectors, Smith headlights of different sizes, designed for oil and electricity. The representative was Newton Clark.

THE BROOKLYN CAR WOOD AND VENEER COMPANY, of Brooklyn, N. Y., had a large exhibit of its woods and veneers for use in the manufacture of street cars. Among these were ceilings and upper decks, advertising racks and side frames, etc. There were also shown a number of double and single settees for railway stations. The backs were made of perforated veneer work. W. V. Le Van, Jr., represented the company.

THE STREET RAILWAY ADVERTISING COMPANY, of New York and Philadelphia, was represented by the treasurer, Samuel P. Ferree, of the former city, and S. H. Taylor, manager of the Philadelphia office.

THE J. G. BRILL COMPANY, of Philadelphia, had on exhibition, just outside of the hall, one of its latest type of cars, which was built for the Reading Traction Company. The car was 31 feet long over all, and was mounted on the company's latest improved No. 21 truck. The electric equipment consisted of two G. E. 800 motors with type K controller. The car was painted Tuscan red with gilt lettering, and presented a very handsome appearance. The company's representative was Samuel M. Curwen.

THE BRIDGEPORT CAR EQUIPMENT COMPANY, of Bridgeport, Conn., made an exhibit of its excellent car fender and sandbox. The fender was so arranged in front of a platform that its operation could readily be examined. The company also had a model of a platform car equipped with the Bridgeport fender and sandbox.

THE H. W. JOHNS MANUFACTURING COMPANY, of New York, had on exhibition a very full line of its overhead material for street railway purposes. There was shown a large assortment of the company's well-known molded mica trolley insulators and other devices made out of the same material. Part of the devices were arranged on a large exhibition board and the remainder on a table immediately in front. The exhibit was arranged in such a way that it attracted no little attention. The company's representative was James W. Perry.

THE WESTERN ELECTRIC COMPANY had on exhibition samples of its overhead material for electric street railways. These devices, which were sent from the New York office of the company, were new to most of the street railway men present, and they were examined with a great deal of interest. The assortment was composed of insulators, trolley wheels, switches, cross-overs, insulator pins, etc. The company was represented by Jay Wiley, of New York.

THE HUBLEY MANUFACTURING COMPANY, of Lancaster, Pa., occupied a large space in the hall, which was filled with samples of their electric railway material. The assortment was very large and it was examined with a great deal of interest. One interesting feature of the exhibit

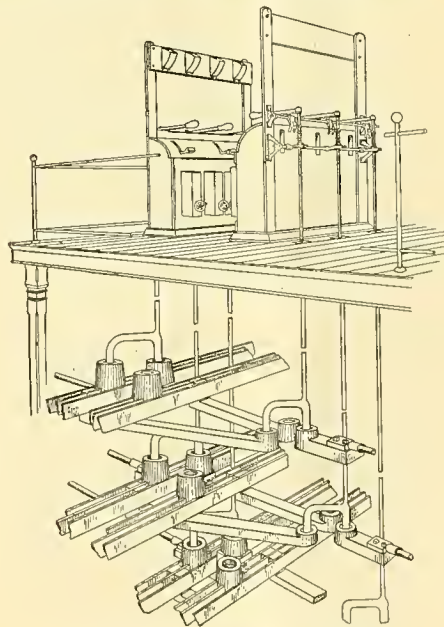
was a car handle, which had been twisted completely out of shape, in order that it might appear that it was practically unbreakable. The company also showed its new trolley wheel and harp and samples of its insulating cloth and paper.

CHARLES A. SCHIEREN & Co., as usual, made an exhibit of their leather belting for electric power stations. A large belt designed for the power station of the Reading Traction Company was on exhibition, as well as a sample of the firm's perforated leather belting.

THE BERLIN IRON BRIDGE Co., of East Berlin, Conn., had an exhibit, which illustrated the construction of the Berlin patent anti-condensation roof-lining. As street railway men are so much interested at the present time in improved methods of constructing power stations, this exhibit was examined very carefully by many of the delegates. This style of roof-lining has been used in the construction of a great many power stations for electric street railways. The merits of this method of construction were explained by the company's representative, John M. Field.

#### BUS-BAR SWITCH FOR CENTRAL STATIONS.

It is often a matter of convenience or necessity to shift the bus-bar connections, particularly where two or more potentials are employed in the same station, and it has been customary in large stations, where the switchboards were located in a gallery, to carry leads to these switchboards which were capable of carrying the entire current generated and delivered to the bus bars. In the case of large stations this becomes a serious cost, on account of the large amount of copper required, and it is also undesirable because it increases the length and resistance of the dynamo leads to the gallery and



Bus Bar Switch for Central Stations.

the feeders from the gallery, which should be kept as small as possible, as it involves constant waste of current. To obviate this expense the improvement illustrated in the accompanying cut was devised, by Albert B. Herick, of Schenectady, N. Y. The invention consists in an arrangement of the gallery and the switches, whereby the connecting parts or poles of the switch are arranged adjacent to the bus-bars which are to be connected, while the entire operating system is assembled in the gallery at a convenient point, and the only connections necessary are those for the shunt field rheostat, the shunt ammeters, and the voltmeters; the connection between the poles of the switches and the operating handles at the switchboards being entirely mechanical, so that the waste of current and of copper pointed out is obviated. So serious is this waste and extra expense that in a single instance in a large station 22 tons of copper would

have been necessary to convey all the current to the gallery and back, and the waste of current in this amount of copper, together with the interest on its cost, would be sufficient to pay six per cent. on a capital of \$16,000. The entire assembly is shown in the illustration, which is an embodiment of the invention.

#### QUEEN & CO.'S ASSETS.

An inventory and appraisal of the assigned estate of Queen & Co., of Philadelphia, was filed in the Common Pleas Court in that city last Wednesday. The schedule of the assets is as follows: Optical department, instruments for testing eyes, spectacles, eyeglasses, opera and field glasses, \$25,000; mathematical instruments, gauges, thermometers, etc., \$31,000; microscopical department, botanical and entomological goods, \$8,500; physical and electrical models and apparatus, \$20,000; lantern department, telescopes, magic lanterns, etc., \$1,500; photographic department, chemicals, devices and materials, \$4,000; chemical department, chemicals and glassware, \$9,000; and Filbert street shop, engines, machinery and tools, \$5,000, making a total appraisal of \$104,000.

Samuel L. Fox, of Bryn Mawr, a member of the firm of Queen & Co., has made an assignment for the benefit of creditors to John W. Brown.

#### REPORT OF THE BROOKLYN HEIGHTS RAILROAD COMPANY.

The quarterly and annual reports of the Brooklyn Heights Railroad Company, Brooklyn, N. Y., were issued this week by President Lewis. The surplus, amounting to \$115,520.73, covers a period of one year and 25 days, the date on which the company took possession of the Brooklyn City Railroad system. Following are the reports:

Earnings, operating expenses, deductions from income and net income for the quarter ending June 30, 1894:

Gross earnings from operation.....	\$1,183,741.98
Operating expenses (excluding all taxes).....	725,883.07
Net earnings from operation.....	\$457,858.91
Income from other sources than operation..	56,063.34
Gross income from all sources.....	\$513,922.25
Deductions from income:	
Fixed charges (including all interest, taxes and rentals).....	496,686.24
Net income from all sources (surplus).....	\$17,235.97
Earnings, operating expenses, deductions from income and net income for the year ending June 30, 1894:	
Gross earnings from operations.....	\$4,303,117.45
Less operating expenses (excluding all taxes)	2,673,391.73
Net earnings from operation.....	\$1,629,725.72
Income from other sources:	
Interest, rents, etc.....	189,339.49
Gross income from all sources.....	\$1,819,065.21
Deductions from income as follows, viz.:	
Taxes on property used in operation of road.....	\$236,839.73
Taxes on earnings and capital stock.....	49,277.02
Taxes on other than above.....	22,510.41
Interest on funded and floating debt, due and accrued.....	20,944.13
Rentals.....	1,433,941.50
Net income from all sources.....	\$54,552.42
Surplus for year and 25 days ending June 30, 1894.....	115,520.73

President Lewis, in commenting on the report, said that during the period it covered the extension of the trolley on the various roads was under way, and that for a long time \$2,000,000 was tied up in the construction of power-houses and trolley lines. "Taking these conditions into consideration," said Mr. Lewis, "and also the hard times through which the country has passed, which have reduced the earnings as well as the extra competition of the Third avenue extension of the elevated road, the stockholders are of the opinion that the road has done remarkably well."

STREET CAR EXCURSIONS.—Why can't the Cincinnati Street Railroad Company, with its elaborate system of lines penetrating every quarter of the city, arrange some style of excursion rate tickets for the down-town denizens who may wish to invade the outskirts during these sultry evenings? A trip and back on any one of the suburban lines does not last long enough. It is an hour and all is over, and the business of sweltering goes steadily on. Why not arrange matters for those of an economical turn of mind that they can have all the pleasures of an evening spent in riding, sans all the care of a horse and buggy, and at about one twentieth the price?—*Cincinnati Times and Star*.



**MULTIPLE FUSE ARRESTERS.**

BY C. S. VAN NUIS.

The function of lightning arresters, on electric circuits, is well known and appreciated by a large majority of those operating electrical plants having overhead conductors, and but few such plants are now operated through thunder storms without some sort of protection against lightning discharges. Occasionally one finds a station that is always shut down at the approach of a thunder storm, and is not started again until the danger is past; but by this means of protecting electrical apparatus, large revenues are annually lost to companies who thus render their plans inoperative many times during the season of storms. The first cost of a full equipment of arresters is seldom the cause of such a state of affairs, for frequently a single stoppage means a loss to the company exceeding the entire cost of the arresters.

The usual cause for a station shutting down for protection is due to the failure of some particular type of arrester, which has been tried and found entirely unsuited to the local conditions, and with its failure has oftentimes vanished the confidence of the station manager in any or all arresters, thus leading him to adopt what he considers the only safe course: to shut down for protection.

Lightning arresters differ, as do the circuits they are intended to protect, or according to the ideas of their designers as to the best means of preventing or rupturing the arc which may follow a lightning discharge across the air-gap between the discharge points.

If all the circuits were purely metallic, and the

called automatic arrester is entirely destroyed by arcing.

In view of the difficulty attending the preservation of the discharge points of any arrester with a small air gap (and arresters must have small gaps to protect the finely wound coils of measuring instruments, as well as armatures and field coils), an idea presented itself, that a succession of very sensitive discharge points, one for each discharge, might be made more efficient and reliable for a given number of discharges than any one pair of points could be.

The Ajax arrester, illustrated herewith, is of the latter type, and consists chiefly of a porcelain arrester box, with a fibronite cover containing 11 fuse discharges. The fuse consists of two pieces of No. 26 brass wire, each about 3 inches long, having a single silk insulation and laid side by side for about



Fig. 1. The Fuse.

1 inch, as are consecutive coils in an armature. This 1-inch lap of the wires offers abundant surface for the discharge gap, which is formed by the two thickness of silk, and amounts to little more than .003 of an inch. Small pellets of a highly insulating wax secure these wires in the above position, and a small glass tube is hermetically sealed over this part of the fuse to keep the dischargers clean and dry until used. The extreme sensitivity of this part of the apparatus is made possible by its being called upon to act but once.

discharge. The fuse may or may not be destroyed, depending upon the severity of the discharge and the condition of the line. If the line has a high potential and ground return, such as are used on single trolley railway circuits, the static discharge will short-circuit the generator current at the discharge points and the fuse will be completely vaporized by the current following the discharge, which will permit the carbon ball to fall to the next fuse, bringing it into circuit automatically, ready to receive a second discharge.

If a low potential metallic circuit is thus protected, one fuse may take care of several discharges providing the circuit is perfectly free from grounds. If an accidental ground exists at the time of the discharge, the action will be the same as in the case of the railway circuit with the ground return. Or, if only a partial ground should exist at such time, the destruction of the fuse might not be complete; but the relative conductivity of the contact between the carbon ball and the small brass wire, as compared with the rest of the fuse, is so inferior in the former that the end of the wire supporting the ball is always the first to disappear, and is sure to allow the ball to drop and reset the arrester, even though the fuse should be only partially destroyed.

The standard types of arrester are adapted to all currents up to 1,000 volts, whether having metallic or ground return circuits, but for higher potentials fuses with a slightly wider gap should be used.

Having, reduced, as far as possible, the resistance and impedance in the arrester and its ground connection, another important step toward the protection of the electrical apparatus will be ac-



Fig. 2.

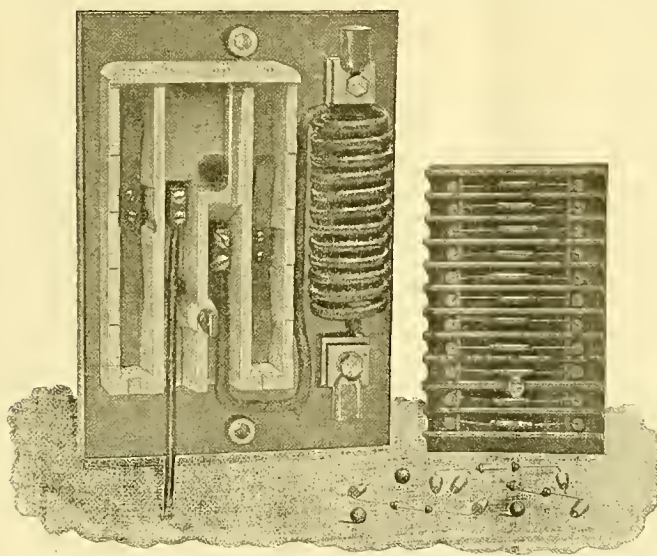


Fig. 3. Isolated Plant Type.

insulation to ground could be maintained well into the megohms, lightning protection would be a comparatively simple task, for there would then be no tendency toward arcing of the generator current at the discharge gap. Experience teaches us, however, that electric circuits "don't stay put," and that high insulation is rather the exception than the rule on many of them, all of which is very detrimental to the discharge gaps of the arresters.

Wider discharge gaps have been used to avert this trouble; mechanical and magnetic contrivances have been resorted to with varying success; but whenever the discharge gap of any arrester that is connected to one side of an electric circuit having a "ground" on the other pole, is operated upon by a static discharge, the discharge points are always more or less injured by the consequent arcing of the generator current. It must, therefore, follow that one pair of discharge points will not remain intact when used on circuits of this class, as at each successive discharge the points are appreciably affected, and rendered less sensitive to the passage of the next discharge. This is particularly true of arresters on single trolley railway circuits, where one side of the circuit is always grounded; and not infrequently a so-

The soft rubber plugs serve to hold the fuse in the corrugated cover of the arrester, and the bare ends of the wire project through the cover, ready to be brought into contact with the line and ground terminals. Into the back of the cover are pressed two strips of metal: one a plain flat strip, to which is connected, by a long clamp, one end of each fuse; the other strip is U-shaped, and into it the remaining ends of the fuses project, but do not make contact with it, except as the carbon ball completes the connection.

In Fig. 2 the carbon ball is shown making contact between the top fuse and the U-shaped strip, which, when the cover is inserted in the porcelain back of the arrester, will receive metallic connection with the line terminal through the flat spring provided for that purpose in the channel at the right in the porcelain. A similar spring is in the left channel to connect the flat strip in the cover to the ground terminal.

The line and ground terminals and flat contact springs in the porcelain backs are well illustrated in Fig. 3. With the arrester thus assembled, it will be seen that only the top fuse has connection with the line terminal, and consequently is the only one that can be operated upon by a lightning

complished by inserting a choke coil in the main circuit, so as to divert the lightning from it into the lightning arrester, and thence to the ground. For this purpose the Ajax arrester is furnished with coils of various capacities to suit the carrying capacity of almost any circuit upon which it may be placed.

For station use, the coil is necessarily of large dimensions, and is usually placed at the back of the switchboard. The arrester may be placed on the front of the board, and the connecting wires led through to it, or it may be put in any other place convenient for inspection. The dimensions of the arrester alone are 7 inches by 4 1/2 inches by 2 1/2 inches.

The type of arrester used for protecting stationary motors or isolated plants is shown in Fig. 3. The regular size is made with a 100-ampere coil, having coil and arrester mounted on a marble slab 7 1/4 inches by 11 inches by 7/8 inch.

For electric cars or pole line use the arrester is placed in an asbestos-lined iron box to protect it from the weather or external injury, Fig. 4.

The number of arresters required to protect any plant against lightning must be determined by local conditions, such as the frequency and severity

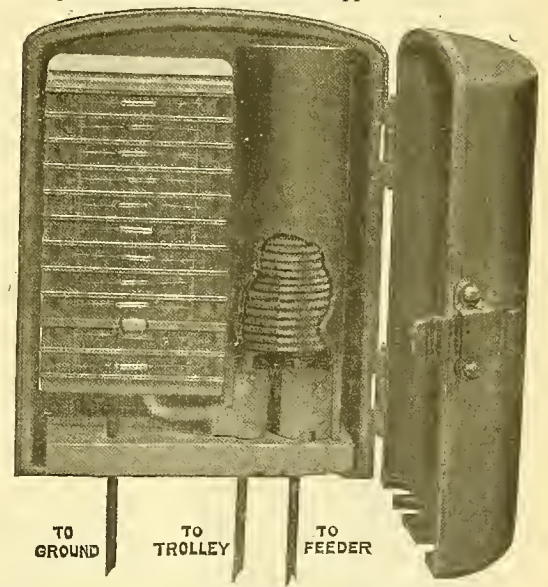


Fig. 4. Pole Arrester with Coil.

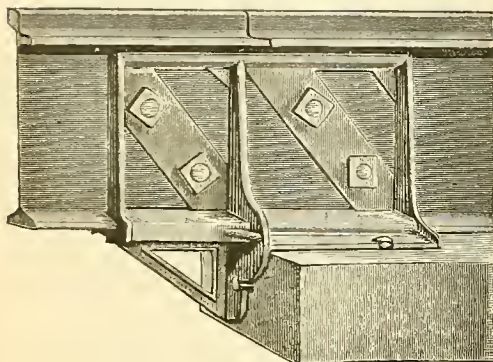


of thunder storms, the amount of natural protection afforded the line by adjacent objects, and the nature of the line itself.

**JOINTS FOR GIRDER AND T-RAILS AND A BOND ADAPTED TO EACH.**

BY JAMES M. PRICE.

In a careful study for two years past of the defects of the splice-bar system of rail joints, whether for railroads or street railways, for the purpose of replacing these by far more perfect and more scientific construction, I have produced

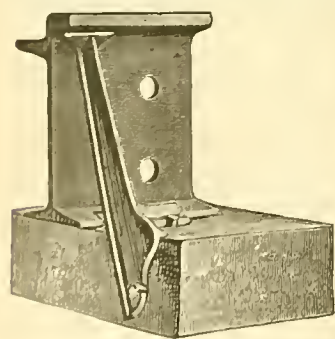


K Joint Fitted to Nine-inch Girder Rails.

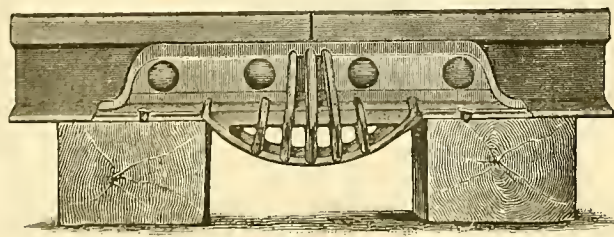
a series of rail joints, for each system of railways, upon lines believed to be novel, and now sufficiently ascertained to accomplish the object intended. A succession of tests, both by testing machinery under a central pressure to the joint of 100,000 pounds, and adequate trial in track, under locomotives, some of which weighed 100 tons, enable me to assert that a way has been found to make a joint of malleable iron, weighing from 22 to 32 pounds for the pair of plates, which will do better work in track than 60-pound splice bars.

Had rail manufacturers solved this problem, possibly we should never have had welding of rails by the mile proposed. The splices on our leading trunk roads are still breaking, and increase of weight in these splices, with increased length also, does not arrest the evil.

Meanwhile, an exaggerated splice-bar of double the height of those in use on our trunk lines under heavy locomotives, of an approximate pattern, and without alignment provided to retain the ends of the rails in even line, is being laid by the mile.



Brace Chair.



Little Giant Joint.

There is not a splice-bar joint in existence which would be safe, with T-rails, for the passage of a locomotive, without its bolts.

The Price joints, however, for either use (trunk line or girder rail) are so made as to embrace the plant in a positive jaw, behind which the foot of the joint-plate projects outwardly or in front of the joint as seen in track, upon the cross-tie, thus nearly doubling the bearings of the rails, as used with splice-bars, and avoiding the need of any tie-plates, while the head or top of the joint-plate presses steadily upon the slanting base of the head of the rail, at the top of the web. At this point every joint-plate has a horizontal ledge, projecting inwardly, to strike the web when driven up, and maintain alignment.

Now the effect of this combination of parts, whether in a "supported" or "suspended" joint, is to tighten the jaw upon the flanges of the rails and press the top of the plate inwardly under the head of the rails and against their web, in exact proportion to the weight of the trains. This has been proved in track by the passage of a heavy train over a pair of plates, set to position by the hands, but not yet driven up (as they should be by a sledge, when they will hold what they get), and neither spiked nor bolted. Under these conditions splice-bars would have been thrown out by the vibration of the rail-flanges. This joint was, however, so tightened by that passage that it could not be removed by the hands only; it was jarred and pried off, simply to measure, roughly, the tightness of its adherence.

It will be seen that increased smoothness of track is to be anticipated from these joints in every sort of railway service. For it is difficult to see how a continuous rail is to be had from the laying of 30 foot lengths, in any other way so perfectly and without "knocking" at the joints, as by embedding the meeting rail flanges in a vise on each side, holding the heads to one level while at the same time giving them support by the top of the joint plate. Within that vise and without harm to it the requisite movement of the rails by contraction and expansion takes place.

The "K" joint is a supported, the "Little Giant" joint is a suspended, joint. They are alike, however, in their component parts, except that the latter adds a supporting truss or bridge of open work and extraordinary strength, to the foot upon each tie, the nicely fitting head or top with its alignment ledge and the embracing jaw, which are usual in the Price joints.

The Little Giant joint also has at its center three stout ribs which descend from the top of the joint plate and encircle the jaw, to preclude its opening under any strain, and are attached at the bottom to the base of the truss.

In the "K" joint, it will be seen that remarkable strength and elasticity are assured by its combination of diagonal braces and upright piers, with a strong rib near the middle of the joint, which passes down alongside of the tie, there to be spiked, after driving up with a sledge to tighten the jaw upon the flanges of the meeting rails, while the foot is spiked at the same time to the top of the tie. In this manner each spike protects its fellow, being driven in a plane at right angles to it. In lieu of tie-rods, so sure heretofore to go with the rails in any lateral movement which heavy hauling may produce in them with its enormous strain upon the rails in turning out from the "wagon tread," I employ powerful brace chairs, seated upon the ties

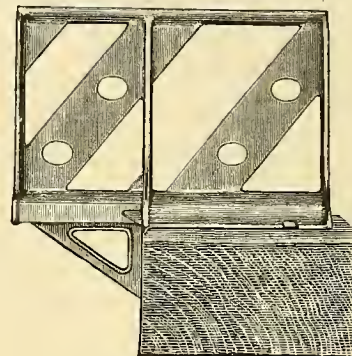
and spiked like the joints at once to the side of the tie, near the foot of the brace, and to the top of the tie, when driven up, like the joints themselves, with a sledge.

The foot of the brace chair, sitting upon the tie, rises in a lip to overlie the flange, while the head of the brace is driven forcibly under the head of the rail.

I think it will be plain to any reader that a strength and steadiness are assured to this construction impossible to any system which relies on tie rods, tie plates and these high splice bars. For splice bars in no degree add to the bearing or tread of the rails themselves upon the ties. They sit within the rails, upon their flanges and under their heads. Their upper surface and their under

surface are each slanting, in opposite directions. Nothing holds them to duty but the bolts; their shape is a detriment, not a help, to the construction. For so soon as wear commences, the inevitable wear, each surface inclines to slide, at the top the most, for there is the perpetually recurrent thrust shove outwardly of the loaded wagons and trucks in turning out. Hence the rails, not even protected by an attempt at alignment by the joint, get out of line. The one valine splice bars have, for street service, is vertical strength, which can be abundantly had, with much less use of metal. They sit upon the flange, but do not embrace it or secure it in its place.

The feet of the "K" joint, with the rails em-



Exterior of K Joint Plate.

braced, cover a span of 10 inches (for a nine-inch girder rail) upon the tie, thus doubling its bearing. Relatively to its height, under the head of the rail, you have the effect of a pyramid in its section. But the side spikes of joints and brace chairs commit the ties themselves to the steadiness of the construction as never before. When wear commences for the Price joints, their tendency to hug the rails just under their heads keeps them still to duty, the pressure starting with the outlying feet. For the weight of the rails and the pressure of the rolling stock come the most heavily upon the inside edge of the jaws, which are continuous with the feet of the joint; that is, the tendency of the passage of a motor or a train of cars is to relieve the strain upon the bolts, in any of the Price joints. The weight of the "K" joint for nine-inch girder rails is 26 pounds. This make of joints can, of course, be adapted to any section of girder rail, with corresponding modification of the brace chairs. These, as made for the nine-inch rails, weigh about 2 1/2 pounds each. The whole construction is cheaper, as well as far better, than the array of tie rods, tie plates and heavy splice bars, with twice the chance of working badly of the present splices of trunk lines of railroads carrying locomotives.

It does away, moreover, with any need of welding rails by the mile, at great expense, the obvious outcome of inability to make satisfactory joints after years of effort.

**REPORTED SALE OF DETROIT ROADS.**

The Sun, of New York, prints the following dispatch from Orange, N. J., under date of Sept. 3:

Contractor Thomas Nevins, of Orange, has disposed of his recent purchase, the Detroit Citizens' Street Railroad, consisting of 80 miles of road operated by electricity and horses. The new owners are R. T. Wilson & Co., of New York. Mr. Nevins bought the road for \$8,000,000. The price for which it was sold has not been made public. The deal was completed late on Saturday afternoon in Detroit. Last night Mr. Nevins and his counsel, Chandler W. Riker, of Newark, returned home.

"I am in no way interested in the road now," said Mr. Nevins. "The deal has been perfected and I have washed my hands of the Detroit enterprise."

Col. J. M. Howards is the president of the road and R. T. Wilson is the treasurer.

Lancaster, Pa.—A charter has been granted to the Lancaster & Susquehanna Railway Company to run an electric line from Lancaster to Marietta; capital \$100,000.

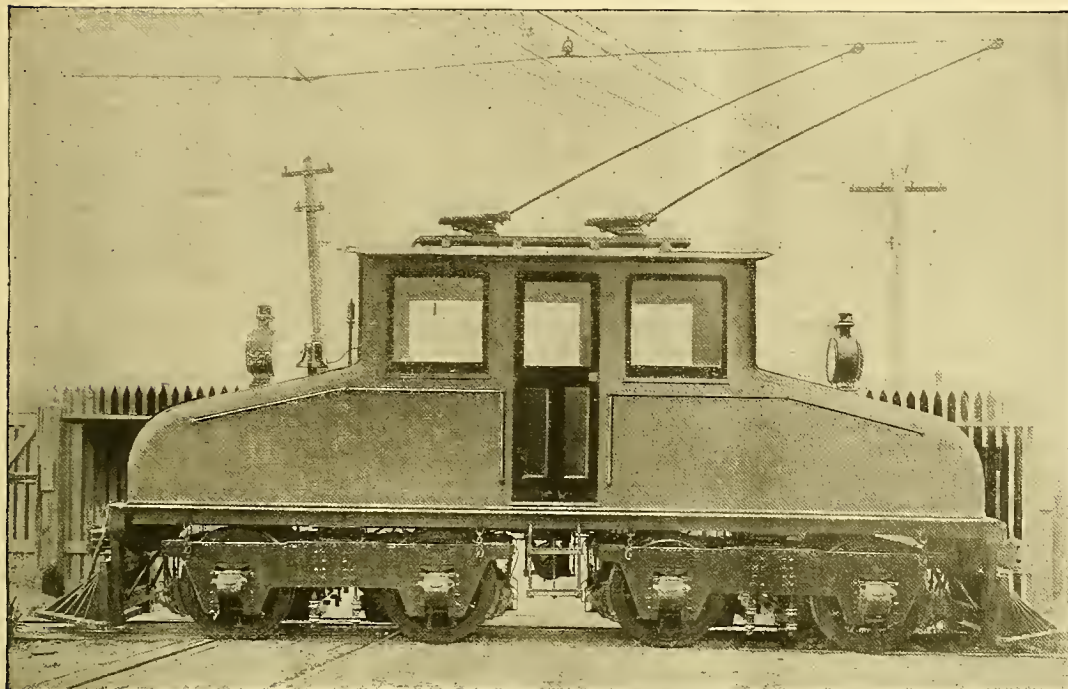


**FORTY-TON ELECTRIC LOCOMOTIVE.**

The thirty ton electric locomotive built by the General Electric Company was exhibited at the World's Fair as a step in advance toward the substitution of electricity for steam on railroads. From 30 tons and one two motor truck to 40 tons and

addition there are bells and headlights and sand boxes. The data of the locomotive are as follows: Weight, 40 tons; draw bar pull, 14,000 pounds; height over all, 11 feet 2 inches; length over draw bars, 24 feet; width over all, 8 feet 4 inches; wheel base of single truck, 6 feet; diameter of drivers with 3-inch steel tires, 40 inches; number of driv-

Two were arrested. One was Baroness, whom the motorman identified as his assailant. Baroness was fined \$3 and costs, but declared that he had not struck the motorman and would stay in jail. He changed his mind when some one else paid it.



FORTY-TON ELECTRIC LOCOMOTIVE.

two motor trucks was merely a matter of development, and the General Electric Company has recently built an electric locomotive of this size. This forty-ton machine is now standing in the factory yard at Lynn, and as will be seen by the illustrations is an imposing electrical engine. It is designed to perform the ordinary work of a steam locomotive of similar capacity where speeds of over 30 miles an hour are not considered necessary. It is constructed with two similar but independent trucks, each having four wheels. Each pair of wheels is driven by its specially designed motor of the single reduction spur-gear type, mounted upon the axle as in ordinary street car practice.

The truck frame is constructed of plate iron and channels designed to contribute at the same time strength and simplicity. The entire weight of the frame, including the cab, is carried on elliptical springs resting directly on the top of the journal boxes. This suspension secures easy riding, and minimizes the wear both of the locomotive and the truck.

The journal boxes are of cast iron with phosphor bronze bearings hydraulically pressed in. Lubrication is provided for by means of a large well for oil and waste. The box slides in jaws protected by adjustable shoes to take up the wear. The journal bearings being outside, all parts are easily accessible for purposes of inspection and repair, and, to insure against any bending caused by hard usage, the axle and journals are made large.

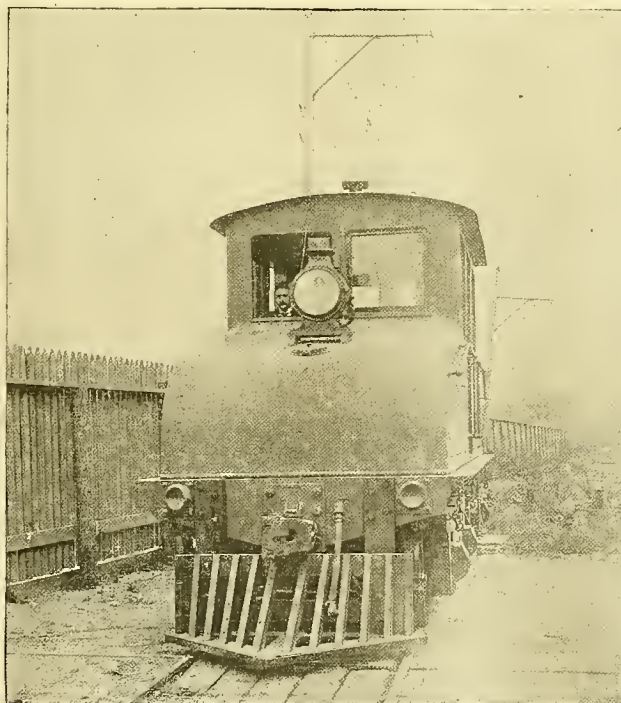
The cab rests on the truck in a manner somewhat similar to that in which the ordinary passenger car is mounted, an ample margin for wear and strength being provided. The cab itself is constructed of sheet iron, and the windows in it are so arranged as to give an almost unobstructed view from one position in all directions. The design of the cab is such as to give plenty of available floor space without making the top of the cab long enough to obstruct the sight. The design of the cab also makes a symmetrically shaped locomotive.

The electrical equipment comprises, besides the motors a series parallel controller, an air compressor, which provides the air for the brakes and whistle, and the automatic safety devices. In

ers, 8; size of journals,  $4\frac{1}{2} \times 8$  inches; gauge,  $8\frac{1}{2}$  inches.

**BARONDESS IN EVIDENCE IN BALTIMORE.**

Joseph Baroness, the New York labor agitator, now residing in Baltimore, was behind the bars at the Central Police Station in that city on September 3d until some friends came forward and paid the fine imposed on him by Justice Murray for striking Motorman Lynch of the yellow electric



FORTY-TON ELECTRIC LOCOMOTIVE.

car. Baroness was marching at the head of the Cloakmakers' Union in the labor parade. The union came abreast of Lynch's car, and several of the marchers ordered him to put down brakes. He refused, and then one of the marchers put a stone on the track. This man was arrested, and then some of the cloakmakers assaulted the motorman,

**COMMENTS AND VIEWS OF CONTEMPORARIES.**

**AN EXAMPLE OF NEWSPAPER NONSENSE.**—While it is true that the street car fare in Chicago is five cents, as is now charged here, it should be remembered that the average length of ride in that city is more than three times as great as in Milwaukee. Besides this, the cost of a cable road is ten times as great as that of a trolley line.—*Milwaukee News.*

**PHILADELPHIA TROLLEY LINES.**—The electric street cars bring many elements of comfort, convenience and pleasure into city life, especially so in a municipality of such extensive area as Philadelphia. The time they save by speedier transit to persons whose homes are at a distance from their places of business, if expressed in money, would make an imposing sum. They have transformed a tedious, uncomfortable trip into the suburbs into a breezy, exhilarating ride. The removal of thousands of horses from the streets by the substitution of the trolley cars for the ancient horse-car and the abolition of the large car-horse stables, which checked building operations in their immediate neighborhoods and were at all times objectionable and offensive, are great public benefits. The old dust-laden and disease-breeding affairs, poorly lighted and hot and stifling in summer, have been supplanted by capacious, open cars, brilliantly lighted, clean, inviting and wholesome. A well-lighted car, so that it is possible to read with comfort, is of itself a boon which the public has gratefully accepted.—*Philadelphia Public Ledger.*

**TROLLEY CAR RISKS.**—But the trolley cars have brought some risks which the public must be educated to avoid. They are higher than the old-fashioned street cars, and, particularly in the case of the open summer cars, greater caution should be used in boarding or alighting from them. The side entrances to the summer cars are dangerous on double-track lines. It is a good rule, on steam roads as street railways, invariably to leave the car on the side opposite to the other track. The failure to observe this simple rule has cost many lives. On some of the open trolley cars on double-track lines straps are arranged to prevent persons from entering or leaving them on the dangerous side, but they are not always fastened in place, and many cars are not provided with them. Nor do the cars contain notices to the public to alight on

the safer side. Riders should be prohibited from standing on the steps of the open cars. Such a position is at all times dangerous. It obstructs the conductor's view, makes his duties more onerous and unduly taxes his vigilance. Better regulations in these respects and a uniform rule as to stopping at street crossings, which should be on the far, not the near side, will doubtless be adopted, and the public, which is an apt pupil in self-tuition, will



gradually learn to take care of itself in the rough school of experience.—*Philadelphia Public Ledger*.

**EXTENSION OF TROLLEY LINES.**—The trolley lines are reaching out in every direction. They are making the distant suburbs seem near. Such lines follow the contour of the country, requiring little or no grading for their roadbeds. The old country roads, many of which are never in proper repair, are favorite routes. The trolley roads have not yet secured the right of "eminent domain." They cannot take land for their purposes without the owner's consent, so the old country roads must furnish them with routes for the present. Nor can the electric roads carry freight, which discourages their introduction in farming communities, where few passengers would be carried and where the roads would have to depend upon the transportation of farm produce or other freight. All surface street railways in cities must be obstructed by street traffic. In the present state of the science of locomotion the ideal city railway would be an elevated electric road. Its motors would emit no smoke to annoy passengers or residents along its route. With stations at proper intervals a high rate of speed could be reached and collision with ordinary street obstructions escaped.—*Philadelphia Public Ledger*.

**DUTY OF PASSENGERS.**—The electric railway companies are justly expected to obey all the requirements of the law relating to the security of passengers and those compelled to use the streets, and to adopt every additional safeguard that human ingenuity can devise. But this does not absolve those who ride upon the trolley cars from the duty of employing ordinary common sense when getting on and off the cars. The electric cars move more rapidly than the old horse cars did, and those who persist in getting on or off at any place they wish while the cars are moving, do so at great risk to themselves, and those who are injured in this way will have only themselves to blame. Conductors talk themselves hoarse in warning passengers to wait until the cars have stopped, but there is a class of passengers they warn to little purpose. The fools are not all dead, but some of them will lose limbs, if not lives, if they persist in disregarding the oft-repeated warning against getting on or off trolley cars in motion.—*Philadelphia Times*.

**TROLLEY PARTIES.**—These are the nights when the young folk are enjoying themselves on the trolley cars. Trolley car parties to the number of four passed down Tenth street last evening, the girls in white or light summer dresses and without bonnets, the young men sounding horns like so many dry land Tritons, and the entire force of the company joining at short intervals in a chorus of discordant howls.—*Philadelphia Inquirer*.

**THE DEADLY PIE.**—Rural Connecticut and Rhode Island are showing a queer enthusiasm over the coming of the trolley. Is it possible that in communities where there is no great store of amusement the thought of being able to get killed every day comes as an excitement and a thrill? And yet pie has slain its tens of thousands where the trolley has slain hundreds.—*New York Sun*.

**LOWERED THE PRICE OF HORSES.**—The introduction of trolley cars has already produced an effect on the price of horses, so that such as are required by the United States army are bought at greatly reduced prices. A government purchasing agent in the West says that in 15 years he has not known dealers so anxious to sell at a small profit.—*Sturford (Conn.) Press*.

**NEED OF ELECTRIC ROADS IN MARYLAND.**—Maryland is particularly suited to the indefinite multiplication of electric street railways reaching out from Baltimore and extending along the "pikes" between the county seats and other towns. It is poorly provided with local steam railways. A few minutes' study of a good railway map will show that the New England States, New York, Pennsylvania and Ohio, not to mention Illinois, Georgia and Tennessee, are cut up in every direction with steam railways, while Maryland is traversed principally by two trunk lines and two smaller systems which do not begin to provide transportation facilities for the whole Commonwealth. Trolley roads can be cheaply built along the county turnpikes, and will furnish the needed transport for agricultural products which the State lacks, and on account of which its industries have languished.—*Baltimore Herald*.

**SPREAD OF ELECTRIC RAILWAYS.**—It is almost startling, when we remember that in 1887 the first really commercially successful electric railway was started in Scranton, Pa., to read that articles of incorporation for a network of electric railways that will connect Jersey City and Philadelphia have been filed. There is no reason why such roads should not be built, for the whole distance is dotted with thriving towns, like beads on a string, and the constant desire of man to be somewhere else than where he now is leads him to patronize the trolley and go to the next town. A similar system of interurban roads already exists in the

coal regions of Scranton and Wilkesbarre, and it is doing a thriving business. How long it will be before these roads can compete with the steam lines for through passenger and all freight business the future alone can tell.—*American Engineer*.

## FINANCIAL DEPARTMENT.

### Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

That the situation, in a financial sense, is a vastly improved one is patent now to every observer of current conditions. That the market for street railway issues is responding to the bettered feeling is also a matter of self-evidence. Hints as to the confidence that street railway magnates feel convinced that the investing public has in these securities is furnished by the presence in the market of new offerings. Last week notice was made of the intended sale by the Long Island Traction Company of a large block of collateral trust bonds. Now the Bridgeport Traction Company offers, through New York bankers, at 100 and interest, in lots to suit purchasers, its first mortgage five per cent. gold bonds, which are an absolutely first mortgage upon the entire street railway system of the city of Bridgeport, Conn., covering 36 miles of track, together with equipment, real estate, etc. These offerings are made now after months of waiting, because bankers and the finance officials of corporations see signs of a renewed demand for investments, and, as has been before dwelt upon in these columns, street railway bonds have proven particularly acceptable to moneyed people in search of good investments. Brokers in these specialties are agreed that the fall holds out unusual hopes of good business, and that on a rising scale of values.

The local street railway stock market has been confined chiefly to trading in Third Avenue stock. On Sept. 13 the Railroad Committee of the New York Board of Aldermen will begin hearings on the applications of this company and of the Metropolitan Traction Company for a franchise for a cable or underground trolley along St. Nicholas avenue, the Boulevard and Kingsbridge road to the city limits. It will be remembered that the Third Avenue filed its application first, and there was a hearing before the Railroad Committee, but it was adjourned without action, and the committee has made no report. Naturally trading in Third Avenue has been affected by the varying chances of success in the fight. Both sides still profess to be sure of victory, and the outcome is awaited with a deal of interest by the brokers as well as by the citizens living in the upper part of the city.

The air just now is full of street railroad extension schemes. To-morrow the Aldermen's Railroad Committee will have a hearing on the application of the Forty-second street, Manhattanville & St. Nicholas Avenue Railroad Company for a franchise to extend their lines in Amsterdam avenue, through Eighty-sixth street to connect with the surface railway across Central Park, also on the application of the Metropolitan Traction Company to extend the Columbus avenue cable road through West One Hundred and Ninth street and Manhattan avenue to One Hundred and Sixteenth street and St. Nicholas avenue. Both these applications are likely to be granted.

Union Railway Company stock, "Huckleberry" road, has been strong on the report just made public, showing that for the year ending June 30, 1894, it earned a surplus of \$95,364 over all expenses and charges, making the total surplus \$130,350. This is thought a splendid showing for a road not long in operation.

### Financial Notes.

**Pennsylvania Traction.**—A report is current to the effect that a written proposition has been received from a syndicate of Boston bankers, agreeing to build the proposed electric railway line of the Pennsylvania Traction Company between this city and Harrisburg, a distance of 103 miles, and that the construction will be of such character as to enable a speed of 90 miles an hour to be made. The proposition also includes, it is said, the construction of the line, power-houses and entire

equipment. The estimated cost is placed at \$8,000,000, and the syndicate requires that the traction company shall give bonds to secure the cost of the work, which shall not be accepted until it gives entire satisfaction. Just how much truth there is in the story cannot now be told, says the *Philadelphia Stockholder*, but it comes from an apparently reliable source, and has not been denied.

**Receiver for a Seattle Road.**—W. J. Grambs has been appointed receiver of the Grant Street Electric Railway, Seattle, Wash. The bonds of the Grant Street Electric Railway Company, amounting to \$125,000, were put up some time since as collateral for a loan of \$113,000 with a syndicate of New York and Boston capitalists. The syndicate is composed of the plaintiffs in the case. The company has failed to pay the interest for the past year. The syndicate, under the terms of the agreement, foreclosed on the bonds and bought them in on Wednesday last. As soon as this was done they asked the United States Circuit Court to appoint a temporary receiver. Judge Hanford accordingly appointed W. J. Grambs, and he qualified by filing a bond for \$10,000.

**General Electric Financial Policy.**—A prominent financial authority is quoted as saying: "We do not believe the current rumors that General Electric is retiring some of its debenture 5 per cent. bonds. We would not be surprised if the management intends to retire a portion of the \$4,251,900 preferred stock outstanding. This hypothesis is strengthened by the fact that the quotation is only 72, which includes 10½ per cent. accumulated dividends. This would make the value of the stock about 62, a very low figure for a first lien on all the assets of the company, after the debenture bonds, and the more so in view of the comparatively high price at which the common stock is selling."

**General Electric Company.**—The Boston News Bureau says: The electrical business is steadily increasing in both new construction and replacement work. The number of hands employed by the General Electric Company at Schenectady and Lynn are slowly but steadily increasing. Lynn has now 1,500 hands on the payroll for full days labor, and Schenectady has 3,100 hands on the basis of full days labor. The General Electric Company has more than \$2,500,000 of unfilled orders on hand. Reduction in the factory cost of many articles has been very large in the endeavor to meet the demands of the times and the lower prices which now obtain in the electric field.

**Philadelphia Rumor Denied.**—The report that the Philadelphia Traction Company has been quietly buying the stock of the People's Traction Company, for the purpose of securing control of the property, is wholly without foundation, and has properly been denied by prominent interests of both companies. There was never any ground for the circulation of the rumor in the first place. True, people closely identified with Philadelphia Traction have at times bought People's stock, as they have also electric stock, but the purchases thus made were purely for speculative reasons; the stock, or portions of it, were subsequently sold when the buyers were satisfied with their profits.—*Philadelphia Stockholder*.

**Ann Arbor Electric Railway.**—The shareholders of the Ann Arbor Street Railway have elected the following Board of Directors: F. H. C. Reynolds, Bangor; M. H. Kelly, Iaco; A. F. Bradbury, Dexter; F. W. Weeks, Bath; J. D. Carroll, Bangor, Me.; H. P. Glover, Ypsilanti, and Charles E. Hiscock, Ann Arbor. They authorized the issue of \$100,000 worth of bonds, of which \$60,000 will be used to take up the old bonds and \$40,000 for new equipment. J. D. Carroll has been elected superintendent.

**West End, Boston, Dividend.**—The West End Street Railway Company has declared a 1½ per cent quarterly common stock dividend, payable Oct. 1. Books close Sept. 15 and reopen Oct. 1. It is not the intention hereafter to pay dividends quarterly, but to change the time of the semi-annual payment of dividends on the common stock to October and April instead of January and July, as heretofore.

**Central Traction, of Pittsburgh.**—The Central Traction Company, of Pittsburgh, has called a meeting of stockholders for Sept. 20, to vote on a proposed increase in the company's indebtedness. The company's present bonded indebtedness is only \$875,000. If an increase is decided upon it is reported that a part of it will be devoted to freeing the company from floating debt.

**Highland Electric Road Receivership.**—Judge Herter, of the Circuit Court, has appointed Louis Hammersmith receiver of the Highland Electric Railway Company, of New Albany, Ind. The road is in debt \$50,000 first mortgage bonds, and \$5,000 second mortgage bonds, with \$8,000 floating debt.

**Street Railway and Illuminating Properties.**—Trustees of Street Railway and Illuminating Prop-



erties, Boston, purchased and canceled Aug. 30 652 shares of preferred stock, paying an average price of \$99.683. This makes a total of 15,934 shares purchased to date.

**Receiver Asked for.**—James F. McLaughlin in Philadelphia last Thursday petitioned the court for the appointment of a receiver for Standard Electric Company of that city.

**Scranton, Pa., Traction Earnings.**—The gross earnings of the Scranton Traction Company during July were \$25,036, an increase of \$1,977. The net increase was \$285.

## NEW INCORPORATIONS.

**Hempstead, N. Y.**—The Hempstead Traction Company has been incorporated to construct a street surface road about four miles long in Hempstead, Queens County, the termini to be Rockaway Road and Fulton street, Franklin avenue and Second street and Cathedral avenue and Fifth street. Capital, \$50,000. Directors: Charles L. Barker, Abraham Barker, Miles C. Palmer, E. R. Tilton, T. H. Kilduff and William Kennelly, of New York city; John S. Lawrence and D. L. Lewis, of Hempstead, and John F. Davis, of Brooklyn.

**Chicago, Ill.**—The Southwestern Suburban Rapid Transit Company, capital stock \$1,000,000, has been incorporated to build and operate a road from the western limits of the city, between Twenty-second and Thirty-first streets, to the village of Hinsdale. According to the incorporation papers the operating power may be furnished by horses, dummy or electricity. Arschar H. Minassian, Newton Wilcoxson and Frank M. Shermau are the incorporators.

**Syracuse, N. Y.**—The Syracuse & East Side Railway Company has been incorporated, to operate a street surface road about ten miles long, the termini to be in the town of De Witt and in the city of Syracuse. Capital, \$200,000. Directors: George B. Leonard, Frederick R. Hazard, H. S. Holden, William Nottingham, David A. Batterson, Willis A. Holden and Jay B. Kline, of Syracuse; John L. Kyne, of East Syracuse, and Clifford D. Beebe, of Dausville.

**Tampa, Fla.**—The Tampa & Palmetto Beach Railway Company has been incorporated with a capital stock of \$30,000. The company is to operate a street railway in Tampa, and from Tampa to Palmetto Beach, and to own and operate electric plants. The promoters: R. W. Easley, W. H. Kendrick, Louis T. Kendrick, Tampa, Fla.

**Cleveland, O.**—The Electric Construction Company has been incorporated. The capital stock is \$10,000. The company will deal in apparatus for electric lighting and railway plants. The promoters are Edmond H. Fishack, Thomas J. Carmack, Harry F. Fishack, Mont. J. Carmack, Robert McNaull.

**Charleroi, Pa.**—The Charleroi, California & Brownville Electric Street Railway Company has been organized; capital stock, \$70,000. The promoters are: A. C. McKean, Charleroi, Pa.; Jno. W. Crawford, Duquesne, Pa.; Wm. I. Berryman, Washington, Pa.

**Philadelphia, Pa.**—The Sanatoga, Royersford & Collegeville Electric Railway Company has been incorporated with a capital stock of \$150,000. The promoters are Paul W. Smith, Clark Dillenbeck, Philadelphia; Jno. C. Lynch, Royersford, Pa.

**Scranton, Pa.**—Milton & Lewisburg Street Railway Company has been incorporated—capital stock, \$36,000. The promoters are Horatio N. Patrick, Henry H. Snively, Scranton, Pa.; Geo. E. Stevenson, Waverly, Pa.

**Riverside, Pa.**—The Riverside Electric Railway Company has been incorporated. The capital stock is \$50,000. The promoters are Jno. Q. Denney, Wm. B. Hammond, Harrisburg, Pa.; E. C. Felton, Steelton, Pa.

**Hartford City, Ind.**—The Hartford Electric Street Railway Company has been incorporated, with a capital stock of \$100,000. The promoters are Guy E. Reynolds, Albert Reynolds, M. Allen Walker.

## NEWS OF THE WEEK.

**Norristown, Pa.**—The Chestnut Hill & Norristown Passenger Railway Company, against which proceedings were begun last Saturday to restrain it from occupying any of the public roads of Plymouth township, has filed a petition for an injunction against the township to restrain it from interfering with the construction of the company's road, and against the Conshohocken Passenger Railway Company to restrain it from occupying the road over which the plaintiff was granted a right of way. The Chestnut Hill company denies that the time limit in which it was to begin operations has expired. Since the first attempt to introduce the trolley in Montgomery County 15 suits in equity relative to electric railways have been instituted.

**New York, N. Y.**—At the regular meeting of the Board of Aldermen, last Tuesday, application was made on behalf of the Forty-second Street, Manhattanville & St. Nicholas Railroad Company, by President John D. Foster, for a franchise for a double-track car line over West Eighty-sixth street from Eighth to Tenth avenues. The permit would give the company a continuous line from east to west of the city, and enable it to carry passengers across town without the necessity of a transfer to other lines. A hearing on the application will be given by the Railroad Committee on Thursday, Oct. 4, at 11 o'clock.

**Niagara Falls, N. Y.**—The Hon. W. Caryl Ely, president of the company that was organized to build the road to Buffalo, announces that the proposed route across the country has been abandoned and it will be built along the highway, giving a view of the river to Tonawanda. The plan is to establish a lower rate of fare than is now given on the steam roads, perhaps 50 cents for the round trip. A traffic arrangement would be made with the Buffalo Street Railroad Company and the local street railroad company so that the passengers could go to any point in either city without extra expense.

**Baltimore, Md.**—At a meeting of the stockholders of the Pikesville, Reisterstown & Emory Grove Railroad at Owing's Mills last week, the issue of the bonds for the construction of the road was authorized, and the contract recently made for the building and equipment of the line from Pikesville to Emory Grove was ratified. Work on the power-house at Owing's Mills, has been commenced, and preparations are making for delivery of material for the construction of the road. Col. John Jameson is the contractor, and expects to finish building the road by January 1 next.

**Pottstown, Pa.**—The Pottstown Passenger Railway Company was last Thursday granted the right of way for the extension of its electric railway line through certain streets. The road will be built next spring from Sanatoga by way of Linfield to Royersford. The Norristown Passenger Railway Company also obtained the concessions they desired, and will extend to Royersford. The latter line runs to Conshohocken, and thus there will be next year a through trolley line from Pottstown to Conshohocken.

**Bristol, Conn.**—Judge Fenn handed down a finding last week on the application of the Bristol & Plainville Tramway Company for leave to construct the proposed tramway line between the towns of Bristol and Plainville, granting the request of the company. Application was made at once by the company to the Railroad Commissioners for permission to cross at grade at Forestville the tracks of the New York & New England Railroad Company.

**Philadelphia, Pa.**—The \$50,000 bond of the Market Street, Richmond & Frankford Elevated Electric Railway Company has been rejected by Mayor Stuart, who declined to approve the sureties, President John Dougherty, of the company, and W. S. McManus. The mayor's declination was based on the ground that they are non-residents. It was also stated that there was not sufficient collateral furnished to make the bond valid.

**Plainfield, N. J.**—The Street Committee of the Plainfield Common Council and the Street Railway Company have at last agreed on terms, and in the very near future the line will be extended to both Dunellen and Netherwood. Later it will be run to Hillside Cemetery and the Crescent cycling track. The Central Jersey Traction Company has acquired control of a site for pleasure grounds along South Plainfield lake.

**Philadelphia, Pa.**—In the Common Council, Thursday, Mr. Steble introduced an ordinance providing for safety guards on street passenger railway cars propelled by electricity, in which the Director of Public Safety is required to stop any cars not supplied with fenders, a fine of not less than \$10 nor more than \$50 being fixed for each car failing to comply with the requirements of the ordinance within nine days.

**New York, N. Y.**—The scheme of the New York & Brooklyn Railway Company for permission to tunnel the East River from Spruce street, in this city, to Myrtle avenue, Brooklyn, was revived this week, and referred to the Committee on Tunnels. Benjamin E. Henning is president of the tunneling company. It was organized a few years ago, and first made the application for tunneling the East River early in 1893.

**Kansas City, Mo.**—C. F. Tuttle, formerly superintendent of the Eighteenth street and Main street line of the Metropolitan Street Railway, has been appointed superintendent of the Armourdale electric line to succeed Charles Grover, who has been promoted to be superintendent of the company's electrical department.

**Youngstown, O.**—The street-car strike was declared off by the union on Sept. 1, a proposition presented by a committee of the men to the com-

pany having been accepted by the company. After being idle for eight weeks most of the employes will resume work.

**Pittsburgh.**—Chief Brown, of the Department of Public Safety, has directed Police Inspector McKelvey to institute suits against all of the traction companies having lines in this city who had failed to comply with the ordinance requiring the use of safety guards.

**Hazleton, Pa.**—Owing to inability to secure the necessary amount of water for the boilers the Lehigh Traction Company has been forced to reduce the number of its cars in service. Sixteen conductors and motormen were in consequence laid off.

**Conshohocken, Pa.**—The Conshohocken Railway Company has purchased the right of way from the Plymouth & Whitemarsh Turnpike Company over the whole length of the latter's road from the Schuylkill River to Plymouth Meeting.

**Lyons, Ia.**—The city council has granted a 25 year franchise to the Electric Railway & Park Company for an electric line extending to Joyce's Park. The new road will be two miles long and equipped for service within 90 days.

**Council Bluffs, Ia.**—A surveying crew is in the field between Council Bluffs and Manawa, along the route granted the Council Bluffs & Manawa Electric Railway Company by ordinance of the city some time ago.

**Hartford, Conn.**—The Hartford, Manchester & Rockville Electric Tramway Company has awarded the contract for building the road from Hartford to Manchester to George U. Vauger and Fred P. Lay, of Springfield.

**Cohoes, N. Y.**—The Common Council has granted a franchise for an electric street railroad to the Cohoes City Railway Company. The company is to complete the outside belt line of the proposed road within 18 months.

**Asbury Park, N. J.**—The right of way has been secured for building the East Jersey Traction Company's road from Branchport to Asbury Park. Washington White and George Potts are interested in the project.

**Charlottesville, Va.**—The city council has granted an extension of time for the franchise of the Piedmont Improvement & Construction Company, and work on the electric railway will commence at once.

**Waukegan, Ill.**—The Bluff City Electric Street Railway Company is about ready to construct a street railway. D. L. Jones, S. D. Talcott and Charles Whitney are interested in the enterprise.

**Toledo, O.**—Fifteen boys, all under 20 years of age, were arrested and locked up in the police station last week. The charge against the boys was jumping on street cars while they were in motion.

**Manchester, Conn.**—The contract for building the trolley line of the Hartford, Manchester & Rockville Tramway Company has been let to the Springfield Street Railway Company.

## PERSONALS.

The many friends of Mr. W. H. Gordon will regret to learn that he has been and still is very seriously ill as the results of an operation for appendicitis and other complications. Mr. Gordon has been confined to his bed for over 12 weeks, and his family appreciate to the fullest degree the many kindnesses that have been shown them by his friends. He resides at 73 West Fifth street, Bergen Point, N. J.

**Payson K. Andrews**, formerly manager of the Chicago office of the J. G. Brill Car Company, but more recently Western manager of the American Car Company, died suddenly in Chicago on August 22. Mr. Andrews was well known among street railway and electrical people as a successful salesman and made a host of friends. His remains were sent east for interment.

**Mr. Albert A. Carey**, of the Abendroth & Root Manufacturing Company, New York, who has been seriously ill for several weeks with appendicitis, and who was obliged to undergo a severe surgical operation, is at present doing nicely and expects to be out again soon.

**F. J. Anderson**, of Portsmouth, Va., general passenger agent of the Seaboard Air Line, is in New York this week arranging transportation facilities to accommodate those intending to attend the Atlanta Convention of the American Street Railway Association.

**A. H. Goode**, for the past two years Chicago representative of the Jenney Electric Motor Company, has accepted a position with the Central Electric Company, where he will have charge of their constantly growing motor department.

**William P. Searles**, president of the North End Street Railway Company, of Worcester, Mass., has announced that he will again be a candidate for re-election to the lower branch of the Legislature.



C. T. Yerkes, president of the North and West Chicago street railway companies, returned from Europe last Saturday.

Mr. Henry B. Cram, of the Bernstein Electric Company, of Boston, was among New York's visitors this week.

Mr. J. W. Godfrey, of the New York Insulated Wire Company, left for the West on a business trip this week.

Alfred Dunn, auditor of the Consolidated Street Railway Company, of Seattle, Wash., died recently.

TRADE NOTES.

Peckham Motor Truck & Wheel Company.—The Kingston Freeman says: At the Peckham Motor & Truck Works the force of men is kept steadily at work every day now, and the output taxes the factory to its utmost capacity. The electric road running from Poughkeepsie to Wappingers Falls is to be equipped with Peckham trucks, twenty having been ordered. A small order for trucks from Newark, Cal., has been received among the many recent ones, and one also from Broad Ripple, Ind. The Peckham truck promises even to become well known in Japan. The manufacturers recently had a letter from Tokio, asking for prices and a description of their truck.

The International Register Company, 197 South Canal Street, Chicago, reports a very satisfactory business. It has closed a number of good contracts recently for its well-known portable register, among them the Kansas City Cable Railway, Terre Haute Electric Railway, Englewood & Chicago Electric Railway, Lake Cities Electric Railway, Michigan City, Ind.; Queen City Railway, Dallas, Tex.; Bloomington City Railway and others.

The company's aluminum stationary register, placed on the market recently, is meeting with much deserved success. It is an exceptionally well made machine and can be depended upon under all kinds of service.

The McGuire Manufacturing Company, of Chicago, gets the contract from the Chicago City Railway Company for 120 of its celebrated Columbian trucks. This is hardly a surprise, since the McGuire company has used as a special advertisement a handsome picture of one of the Railway Company's cars as seen on the streets on Chicago Day at the World's Fair. Never were cars loaded so before, and only those who were at the fair on that day can believe that cars in ordinary service could be loaded as they were, and it is claimed there was not a single interruption in the running time nor a single accident on that day.

The Western Telephone Construction Company, Chicago, has just completed an exchange system in Cambridge, Ohio, which opened with 111 subscribers. The instruments used throughout are the magneto telephones of this company, using no battery. The subscribers seem to be quite unanimous in their praise of the service. The company has also contracted with the Interstate Telephone and Telegraph Company, of Frederick, Md., to supply it with instruments for the company's lines in Maryland, Virginia, West Virginia and District of Columbia.

The Graham Equipment Company, of Providence, R. I., is making a drive on its snowplow, and warning the street railway companies to prepare for a snowy winter. Now is the time to consider this indispensable article, and the Graham company is not backward in proclaiming the merits of its plow. The Graham truck is increasing in favor, and business with this company is reported as constantly improving.

The Atlanta Consolidated Street Railway Company has placed an order for adjustable traction and Columbian trucks with the McGuire Manufacturing Company, to be delivered in time for the convention Oct. 17. No matter where the convention is held, the McGuire people seem to manage things so that they get paid for exhibiting. There never was a small order let when the competition was stronger.

The Crescent Electric Company, Chicago, experts on armature and commutator work, say their business is rapidly increasing and extending. This company has in its employ some of the best experts in the country and is well equipped in every way for satisfactorily and promptly repairing armatures, fields, commutators, etc. The company makes a specialty of street railway work.

The Wallace Electric Company, Chicago, has been appointed Western agents for the Electric Construction and Supply Company, of New York, and will carry in stock in Chicago a complete line of the latter's arc lamps. The arc lamps made by this company for street railway service are giving excellent results and are meeting with a ready sale.

Harrisburg Foundry & Machine Works have just issued a new catalogue descriptive and illustrative of their new double-engine steam road-roller. The catalogue is elaborately illustrated and will be found of great interest to all those employing apparatus of this kind.

F. E. Donohoe, manager Chicago branch of American Electrical Works, Providence, reports business as quite satisfactory and steadily improving.

Cushing & Morse, Chicago, say that their sales of Keite wire for August were the largest of any month since they have been in business.

RECORD OF STREET RAILWAY PATENTS.

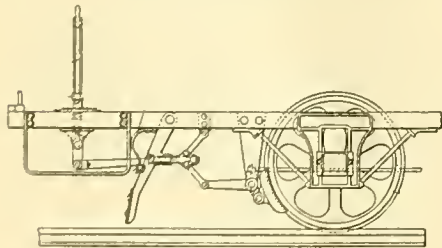
U. S. Patents Issued Aug. 28, 1894.

525,001. Insulator; Leonard W. Bradley, Cleveland, Ohio. Filed Feb. 13, 1894. The insulator is composed of two parts, each part being provided with a central screw passage. The meeting faces have coincident grooves which begin on approximately straight lines near the edges and curve near the center of the parts to avoid the central aperture. The walls of the grooves are adapted to engage the upper and lower portions respectively of the electric wire and hold it firmly longitudinally.

525,015. Trolley; Naaman W. Haskins, Brooklyn, N. Y. Filed Dec. 1, 1893. This is a trolley having a plurality of grooved annular bearings.

525,016. Trolley-Wire Switch and Crossing; Naaman W. Haskins, Brooklyn, N. Y. Filed April 23, 1891. This is a switch and crossing suitable for use with a trolley wheel made in the form described in the previous patent.

525,055. Device for Prevention of Accidents on Street Cars, etc.; Alexander McKerlie, Hamilton, Canada. Filed Aug. 20, 1893. This device has front projecting side arms which have a front bearing



No. 525,071.

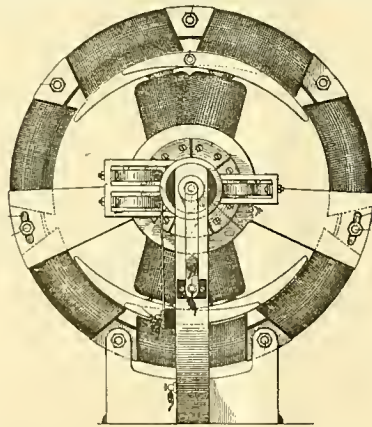
provided with a cap. The through angle shaft in the bearings is equipped with brush roller or blades at each side of a centrally located enamel wheel.

525,071. Combined Car Fender and Brake; Hampton W. Evans, Philadelphia, Pa. Filed March 29, 1891. This is a combination in a car having wheels and brakes adapted to engage therewith and a brake-operating lever, of a fender provided with a frame having bent ends or wings. The frame is secured to movable arms connected with the truck frame of the car. There are up legs in movable engagement with the arms of the fender for supporting the same at an angle from the truck frame and above the track rails, toggle-rod-bell-crank mechanisms on each side of the car in connection with said fender and brake-shoes. The construction and arrangements are such that the brake-shoes are either applied by means of the brake-operating lever or automatically by means of the fender under the impact of an object brought against the same. (See illustration.)

525,108. Electric Motor; Abraham V. Meserole, New York, N. Y. Filed Jan. 8, 1891. Claim 13 reads as follows: "In combination with a fixed field ring wound in series, and with a bipolar armature independently wound in series, an armature shaft carrying insulated contacts, two of which are electrically connected with the respective ends of the armature coils, three revolving brushes carried by said armature shaft, and an electric circuit, the respective legs of which are connected with said armature contacts, while one leg thereof is

connected with one of said brushes and the other leg with one of the other of the second and third brushes according to the direction of rotation." (See illustration.)

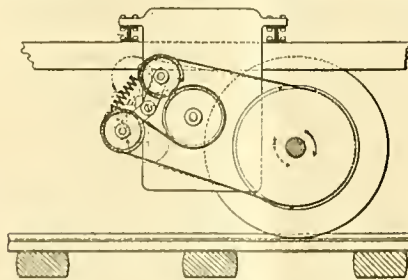
525,115. Safety Guard for Street Cars; William H. Rice, Rochester, N. Y. Filed Nov. 21, 1893. There is a supporting frame with a roller at the outer end of the



No. 525,108.

frame provided with spring sprockets which stand eccentrically to the roller. A flexible guard is attached at one end to the sprockets and is partially wound thereon, and at the other to the car.

525,118. Means for Mounting and Driving Dynamo-Electric Machines; Andrew L. Biker, New York, N. Y. Filed May 19, 1891. This is the com-



No. 525,118.

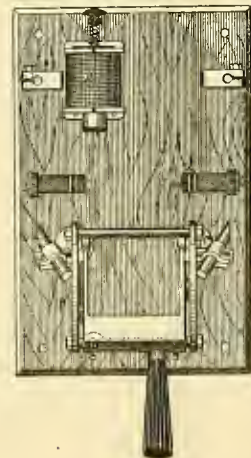
ination with the armature pulley and driving pulley, of a belt for transmitting motion from one to the other. There is a swinging idler around which one side of said belt is looped, so that the pull of the latter operates to draw said idler against the armature pulley, gripping the belt against the same, and means for automatically taking up the slack in the other side of the belt. (See illustration.)

525,131. Circuit-Breaker; Cummings C. Chesney, Pittsfield, Mass., Assignor to the Stanley Laboratory Company, same place, Filed July 6, 1891. A pivoted bridge piece is adapted to be forced and maintained in

engagement with said terminals. There is a pivoted weight engaging with the bridge piece, but having a determined range of movement independent of the same, and a tripping device is provided for holding the weight in an elevated position against the force of gravity. (See illustration.)

525,167. Car-Fender; Charles E. Struck, Newark, N. J., Assignor of one-half to John A. Baldwin, same place. Filed Feb. 1, 1894. This is the combination with the platform of a car of a bumper, pivotally secured to the car in front of the platform, and a knuckle connecting the lower extremity of the bumper with the platform.

525,176. Station Indicator; Athean C. Allyn, Boston, Mass. Filed Oct. 30, 1893. A roller and curtain of nippers are pivoted to the roller and adapted to extend over the curtain and clamp the same against the roller. The nippers have flanges projecting on the outer sides of their pivots, and a fixed cam having a section which coacts with the said flanges, moves the nippers against the roller and a tapered blade over which the flanges may take when the nippers move away from the roller, and springs impel the nippers away from the rollers.



No. 525,134.

525,233. Safety-Fender for Tram, Electric or Cable Cars; Henry S. Robins, Philadelphia, Pa. Filed Sept. 15, 1893. The fender has frame and a tubular guard formed of soft elastic or yielding material. The guard is located at the forward portion of the bed, and means are provided for holding said tubular guard expanded.

525,281. Street Car; William F. S. Robinson, Somerville, Mass. Filed Dec. 7, 1893. The car has a guard situated in front of the dash-board and extending substantially across it and adapted to be raised from a position in front of the bumper to a position above and clearing the bumper, and to be sustained in either of said positions.

525,285. Car-Fender; William F. S. Robinson, Somerville, Mass. Filed Dec. 7, 1893. The fender is adapted to run on the track in front of the car. A pivoted connection between the fender and truck consists essentially of a substantially horizontal tube or cylinder pivoted at its front end to the fender and a rod pivotally connected at its rear end to the truck. At its front end is a piston playing to said tube.



# Street Railway Gazette.

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New York State Convention. The New York State Street Railway Convention will be held next Tuesday, in Syracuse. A good programme has been arranged, and a large attendance is expected.

Questions and Answers. We begin in this number a department of questions and answers, and we cordially invite readers to avail themselves of this column for the purpose of securing information on practical electrical questions. We trust that such interest will be taken in the department that it will become a permanent feature of the paper.

Interstate Commerce Two or three incidents recently have served to show that street railways may come under the jurisdiction of the Interstate Commerce Commission. Judge Woods, in the Debs hearing in Chicago a few days ago, presented an extreme view. He remarked, incidentally, that street cars can be considered as engaging in interstate commerce, for the reason that persons bound to different points ride in them on a part of their journey. The view seems rather far fetched, and if it is correct all public conveyances for the same reason must be considered as participating in interstate commerce. A proper subject for the investigation of street railway traffic by the Interstate Commission was brought up the other day. A complaint against the Rock Creek Electric Railroad Company of the District of Columbia was filed with the Commissioners charging discrimination in favor of guests of the Chevy Chase Hotel, which is located on the company's property, and against the residents of Montgomery county, Md. This is the first time, it is stated, that the Commission has been called on to settle disputed rates on an electric road.

Delays Caused by Teamsters. It is interesting to note that an effort is to be made in Philadelphia to prevent the obstruction of street cars by teamsters. The officials of the People's Traction Company have requested the authorities to impress upon policemen the necessity of abating the nuisance, and action has already been taken. One obstreperous teamster has been arrested, fined \$5 and costs and held in \$300 bail to keep the peace. A few examples of this sort will convince drivers that they cannot with impunity interfere with the operation of street cars. There is less excuse for car obstruction by teams in Philadelphia than in most cities, for in return for the privilege of operating their cars by electricity the railway companies have laid hundred of miles of improved paving. A Philadelphia contemporary, in referring to the matter, says: "Under the old horse-car system, when the street on both sides of the track was so badly paved that it meant a fearful tug and strain to get off the track and on again, the teamster had a good excuse for blocking the cars. But now, when he has a smooth, level street on both sides of the rails, an attempt to hold the latter and to delay the cars to the annoyance of the passengers can be set down to pure and uncalled-for stubbornness. To allow a

few obstinate drivers to impede public travel will break down all the possible benefit to be derived from the trolley. No thinking driver would do so, and those who cannot view the rights of the public in the proper light must be taught to see their mistake."

Trolley Parties in Street car parties have been Philadelphia popular to a greater or less extent ever since the introduction of rapid transit on surface lines, but in no place has street car riding for pleasure assumed such importance as in Philadelphia. The Quaker City received electric cars with a great deal of grumbling and with no little apprehension, but within the last few months public opinion has veered round to the opposite extreme, especially among the younger element, and trolley parties have seemed to be the most popular of all summer amusements. On a single evening recently 40 cars belonging to one company were engaged in this special service. No topic has been so vigorously discussed by the local papers as what they are pleased to term the "trolley fad," or the "trolleymania," and some of them have been disposed to criticise the car excursions because the young people, by horns and other noise-creating instruments, disturbed the quiet in the suburbs. The hubbub which they have condemned undoubtedly was a nuisance, and the police were justified in insisting upon more decorous conduct. There is no earthly reason, however, why enthusiasm should not be kept within as reasonable bounds under these circumstances as well as under any others, or that the trolley ride should not be as legitimate as it has proved to be an enjoyable amusement. The extraordinary popularity of trolley parties in Philadelphia suggests that electric railway companies might find it profitable to develop pleasure riding on their roads to a far greater extent than they have done hitherto. If a single company in Philadelphia finds itself unable to meet the demands of trolley parties, even when 40 cars are engaged in the special service, this branch of the business certainly presents large possibilities. If cars be leased for an evening at \$10 per car, the price which prevailed in Philadelphia, we believe, many companies could in this way add quite a handsome sum to their incomes during the summer months, and a very large part of the revenue would be net gain. A legal question has been brought up in connection with the chartering of electric cars by parties, but we fail to see a great deal of force in it. When cars have been engaged it has been understood, naturally, that the parties paying for them were to enjoy the exclusive use of them. But certain persons with a strong belief in individual privileges have insisted that all electric cars are public vehicles, and that no one who wishes to ride on them can be excluded so long as fare has been paid. Some of the people holding to this notion have boarded cars in defiance of the trolley parties and would not leave in response to entreaties or threats. Others have been ejected and they threaten suits for damages. What argument could be made in favor of the maintenance of exclusiveness on a private car on a steam road that would not apply with equal force to the trolley car, it is very difficult to see. Yet the right of the railroads to operate private cars does not appear to be contested.



**EXHIBITS AT THE READING STREET RAILWAY CONVENTION.**

In the last issue of the STREET RAILWAY GAZETTE the exhibits at the Reading Convention

the New York syndicate will not make an effort at the next Legislature to have a law passed which would nullify the decision of the Supreme Court and give a right for the building of elevated roads

law legalized the construction of elevated roads in Philadelphia; but Mr. McMichael said, as the Supreme Court has decided that the roads cannot be built, his New York clients had determined to go out of the business. August Belmont, the well-known banker of New York, was at the head of the scheme.

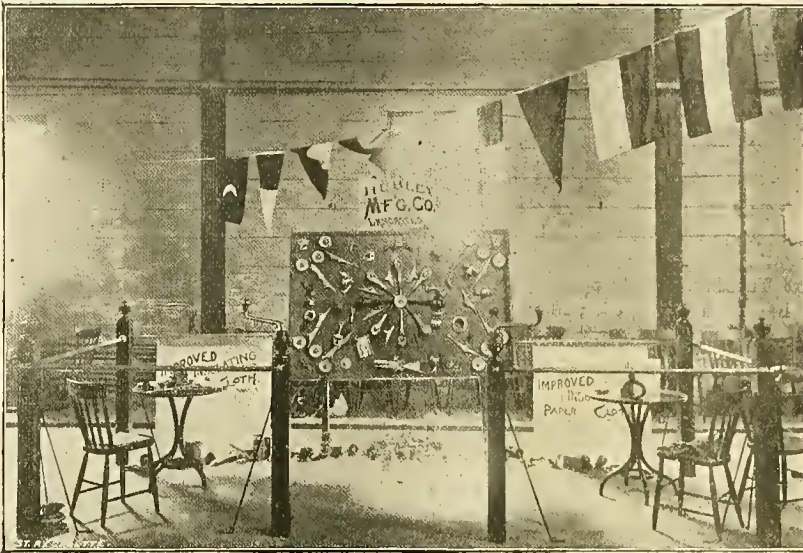


EXHIBIT OF THE HUBLEY MANUFACTURING CO. AT THE READING CONVENTION.

of the Pennsylvania Street Railway Association were described somewhat at length. The fact that the general exhibit was much more meritorious than had been anticipated was noted, and the views which are presented herewith show the preparations which several of the manufacturers made to interest the street railway men in their respective kinds of apparatus. The descriptions of the several exhibits herewith illustrated can be found in the last issue of the STREET RAILWAY GAZETTE.

**NEW YORK STATE STREET RAILWAY CONVENTION.**

The annual meeting of the New York State Street Railway Association will be held next Tuesday at the Yates Hotel, Syracuse. The first session will be held at 10:30 A. M. It is predicted that a large number of street railway men will be present and that the meeting will be of unusual interest. Two papers will be read. The first, which will treat of "Recent Improvements in Cable Traction," will be read by Maj. G. W. McNulty, who was chief engineer during the period of cable construction on the Broadway and Seventh avenue line, New York. The second paper will be read by J. B. Craven, electrical engineer of the Buffalo Railway Company. His subject will be "Economy in Electric Power Stations."

**ELEVATED RAILWAY PROJECTS ABANDONED IN PHILADELPHIA.**

The New York syndicate, which made an effort to build elevated railroads in Philadelphia has decided to abandon the projects and to surrender its charters. This decision was the direct result of the finding of the Supreme Court that there were no laws under which elevated passenger railways could be built. It is stated that the syndicate had \$14,000,000 ready to expend in elevated roads, and it paid out about \$100,000 in preliminary work. The counsel of the syndicate has made application to the Court for a decree dissolving the Northeastern and the Quaker City Elevated railroad companies. The application for the dissolution and the surrendering of the charter of the Quaker City road will probably be heard in court on Sept. 17; that of the Northeastern will be called up in Common Pleas Court No. 2 some time in October. The companies have no debts to pay, and their winding up will be a mere formality. Charles W. Buchholz, who is president of both the companies, will make the petition to the Court for the surrender of the charters. These have not yet been filed, as the law requires that notice of them must be advertised before presentation to the Court. It is understood

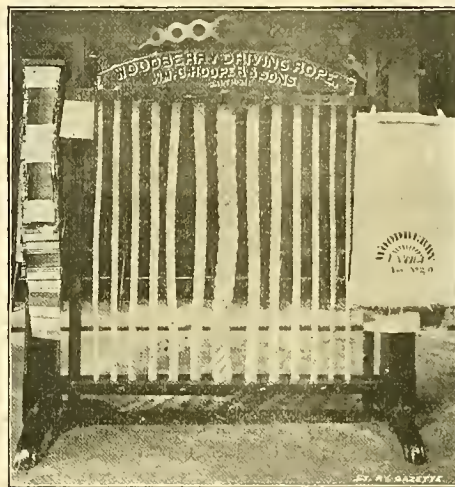


Exhibit of William Hooper & Sons.

**OHIO STATE TRAMWAY CONVENTION.**

The annual meeting of the Ohio State Tramway Association will be held Wednesday, Sept. 26, in Toledo. The members will meet at the Beebe House, but if the delegates reach the city early enough arrangements will probably be made for holding the sessions on a steamer running to the Islands. This trip and the return can be made in a day. The officers of the association have issued a very cordial invitation to the members, and urge the Ohio companies to send as many representatives as possible.

**TROLLEY LINE TO POTTSTOWN.**

The announcement that the Pottstown and the Norristown passenger railway companies had been granted the privilege of occupying certain streets in the borough of Royersford is of greater importance than appears on the surface. It means, in short, that before the passing of another year there will be a continuous line of electric railway from the business center of Philadelphia to the very heart of Pottstown. This chain of railways will not be under one management, but the several companies comprising it will act in harmony, for there is certain to be a traffic agreement between them. This system will be composed of the People's Traction Company, the Conshohocken & Norristown Electric Railway Company, and the Pottstown Electric Railway Company. Connection in this vicinity will be made either with the Norristown line at Chestnut Hill, or at Ambler over its Chestnut Hill & Spring House Electric Railway, which connects with the People's Germantown line at Chestnut Hill. The Norristown and the Pottstown lines will then complete the system to Pottstown and Royersford, and the route will include Norristown, Conshohocken, Spring Mill, Barren Hill and Roxborough. The combination by no means exists on paper—it is an assured fact, for several of the lines are now in course of construction, and others will be begun at an early day. The work will be pushed forward rapidly, and it is not improbable that by next summer the People's Traction Company will



EXHIBIT OF THE GENERAL ELECTRIC CO. AT THE READING CONVENTION.  
General View of Exhibition Hall.

in Philadelphia. The syndicate spent a considerable sum of money and made a determined and long legal fight in the Courts, believing that the

be able to provide an outlet for its patrons as far as Pottstown. Other lines are also being built in the coal regions heading toward Philadelphia, and we



feel safe in venturing the prediction, says the Philadelphia *Stockholder*, that within the next few years a person can beard an electric car in Fourth

maintains that, under the ruling of the Supreme Court in the case of Miller vs. Eagle Manufacturing Company, the first, second and third claims of the

remedy by feeding conductors, having no lamps therein, connected with the mains of the consumption circuits arranged in sets concentrically around the central generating station, and so proportioned as to secure equal electrical pressure throughout the entire system. It is contended that the invention described and claimed in the earlier patent is for one form of the alleged invention described in the later patent and covered by the three first claims thereof, and that no one could use the invention of the earlier patent without infringing these later claims. The question thus raised is a serious one; but we do not deem it to be necessary to consider it, inasmuch as the views we have expressed upon the other branch of the case are decisive. The decree of the Court below is reversed and the cause is remanded, with directions to enter a decree dismissing the bill of complaint with costs."

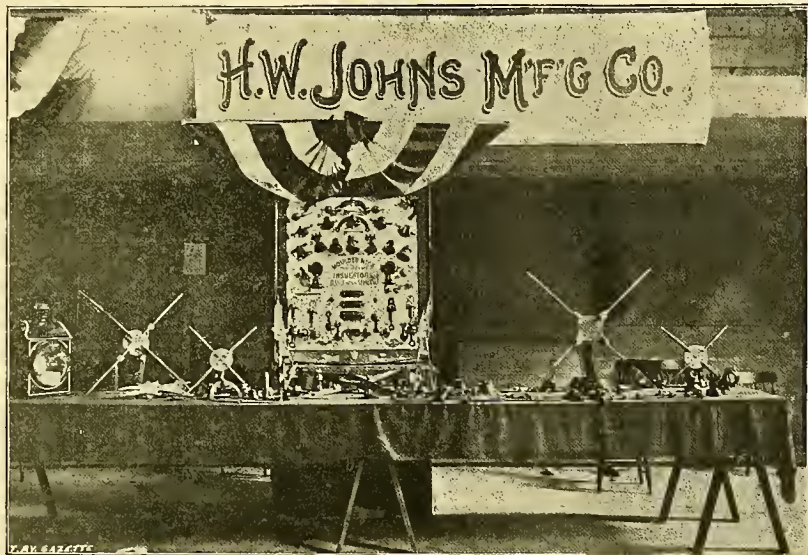


EXHIBIT OF H. W. JOHNS MANUFACTURING CO. AT THE READING CONVENTION.

or Eighth street and be carried to Scranton and Wilkes Barre.

**FEEDER AND MAIN PATENT NOT SUSTAINED.**

Judge Acheson, of the United States Circuit Court of Appeals in Philadelphia, last Wednesday, filed an opinion in the case of the Edison Electric Light Company against Westinghouse, Church, Kerr & Co. The suit was brought for injunction and damages because of the alleged infringement of the Edison feeder and main patent owned by the complainant. In the United States Circuit Court for New Jersey last March an interlocutory decree granting the injunction was granted by Judge Green. An appeal was taken to the Circuit Court of Appeals. Judge Acheson's decision is in favor of the defendant, and in his opinion the Judge said:

"This patent does not deal with the complicated general problem of the distribution of electricity and the subdivision of the current for the purpose of domestic illumination. The patent is not for an incandescent lamp or for a dynamo for generating electricity, or for the arrangement of the lamps in multiple arc, or for indicating and regulating devices for controlling the current from a central station, singly or combined. The patent deals with the one particular difficulty of drop in tension or fall in pressure—loss of electro-motive force—due to the resistance of the conductors to the electric flow. To remedy the evil effect therefrom, the patentee provides special conductors for the transmission of electricity extending from the generator to the main conductors, with which the lamps are connected and from which they are served. The patent is for a specific arrangement and proportioning of the two sets of conductors, which, together, constitute the complete circuit."

After a long review of the controversy, the Judge continued: "The plan of electric distribution covered by the claims in question is not 'the creative work of that inventive faculty which it was the purpose of the constitution and patent laws to encourage and reward' To sustain these claims would be to sanction a monopoly in that which belongs to the public. In announcing this conclusion we cannot do better than quote some observations of the Supreme Court which apply with great force to this case, as we read the proofs. In *Atlantic Works vs. Brady* the Court said: 'The progress of development in manufacturers creates a constant demand for new appliances, which the skill of ordinary head-workmen and engineers is generally adequate to devise, and which, indeed, are the natural and proper outgrowth of such development. Each step forward prepares the way for the next, and each is usually taken by spontaneous trials and attempts in a hundred different places. To grant to a single party a monopoly of every slight advance made, except where the exercise of invention, somewhat above ordinary mechanical and engineering skill, is distinctly shown, is unjust in principle and injurious in its consequences.'

In conclusion, the judge said: "The appellant

patent in suit are void, because of the grant of an earlier patent to Mr. Edison . . . which dealt with the evil of drop in tension, and provided a

the field or the direction of rotation of the armature are alone reversed; but if both be reversed the direction will remain the same.

**QUESTIONS AND ANSWERS.**

The STREET RAILWAY GAZETTE is frequently in receipt of letters from persons in search of practical information, which for some reason is not easily found in the reference books at their disposal. Queries of an electrical character are especially numerous, and the difficulties which they present seem to be particularly perplexing. Instead of replying to inquiries by personal letter, as has been our custom heretofore, we propose in the future to answer these letters in the columns of the STREET RAILWAY GAZETTE, in the hope that the information which we publish may be of value to others besides the writers of the communications.

**DIRECTION OF CURRENT ON ARMATURE COILS.**

To the Editor of the STREET RAILWAY GAZETTE: We have recently enlarged the capacity of our station, by adding two new machines. In order to economize space this has necessitated an entire rearrangement of the dynamos, so that some of them are now running left handed and some right handed. This has confused me for the time being, and I find myself always in doubt when I come to either class of machine as to which direction the current is flowing in the armature coils. Can you give me a general rule by which this may be determined for either right or left handed machines?

CINCINNATI, O. J. K. E.

**ANSWER.**

We suggest that you mark the north pole of each of your generators so that it may be recognized at a glance. Then if when facing the commutator end of the armature the north pole is at your right and the armature is revolving with the hands of the clock, those wires passing the north pole piece will have currents flowing in them away from you, and those passing the south pole piece will have them flowing toward you. The directions of the currents will be reversed if either the poles of

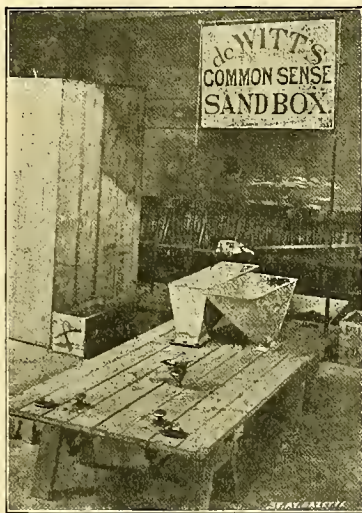
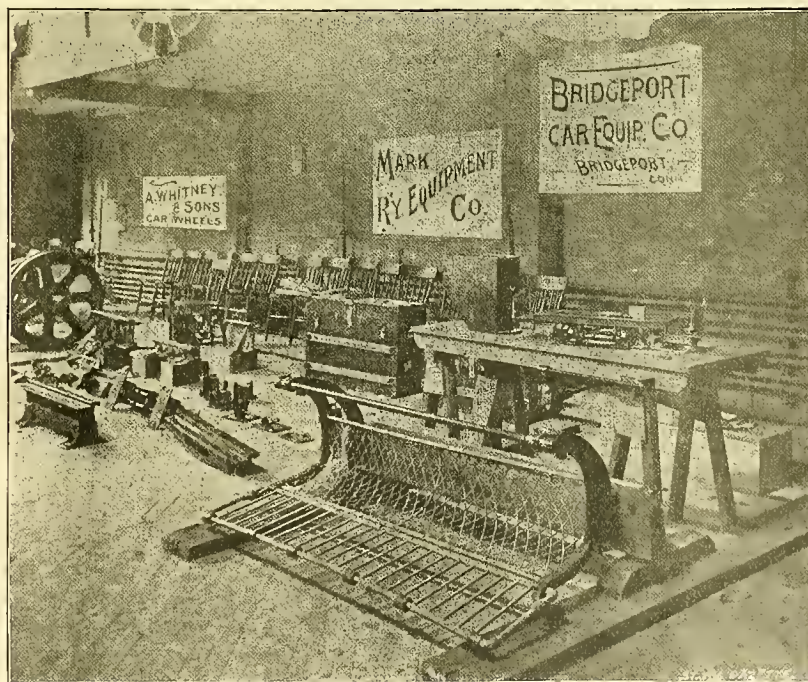


Exhibit of E. F. De Witt & Co.



EXHIBITS OF BRIDGEPORT EQUIPMENT CO., MARK RY. EQUIPMENT CO., AND A. WHITNEY & SONS,



## DIRECTION OF THE CURRENT.

To the Editor of the STREET RAILWAY GAZETTE:

Will you please give me an easily remembered method of detecting the direction of a current in a conductor by means of the pocket compass?

PROVIDENCE, R. I.

LINEMAN.

## ANSWER.

Two of the mnemonics suggested for this purpose are the words SNOW and NOSE. When

you lie down and see whether the feuder will do all that it is said it can do? No, they will not do it. The company has spent considerable money in making these experiments and we are very anxious to secure the proper devices. The pick-up fender should not reach out too far in front of the car. Such an appliance would be stripped of its value very much if the projection were great.

## THE SERIES METHOD AS A REMEDY FOR ELECTROLYSIS.

BY NELSON W. PERRY, E. M.

In a recent issue of the STREET RAILWAY GAZETTE I propounded the question, "Shall we come to the double trolley at last?" and presented arguments tending to show that it must be answered in the affirmative. At that time I discussed the multiple arc system alone; but there is another system that seems to possess many merits which I wish to discuss now. That there is a growing interest in the double trolley system as a substitute for the single trolley has for some time past been manifest, for electricians who a year ago would scout the idea of the double trolley now speak of it as a possibility at least, and treat the subject not only with respect, but with close attention when it is brought to their notice.

In no way has this change of opinion been made more manifest than by the reception which the article in question received—it having been widely copied either in full or in abstract both in this country and abroad. In my previous communication I stated that the double trolley would probably prove equally cheap to construct with the single trolley if an approved earth return for the latter were provided. I also quoted some court records to show that the double trolley had the advantage in economy of operation over the single trolley, but admitted that there were introduced by the former both mechanical and electrical difficulties, especially where crossovers and turnouts were frequent, as in street railroad centers, which largely counterbalanced the advantages gained. In suburban districts, however, where these complications did not arise, I expressed my opinion that the double trolley was superior to the single trolley.

The chief difficulty with the double trolley multiple arc system, aside from those due to crossovers and turnouts, is the difficulty of insulation between positive and negative wires. They must necessarily be placed close together. In Cincinnati, the distance between the two varies on different lines from 12 inches to 18 inches. Wherever a span wire occurs it forms a possible path for the current from positive to negative, which in wet or sleety weather may become of comparatively low resistance. Then, too, there is a possibility of creating momentary short circuits due to the swaying of the wires. Of course all such leakage increases the drop at the end of the line, which is the bane of the multiple arc system. It is to avoid this drop that the feeder system is used, and it is this very drop which limits the distance to which electric railroads may be extended. It is, however, merely a question of copper as to what distances current may be carried with a given drop, but the expense attendant upon the use of sufficient copper limits the distance for street railway currents to perhaps eight miles, dependent, however, upon the amount of current carried. Beyond this limit it becomes cheaper to erect another station and employ a duplicate set of employees than to add sufficient copper to maintain the potential sufficiently high to carry the required current further. These are some of the objections to the multiple arc system, whether it be single or double trolley, that are admitted by all.

There is, however, another system of distribution that possesses none of these objectionable features, and which has peculiar merits of its own as well as some demerits. I refer to the series system, which is most familiarly exemplified in our arc light systems. In this the lamps are strung on the line like beads on a string, the current passing successively from one lamp to another before returning to the dynamo. The current in this case remains constant whatever the load may be, the additional energy required by an increase of load being supplied by a corresponding increase of electro-motive force instead of by an increase of current, as in the multiple arc system, and no matter how long the line or how great the load, provided the latter does not exceed the capacity of the generator, there will

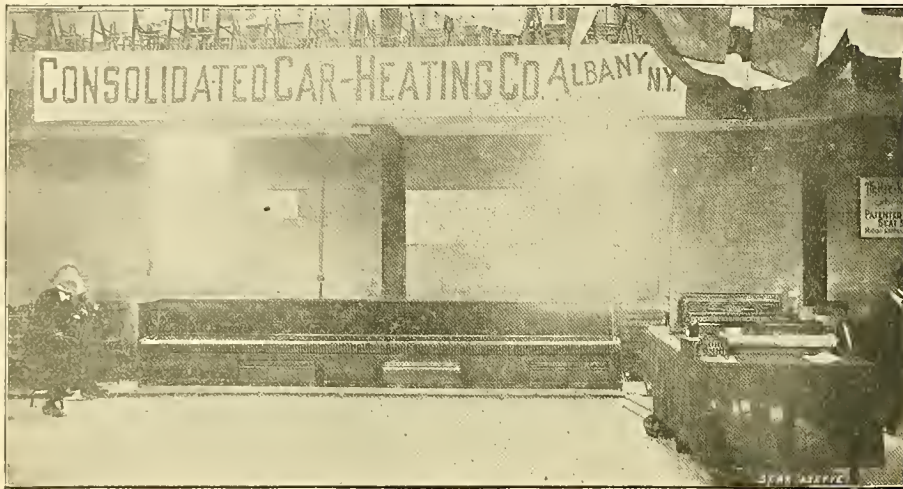


EXHIBIT OF THE CONSOLIDATED CAR HEATING CO. AT THE READING CONVENTION.

the current passes from South to North Over the needle the latter will be deviated to the West. When the current passes from North Over the needle to the South it will be deviated to the East. The north-seeking pole of the needle is of course here referred to.

## FENDER QUESTION IN PHILADELPHIA.

George D. Widener, vice-president of the Philadelphia Traction Company, has in charge the tests of fenders which are to be made to demonstrate their relative merits. The company has already tested about 100 fenders, but none of them has proved entirely satisfactory. In speaking of the experiments Mr. Widener said recently:

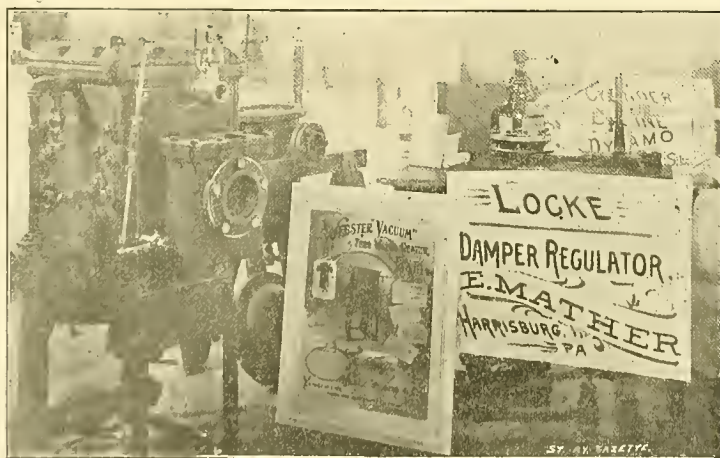
"The company would much rather pay out

The company has about 800 cars, which will be provided with pick-up fenders if a satisfactory device can be found."

## POWER HOUSE AT GETTYSBURG BURNED

The power house of the Electric Light and Railway Company, at Gettysburg, Pa., caught fire at 7 o'clock last Monday evening and was entirely consumed. The loss is \$40,000; no insurance.

THE ELECTRIC LOCOMOTIVE.—Every invention must pass through the experimental stage before its general acceptance is assured. Nearly all of our most useful practical devices were regarded



EXHIBITS OF WARREN WEBSTER & CO. AND E. MATHER AT THE READING CONVENTION.

money for fenders than pay money for the loss of life. Of course it is expensive to get fenders, but the expense is not so great as fatal accidents which might be averted by a satisfactory fender. The fenders that we have tried have not answered all that was said of them. When we would try them they would not do the work. If one of these devices to be tried later is very satisfactory, the chances are that it will be accepted by the company.

"The point strikes me is that these men, who claim that the fenders can do so much, should convince the company of the worth of the appliances by lying down on the track and allow themselves to be picked up or thrown aside. But they will not do it. I have asked them: 'Why don't

as mere toys in the beginning. They made their way against old methods and the conservative spirit which discredits everything not in line with past experience. There is every promise of a wonderful development of electric power. When the electric locomotive can run at a speed comparable with our fleet steam locomotives, the day of the introduction of electricity on the great railway systems of the country is not far distant. When electric power has reached such a pitch of efficiency the old railroads will find their present roadways, with their easy grades and immunity from the obstructions which prevent high rates of speed on electric lines laid on ordinary roadbeds, finely adapted to the new order of things.—Philadelphia Public Ledger.



be absolutely *no* drop at the end of the line. This is accomplished by an automatic increase of E. M. F., corresponding to the automatic increase of current which takes place with the parallel system.

Where arc lamps or other stationary translating devices are operated by the constant current method, they may, to use the previous analogy, be strung along the whole circuit like beads on a string. It may, therefore, be said in such cases to be a single wire system—the wire which furnishes current to one lamp extending to the next, and so on around the complete circuit. When adapted to moving translating devices, however, such as street cars, it becomes necessary to use two wires, the current coming to the car on one wire, passing through the motor to the other wire, thence by that wire to the second car, through whose motor it passes back to the first wire again, and so on to the end of the route. This double wire arrangement seems necessary in order that the cars may be run in series; and for this reason the series system of distribution for street cars is necessarily a double trolley system. It, however, is much simpler electrically than the multiple arc double trolley. The line is divided into sections of any length desirable, and since the two wires of each section are both at the same potential, except when a car is on that section, there can be no leakage from positive to negative (if such an expression is proper here), how-

placed upon the wires, and when once placed could not possibly by accident leave them.

In this way we would have a double trolley system quite as simple as, and more efficient than, the present single trolley. The action of the cars would be entirely independent of the condition of the track; no electrolytic corrosion of the pipes would be possible, and there would be no drop in potential however long the route or whatever the load, provided, of course, the latter did not exceed the capacity of the generators.

In addition to this we would enjoy other advantages. The current remaining always constant, the copper that would be sufficient to operate one car would also be sufficient to operate a dozen or more cars with equal economy whether the distance were one mile or thirty.

In the multiple arc system, since the energy transmitted varies as the current, copper sufficient to supply the maximum demands must of course be provided, but since this maximum demand is always many times the mean demand it is impossible to proportion the copper economically. On the other hand, in the constant current (series) system, the energy transmitted varies as the electromotive force, the most economical weight of copper can be at once determined, and will be entirely independent of either the load or the distance. Hence we have a greater economy in

multiple arc system. Thus we have in the series system greater economy of copper, greater economy in power-house equipment, and greater economy in operation, a simpler trolley arrangement—all these advantages with the additional one of the total avoidance of electrolytic corrosion of the water, gas and other pipes.

The series system of street car propulsion has, however, come into disrepute on account of the difficulties encountered—chiefly of an electrical nature, and the failure of all attempts to operate it successfully. The difficulties encountered are exactly of the same kind as those encountered by Mr. Charles F. Brush in his early attempts to adapt the series system of distribution to arc lamps.

It must be remembered that in this system each translating device forms an integral part of the circuit, so that the irregularities of the various translating devices are cumulative, the culmination in an arc light circuit, for instance, occurring when one of the lamps for any reason failed to conduct the current. This means a break in the circuit, and since all the lamps are dependent upon the continuity of this circuit, when it is broken all are extinguished. But before such a culmination is reached, any irregularity of a single lamp was in the early days visited upon every other lamp, and as each lamp was liable to have its own faults



AT THE SIXTEENTH ANNUAL CLAMBAKE OF THE AMERICAN ELECTRICAL WORKS, PROVIDENCE, R. I., AUGUST 25.

ever close together the two wires are placed. The only chance for leakage across would be when the section were occupied by a car and when thereby a difference of potential was created. But such leakage would only constitute a partial short circuit of that car, the leakage current passing around that car and proceeding on with the remaining current, unimpaired in volume, to the next car, and so on until all were supplied, and then finding its way back to the station by the return wire, which might pass down another street. In this system, therefore, whatever leakage there might be between wires would not be lost energy, as in the multiple arc system, but would join the main current and go on to the next car.

The ability to place the two wires close together—say three or four inches apart—removes many if not all of the mechanical objections to the double trolley. Whereas in the latter two distinct trolley masts and wheels are necessary, each as liable to get off the wire as the single trolley now in use, only one mast is required in the series double trolley system, and by giving the trolley wheel a section somewhat resembling two cones with their bases joined together so that the apexes of the double conical wheel will extend up between the two wires, it (the trolley) could be much more easily

copper. In the series system the station equipment is complete with an ammeter, voltmeter and line switch, and is thus far simpler and cheaper to construct than the usual present equipment.

With this system the speed regulation of the car is effected by rocking the brushes in one or the other direction around the commutator, thus doing away with all the losses due to commutated fields, rheostat or series-parallel controller, and by reversing the brushes the motor may be converted into a dynamo in series with the one at the power-house, driven by the momentum of the car. At the same time, the energy thus absorbed brings the car to rest and is thrown onto the line for use elsewhere instead of being frittered away in heat on the brakeshoe, as is necessary in the multiple arc system.

This is an advantage of extreme importance, for by this means a car descending a grade may assist all other cars on the line, and in extreme cases might generate sufficient current to operate quite a number of cars on a level or to haul a single car up a lesser grade, entirely independent of the power-house. This is not mere theory, but a demonstrated fact. It is a feature that places the economy of operation by series method far and away in advance of anything possible with the

and had to suffer the faults of all the other lamps at the same time, the number that could be operated on a single circuit satisfactorily even for the pioneer days was exceedingly limited. The same was, of course, the case with street cars operated by this method when the system was in the same stage of development.

If I recollect rightly, Brush found that three was the maximum number of lights that he could operate satisfactorily on one circuit until he invented the automatic cutout, or bypath, which the current might take in case of the disability of the lamp. By this simple device it became possible to operate any number of lamps desired on a single circuit. Sixty-five lamps have until recently been the maximum number usually fed from one circuit, but the tendency now is to at least double this number, and machines capable of operating from 100 to 150 lamps are now being manufactured and successfully operated.

The evolution of the series electric railway has proceeded along exactly parallel lines. Up to within recent date all experiments with the series system have introduced the cars in circuit just as Brush did his arc lamps in the early days—viz., without an automatic cutout—and the result has been the same—failure. Strangely enough, the



maximum number of cars that could be thus operated was three. With a less number of cars the system worked as well with cars as it did with lamps. But if the trolley of one car got off the wire the others were without current, and it was impossible to operate roads having branches, sidings or turnouts. These difficulties were, however, all remedied in the same way that Brush's early difficulties were remedied, viz., by introducing the automatic cutout.

Since the arc-light system was converted from an impracticability to an unqualified success by this simple means, I believe that series electric

the course of the currents as a car passes from one feeder section to another operated by a separate dynamo. By this device the electromotive force on any one section may readily be kept within safe bounds.

**PENNSYLVANIA STREET RAILWAY LEGISLATION.**

It is predicted that the next session of the Pennsylvania Legislature, which convenes in January, 1895, will witness a very bitter struggle for supremacy between steam railroads of the State and electric railway interests. The latter will ask for

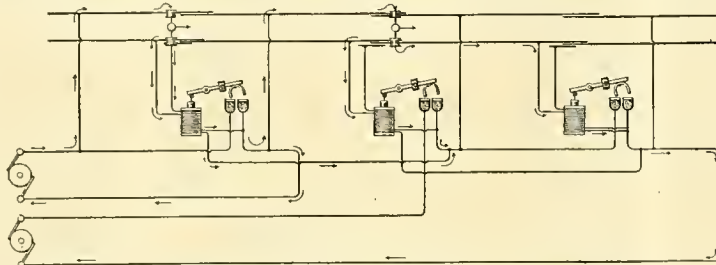


FIG. 2. FEEDER SERIES SYSTEM—FEEDER TRANSITION.

traction has been likewise converted from the failure that it has been to a practicability by the same means.

As stated in my previous communication, I believe that while there are many palliative recourses open to the street railway companies, there is but one radical remedy for electrolysis, and that is to keep the current out of the ground. This of course involves resort to the double trolley. Of the two systems, the multiple arc and series the latter seems to present so many advantages, not only as to economy of installation and operation, but as to the distances from the power-house to which cars can be successfully operated, as to really leave little if any choice as to which should be used.

In the series system referred to there is employed what its inventor calls a *feed wire* whose office

legislation favorable to them, and it will be opposed by steam roads as a matter of protection. So far as known, says a financial paper, at present electric railways will ask: first, for a law allowing the consolidation of electric roads; second, the right of eminent domain, the same as now accorded steam roads; and, third, the right to engage in the transportation of general merchandise. The consolidation feature, it will be remembered, passed the last legislature, but was vetoed by Governor Pattison. Messrs. Quay and Magee both favored the bill, so that there is little doubt it will receive more friendly treatment if General Hastings is elected. Upon its becoming a law several consolidations will at once be effected, beginning with the Pittsburgh lines, in which Mr. Magee is interested. The general movement for

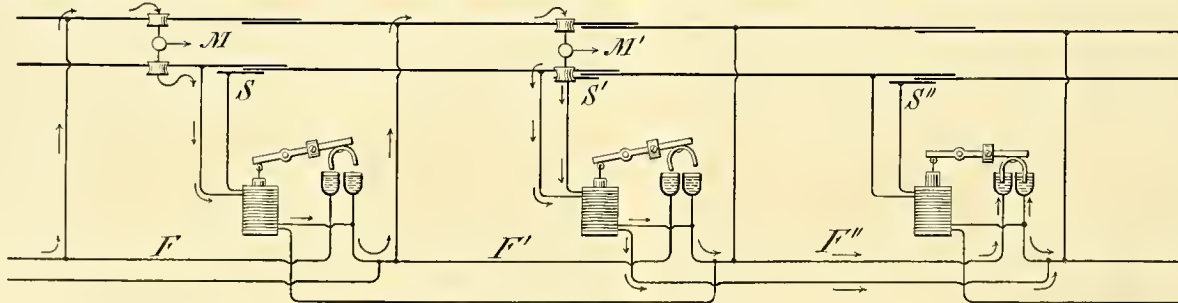


FIG. 1. FEEDER SERIES SYSTEM.

is to feed into the trolley wires volts instead of amperes. The arrangement of the trolley sections *M, M',* and the so-called feeder sections *F, F', F'',* are shown diagrammatically in Fig. 1. It will be observed that the two trolley wires of each section lap over the ends of the wires of the adjacent sections, and that these laps are staggered. There are also short lengths of subsidiary wire, *S, S', S'',* adjacent to one of these laps. The feeder wire, *F, F', F'',* is also broken into sections terminating in mercury cups which are electrically connected by forks taking into them. These forks are actuated by solenoids connected with the trolley and subsidiary wires as shown, so that when a car is on a given trolley section the feeder wire is broken and the current compelled to take the circuitous course indicated by the arrows through the motor and around the break. This constitutes the automatic cut-out referred to, for should the trolley get off the wire the current which actuated the solenoid would be broken, the fork would drop, and the integrity of the circuit be renewed through the cups.

In order to prevent too high a rise in potential in long lines, the latter are divided into feeder sections, each consisting of a number of trolley sections, and each operated by a separate dynamo and feeder. Fig. 2 shows this arrangement and

legislation favorable to electric railways is yet, however, in its incipency; but it is favored by the managements of the various companies in Pennsylvania, and a combination of these interests will, before the legislature convenes, be effected. It is almost certain to have the support of members from the country districts, as the construction of new electric lines through farming lands cannot fail to enhance their value.

**ELECTRIC LIGHT ASSOCIATION TO MEET IN CLEVELAND.**

The executive committee of the National Electric Light Association met at the Hotel Brunswick, New York, on Tuesday evening last to decide upon a place for the next convention. The committee, after some discussion, voted in favor of Cleveland, O.

**Camden, N. J.**—The Camden Horse Railroad Company started this week to equip the North Fifth street branch of its system. The poles and other material have been distributed along the line, and the work of stringing the wires will be pushed rapidly. The line extends from the Market street ferry to the Vine street ferry, by way of Penn, North Fifth and State streets.

**JOINTS FOR GIRDER AND T-RAILS AND A BOND ADAPTED TO EACH.\***

BY JAMES M. PRICE.

**PART II.**

The "Little Giant" joint is applicable to any T-rail from 50 to 70 pounds in weight per yard, used for steam traffic, or any weight of locomotive. When the weight is from 75 to 100 pounds, the "Eagle Joint," of the same general type, but heavier, weighing without bolts usually from 32 to 35 pounds for the pair of joint plates, would be recommended. The weight of the "Little Giant," for a 70-pound rail, is 22 pounds. Its tread upon the cross-ties, counting in the rail embraced in its jaws, is 8½ inches, for a rail 4½ or 4¾ inches in height and width. Its seat is, therefore, far more secure upon the tie than that of any splice-bar joint. The open work of its center permits this joint to be fitted to any curve, from 38 feet radius upwards; adapting it peculiarly to the needs of electric roads.

**THE PRICE BOND.**—In many towns and cities the introduction of the trolley lines on the single trolley system has been followed by great damage to the metal of the water pipes and gas pipes adjacent, and to the lead coverings of underground wires and cables. Renewals of these pipes, etc., have frequently been necessary in the same spot. On looking over the field of street railway construction, I have thus far seen no bond for the transmission of the electric current from rail to rail, which is not embedded in the earth, although sufficient dampness may fairly be expected throughout almost the entire year to make it the vehicle for transmission of any waste of current to adjacent pipes, etc. Meanwhile the conductivity of a 9-inch rail, in iron, equivalent nearly to a rectangle of 1 inch by 9, should be met at every joint by large use of copper, if it is hoped to induce the current to pass without leakage. Assuming the conductivity of copper to iron to be as 6 to 1, it

follows that, upon this method of bonding, the aggregate section of such copper bonds, if to be buried in the earth, should be about 1½ square inches. I have been unable thus far to find any single wire or triple which attains ¼ of a square inch. That is, these bonds, with earth contact, aggregate less than one-fifth the section of equivalent conductivity of that of the rails. I think we need go no further in the search for the cause of this widespread damage and increasing danger.

Bonds are being laid by the mile, in length from 8 inches to 25 inches and 30 inches up to 40 inches, of divers patterns and with contact with the rails at their ends ranging from less than ¼ to ⅝ of an inch. All are embedded in the earth, and yet the scientists assure us that ½ of a volt will under conditions of dampness in the earth produce electrolysis. Within a half-mile of where I sit, with track used by a trolley line less than four months, a waste of 3½ volts has been measured.

To avoid this liability at the same time that we offer a greatly improved construction of track, I have devised a bond based upon new principles and adapted particularly to the Price joints of every pattern.

The Price bond, whether used with the Price

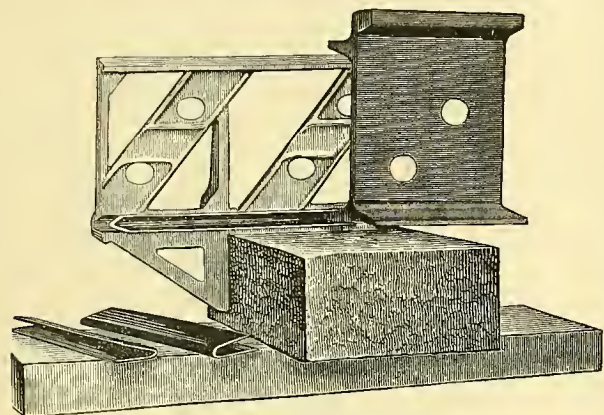
\* See Part I. in STREET RAILWAY GAZETTE, September 8, page 98.



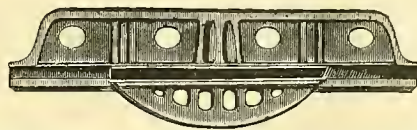
joints or with any other, consists of a plate of copper or its equivalent, placed against the rail under the head, or embracing the flanges where two rails come together, and there held by severe pressure,—and, with the Price joints encased in iron so as to exclude the earth and prohibit its contact. This gives the "short haul," so much es-

So excellent, meanwhile, is the contact of the K joint itself with the rails as first made, without allowance of space for the copper within it, that it is suspected that but few sphee bar joints as now laid, with various bonds attached to them, equal in conductivity these joints as used without copper connection.

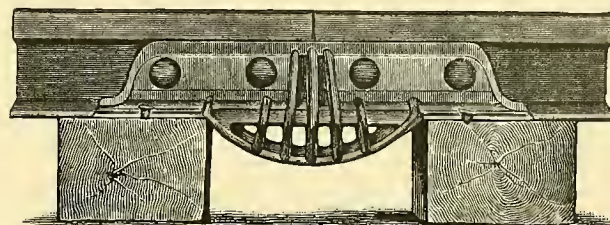
widened as to receive the copper bond) with the proper bonds inclosed. Elastic cement, as laid on in roofing with a trowel, run around the edge of the bond when pushed into place on the flanges, before setting the joint plate in place and driving it up, will attach to the edges of the joint plate, preventing the entrance of water.



INTERIOR OF K-JOINT WITH BOND.



INTERIOR OF LITTLE GIANT JOINT WITH BOND.



LITTLE GIANT JOINT.

teemed in railroading. In other words, the electric current is invited to take "the short cut" along the surface of the rail flanges, assisted and protected by joint-plates which largely add to the conductivity of the bond, and without contact with the earth to initiate electrolysis. As the jaw of the joints has the practical effect of a double inclined plane when driven up with a sledge, it can be seen how a "severe pressure" can be secured. The peculiar spiking, to the sides as well as the top of the ties, accounts for its retention. While the contact with the rail of any other bond which I have seen is less than 5½ square inches, counting both ends of it, I can attain, with proper sledging of these malleable joints: for the Little Giant, 40 square inches; for the K joint, from 50 to 60 square inches of contact, and we shall hold what we get.

As used with the K joint and with the Little Giant joint this bond consists of a plate of copper, bent into shape resembling a V in section, placed upon the flanges of the two rails on each side, and

A recent test at the Drexel Institute, Philadelphia, has been made by Prof. Arthur J. Rowland, of the bonds chiefly used in Philadelphia, placed in the same current with the Price bond, encased

**BROADWAY CABLE SYSTEM, NEW YORK.**

The report was sent out from New York last week that the Metropolitan Traction Company had

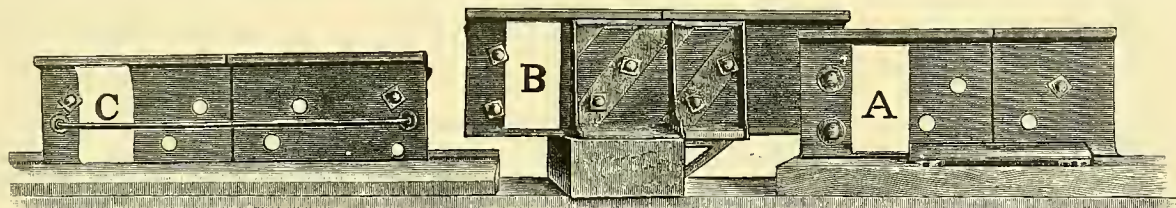
**TEST IN THE SAME CURRENT AT THE DREXEL INSTITUTE, OF VARIOUS BONDS, BY ARTHUR J. ROWLAND, PROFESSOR OF ELECTRICAL ENGINEERING.**

(General Results.)

	Average current passing (amperes).	Average resistance (Ohms).	Average Watts lost.	Average horse power lost.	Volts lost per mile.	Watts lost per mile (1 rail).	Horse power lost per mile (1 rail).
A. The Price bond.....	200.	.000042	1.71	.00229	1.50	301	.403
C. The Johnston bond.....	200½.	.000142	5.72	.00767	5.02	1,006	1.350
E. The Interlaced (3-wire).....	200.	.000119	4.78	.00643	4.20	842	1.130
D. The Technic bond.....	200.	.000047	1.88	.00252	1.65	331	.443
B. The K joint, without copper.	200½.	.060039	2.38	.00319	2.09	418	.562

in cast-iron foot pieces, to hold the bonds to place, one on each side of the two rails, and the K joint without copper. I append the readings :

determined to abandon the cable system on its Broadway line and would substitute an underground electric system. Persons who are informed



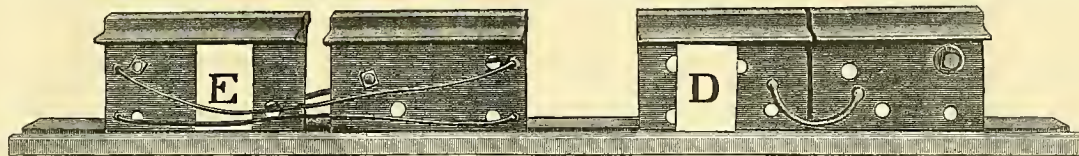
A PRICE BOND—B. K. JOINT WITHOUT COPPER—C. JOHNSTON BOND.

inclosed altogether within the jaws of these joints, by driving up. As the jaw has the effect of a double inclined plane, it will hold all it gets of pressure, when spiked and bolted. It will be seen that the copper is thus compressed firmly between two stout surfaces of iron and steel, with large and excellent contact with each. The electric current is, therefore, not asked to traverse a slender

(A). The Price bond on each side of the rails, encased in a thin, gray casting, which cannot be driven up. The castings have no contact with the rails except through the bonds.

(A. J. Rowland examined the interior contact of these bonds with the rails after the test, and ascribes to them one-eighth of the entire contact which can be had with these bonds).

regarding the cable system in New York promptly discarded the report as incorrect, but the statement was thoroughly believed in other quarters, and was commented upon as an announcement of considerable significance by some of the financial journals. The incorrect report originated, without a doubt, from the fact that the company is about to install the Siemens & Halske conduit system on



D TECHNIC BOND—E INTERLACED BOND.

copper rod, embedded in the earth, and with a very small contact at either end with the rail. It is also not exposed to the danger of electrolysis from the action of the salts of the damp earth, under the influence of a steady current of electricity, upon the copper of the bond and the iron of the rail at their point of junction. Neither is it so placed as to become a source of damage to the adjacent water and gas mains and supply pipes in the towns and cities. A recent test of this bond in comparison with others, each without its joint plates, will be found of interest.

(B). Joint K without any copper, the pieces of rail and the joint plates alike rusty, before driving up; without cleaning.

(C). The Johnston bond, attached to the rails by the Car Equipment Company, 1/16 of an inch thick and 27½ inches from insertion to insertion.

(D). The Technic bond, furnished set up by Pepper & Register; 1/8 thick, and about 8¼ inches from insertion to insertion.

(E). The interlaced or three-wire bond, furnished set up by Pepper & Register. No. 0 wire, the three averaging 30½ inches in length.

A further test will follow, including the K joint and The Little Giant joint (each with its jaw so

the Lenox avenue line. If the experiment is successful and meets the expectations of the company the system will be introduced on other lines, but not in any place as a substitute for the cable. President Vreeland, of the Metropolitan Traction Company, speaks of the cable system as follows :

"There is no system of motive power in existence that we can use on our cable lines that is as cheap or as serviceable as the cable, and consequently we have no idea of changing it. Where traffic is light or moderately heavy, electricity is all right; but when you are called upon to handle such an enormous traffic as exists along our Broad-



way line the cable is the power. The Siemens system of underground trolley has yet to demonstrate its value, and we will give it an exhaustive test so as to show its worth in all kinds of weather and under all conditions. If satisfactory, as we believe it will be from what we have already seen of its operation, we shall equip our new up-town lines with it; but we have no idea in substituting it for our present cable system."

**WILSON AUTOMATIC SWITCH.**

A patent has just been issued to Charles F. Wilson, of Brooklyn, on the improved street railway switch, which is represented in the accompanying illustrations. The mechanism by which the switch is operated from the approaching car is simple but effective. The construction is such that there is no liability that the parts will be injured by street traffic. Fig. 1 shows how the mechanism operates the switch. To the body or platform of the car is fixed an operating arm which may be lowered or raised by the motorman or gripman. If when the car approaches the switch the motorman wishes to operate it, he drops the operating arm. When the car wheel engages the bearing piece, as is shown in Fig. 1, the latter is depressed and a lever is thrown up in front of the operating arm. By means of a connecting rod and crosshead the

the audience is entirely ignorant, both of the nomenclature and principles of applied electricity, but is anxious to gain a foothold, as it were on the science. To this end he has avoided the use of all technical terms except such as necessarily form the very alphabet of the science and these have been met boldly. The principle being followed, however, of first explaining by simple experiments, such as are readily within the scope of a child of 15 years, the phenomena themselves and then assigning to the phenomena their proper names.

In the study of a new language, a new science or a new branch of mathematics, it is the first principles that are almost always the most difficult to acquire. Few of us probably recall the task it was for us to learn the alphabet of our own language. More of us will remember the difficulty experienced in acquiring the multiplication table, and all who have pursued the higher mathematics will remember how, after passing through algebra, geometry and trigonometry, they were perplexed by the very rudiments of the differential calculus. As each step was taken the mind had to be pre-

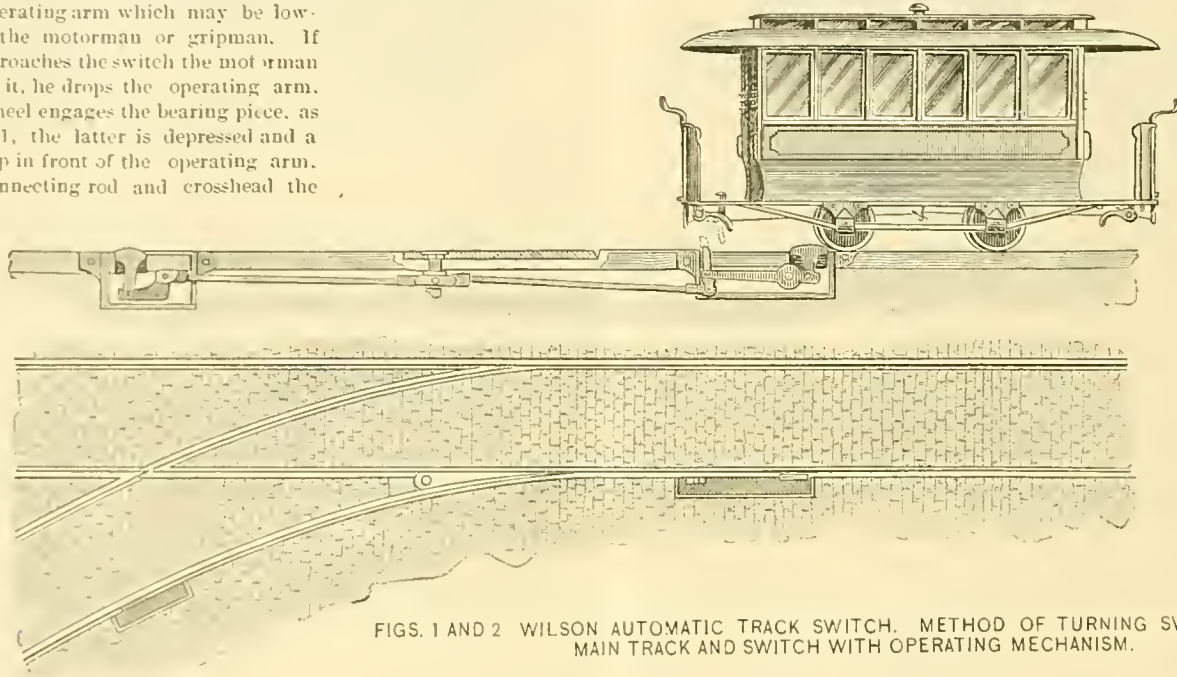
pared for the new study by means of analogies which, though never exactly true, enabled the mind to grasp ideas approximately correct only, but which served as stepping stones to other ideas which approached more nearly the truth. In this work free use has been made of analogy, but by extending the analogies over a somewhat extended range, and by making use of some which are believed to be new, it is thought that the ideas inculcated by them will be as free from error as is possible under such circumstances.

The author has insisted upon a full understanding of Ohm's law—the fundamental law of the flow of currents—as a prerequisite to a farther understanding of the subject. This law, however, is not sprung at once upon the student, but is led up to by the series of simple and inexpensive experiments before referred to, in the performance of which the student at last finds himself surprised that he has not only practically worked out for himself, but has actually constructed an elementary dynamo and motor for himself, together with instruments for measuring electrical currents. The law is then enunciated and further illustrated by a number of concrete examples involving only the simplest mathematics, but at the same time practically covering every problem in electrical distribution by direct current that the electrician is ever likely to be called upon to solve. The extreme simplicity of these operations—all depending upon Ohm's law—will doubtless be a revelation to most of those for whom this book is intended.

The dynamo and motor are treated as one and the same machine, as they really are, and it is shown that they all, of whatever type, are built upon exactly the same principles, and these are explained and developed from the simplest forms by the aid of numerous cuts and diagrams leading up to the finished multipolar machine of to-day. The intricacies and refinements of the completed machines are, however, avoided as tending in a book of the scope of this one to undesirable confusion. The theory and in fact of speed control of railway motors are treated in a comprehensive manner as seemed desirable—the aim being always to explain the why and wherefore of a given arrangement, rather than to describe in full a specific device. Following this comes a brief description of the power electric railway systems which promise to come into more or less general use, but which are not now generally known to the lay public.

Thus far it is believed that the book will be of service to others than motormen—that it will be of interest to the large class of intelligent Americans who desire to acquire a somewhat definite knowledge of this mysterious agent that they see working around them daily—who wish to know something more definite of electricity, either with the view of taking up its study more systematically in the future, or for the purpose solely of getting a more intelligent idea of its workings.

The last part of the work is devoted to directions for the care of street-railway motors, the detection and remedy and prevention of their faults. These suggestions come from a most extended and varied practice, not of the author's alone, but of other engineers, and of the manufacturers of the motors themselves. This portion of the book is especially intended for those whose business it is to handle the motors. The author hopes that this portion of the book will be found particularly useful to those for whom it is intended, by reason of the fact that



FIGS. 1 AND 2 WILSON AUTOMATIC TRACK SWITCH. METHOD OF TURNING SWITCH TONGUE. MAIN TRACK AND SWITCH WITH OPERATING MECHANISM.

switch tongue is then thrown. When it is not desired to operate the switch the operating arm is not lowered. Then the switch tongue is not moved, for while the lever is lifted when the bearing piece is depressed, it does not strike the operating arm.

After the switch has been turned it is reset in its original position by the action which takes place when the car wheel strikes the second bearing piece in the box at the left.

This bearing piece is similar to that in the box at the right with rounded surface, so that it can be gradually depressed by the wheel.

Fig. 2 shows a plan view of a portion of a main track and switch with the boxes at the side of the track containing the switch operating mechanism.

**ELECTRIC MOTORS: THEIR CONSTRUCTION, OPERATION AND MAINTENANCE.**

The appended extract from the preface to "Electric Motors: Their Construction, Operation and Maintenance," by Nelson W. Perry, E. M., will give somewhat of an idea of the scope of the work and of the manner in which the topics are treated. The book, which will be published by the STREET RAILWAY GAZETTE, will be ready for delivery by Oct. 1. The volume will contain about 250 closely printed pages, and will be profusely illustrated. It will be bound in stiff cloth covers of a size convenient for carrying in the pocket. The book will be mailed to any address on receipt of \$1.

The matter contained in the book first appeared as a serial in the STREET RAILWAY GAZETTE, beginning with the first issue in January and extending through the closing issue until that of July 11. The convenience of the serial was to provide for subscribers an interesting and elementary exposition of the processes upon which are founded the apparatus with which they are so familiarly conversant in their daily work, and which are called upon to handle. It has been assumed by the author that

pared for the new study by means of analogies which, though never exactly true, enabled the mind to grasp ideas approximately correct only, but which served as stepping stones to other ideas which approached more nearly the truth. In this work free use has been made of analogy, but by extending the analogies over a somewhat extended range, and by making use of some which are believed to be new, it is thought that the ideas inculcated by them will be as free from error as is possible under such circumstances.

The author has insisted upon a full understanding of Ohm's law—the fundamental law of the flow of currents—as a prerequisite to a farther understanding of the subject. This law, however, is not sprung at once upon the student, but is led up to by the series of simple and inexpensive experiments before referred to, in the performance of which the student at last finds himself surprised that he has not only practically worked out for himself, but has actually constructed an elementary dynamo and motor for himself, together with instruments for measuring electrical currents. The law is then enunciated and further illustrated by a number of concrete examples involving only the simplest mathematics, but at the same time practically covering every problem in electrical distribution by direct current that the electrician is ever likely to be called upon to solve. The extreme simplicity of these operations—all depending upon Ohm's law—will doubtless be a revelation to most of those for whom this book is intended.

The dynamo and motor are treated as one and the same machine, as they really are, and it is shown that they all, of whatever type, are built upon exactly the same principles, and these are explained and developed from the simplest forms by the aid of numerous cuts and diagrams leading up to the finished multipolar machine of to-day. The intricacies and refinements of the completed machines are, however, avoided as tending in a book of the scope of this one to undesirable confusion.

The theory and in fact of speed control of railway motors are treated in a comprehensive manner as seemed desirable—the aim being always to explain the why and wherefore of a given arrangement, rather than to describe in full a specific device. Following this comes a brief description of the power electric railway systems which promise

to come into more or less general use, but which are not now generally known to the lay public. Thus far it is believed that the book will be of service to others than motormen—that it will be of interest to the large class of intelligent Americans who desire to acquire a somewhat definite knowledge of this mysterious agent that they see working around them daily—who wish to know something more definite of electricity, either with the view of taking up its study more systematically in the future, or for the purpose solely of getting a more intelligent idea of its workings.

**FINANCIAL DEPARTMENT.**

**Eastern Stock and Bond Market.**

(From Our Wall Street Correspondent.)

The feature of the local market for street railway stock and bond issues during the week ending Sept. 12 has been the sudden augmentation of the investment demand for bonds of local street railway companies. It has freely been predicted in these columns in previous communications that the first class of securities to participate in any decided buying movement would be street railway bonds, by reason of the reputation, stability and security they have acquired with recent years or even months. Now that the big amounts of money that lay idle pending the settlement of the much vexed tariff question are seeking investment consequent upon the revival of business quickly following upon the removal of this disturbing outside influence, the demand for street railway issues has developed very large proportions, and threatens now to soon to deplete all brokers' stocks.

As a consequence of this active buying prices have been put way up; in some cases none better have ever been recorded. For instance, Bleecker street 7s of 1890 are quoted at 112½, the highest price known in years. Again, Central Crosstown 6s of 1922 are quoted at 120 bid, 121½ asked, the highest prices ever known to be paid for these bonds. Then any number of Broadway Consolidated 5s are being disposed around 110, at a rate that will soon make the supply far unequal to the demand. These are examples of the good that the revival of trade is doing for the street railway securities market.

Among shares Ninth Avenue has displayed unusual activity, and many buying orders have put the price up to 150. It is hard to see what attraction the stock offers at that figure, as at 150 it will net the purchaser less than 3½ per cent, on his investment, very little when compared with the



returns to be had on many other local street railway stocks. It may be that the present purchasers are looking for increased profits when the cable starts running. This is promised at an early date. The roadbed is all completed, and horse cars are temporarily running over the entire route. If the experience of other cable roads in New York proves anything, then there is big money ahead for Ninth Avenue, and people who can afford to wait are justified in buying the stock at present high prices. But to buy in hope of any immediate appreciation of values is futile.

Third Avenue has moved up to 187, just why is hard to tell, except that the stock is disposed to participate in the general strength current news regarding the company is hardly favorable. Mr. John D. Crimmins has begun on his own hook the laying of tracks on St. Nicholas avenue on the proposed extension of the Metropolitan Traction Company without waiting for any Aldermanic decision on the fight with the Third Avenue Railroad Company, and the confidence with which he is going ahead means practically that the whole matter is already cut and dried, and that the Metropolitan Traction Company will get all it asks for to the discomfiture of the Third Avenue people. Such is the general opinion.

The outlook is encouraging, and there is apparently big money ahead in all locally dealt in street railway issues.

#### Financial Notes.

**Rumored Consolidation in Philadelphia.**—The Philadelphia *Stockholder* says: The Street was considerably excited yesterday over reports connecting the Electric and People's Traction companies in a deal having for its purpose the consolidation of the two interests into a single system. One report had it that the People's company was to absorb the Electric, while another was to the effect that the latter was to absorb the former. Following these reports came confirmations and contradictions of them, and before the business day had ended the public was unable to know just what to believe. The *Stockholder* made a careful canvass of the situation, with this result: A consolidation of the two companies has been discussed by some of the directors of both concerns. In a measure it was informal, and while nothing definite has been decided upon, it was admitted that a consolidation was not unlikely.

**Syracuse Road Sold.**—The property of the Syracuse, Eastwood Heights & De Witt Railroad Company, estimated to be worth about \$35,000, was sold for \$350 at the sale of Receiver Charles G. Baldwin in the corridors of the Courthouse last Saturday. C. D. Beebe as trustee, was the purchaser. Mr. Beebe represented the newly incorporated company, the Syracuse & East Side Railroad Company, which has compromised with the creditors of the old road. The property of the road consists of the tracks; trolleys, right of way, cars, machinery, tools and real estate. The action on which the sale was made was that of Edward H. Jones et al. against the company.

**Sale of the Detroit Lines.**—The sale of the Detroit Citizens' lines was noted in the last issue of the STREET RAILWAY GAZETTE. It is reported that 6,015 shares were purchased by Thomas Nevins at 75. He turned over the shares to R. T. Wilson & Co. at a slight advance. The officers and directors of the new company are: Maj. J. M. Edwards, of New York, president; M. W. O'Brien, vice-president; R. T. Wilson, treasurer; D. M. Ferry, John C. Donnelly, R. T. Wilson, M. W. O'Brien, Cameron Currie, Maj. J. M. Edwards and F. R. Pemberton, directors.

**Earnings of the Broadway Road, New York.**—President Vreeland, of the Metropolitan Traction Company, is quoted as saying in regard to the Broadway road earnings: "They have shown improvement throughout the summer, and since the first of September the increase has been more marked. In fact, we are doing 10 per cent. more business now than we did in July and August. These months are the duller in the year for us. Our busiest season is in the winter months, and our earnings will unquestionably improve from this time forward."

**Denver Cable Company.**—The Central Trust Company of New York filed a bill in the United States Court this week asking for an order for the sale of the property of the Denver Cable Company, which has defaulted in the payment of interest on mortgages aggregating about \$1,500,000, and the appointment of a new receiver pending such sale. The property is now in the hands of W. E. Randolph, appointed receiver a year ago. He was formerly manager of the road.

**San Mateo Road (Cal.) Receivership.**—In his report to the Superior Court Receiver Sanford Bennett, of the San Mateo Electric Railway, states that during June the receipts of the road were \$18,694, and during July \$19,499. The expenses during these months were respectively \$16,252 and

\$16,148. Since the receiver has been in charge of the road the expenses have been reduced \$75 per day.

**Brooklyn Bridge Fares.**—The proposition that fares on the Brooklyn Bridge be reduced to two cents has been tabled. The majority of the trustees are opposed to any change from the two-for-five plan. The railroad receipts for August were \$81,084.03, which is \$2,774.05 less than the corresponding month last year.

**Sale of Oswego (N. Y.) Railway.**—The Oswego Electric Street Railroad was sold last week. The name of the purchaser was not made public, but the buyer is said to be the General Electric Company of New York, which holds a mortgage of \$110,000 on the plant.

**North Shore Electric, Chicago.**—The gross receipts of the North Shore Street Railway Company were about \$20,000 during August. The operating expenses were about 45 per cent.

### NEW INCORPORATIONS.

**Clinton, Ia.**—The Electric Railway & Park Company has filed articles of incorporation. The incorporators are: C. C. Coan, E. C. Walsh, A. L. Stone, M. A. Walsh, J. W. Walsh and A. L. Schuyler. The officers for the ensuing year are: President, E. C. Walsh; Vice-President, D. Langan; Secretary, C. C. Coan; Treasurer, A. L. Stone; Directors, E. C. Walsh, C. C. Coan, J. P. Calnan, J. K. Sweney, M. A. Walsh, A. L. Stone, George T. Baker, William Calnan, D. Langan, Murray Haywood, A. L. Schuyler and J. W. Walsh. The purpose of the company is to construct an electric railway from Main street, Evans, to Joyce's Park. The capital stock is \$50,000. It is expected the work will commence at once.

**Waukesha, Wis.**—The Pewaukee Beach Railway Company has been formed with \$75,000 capital stock by A. M. Jones, T. E. Ryan, W. P. Sawyer, Geo. B. Harris and P. J. Buckley. The company proposes to build an electric railway from Waukesha to Pewaukee.

**Lancaster, Pa.**—The Lancaster & Susquehanna Railway Company has been incorporated. The capital stock is \$100,000. The promoters are Jno. S. Grayhill, Lancaster, Pa.; Wm. B. Given, Columbia, Pa.; Horace L. Haldeman, Chickies, Pa.

**Chicago, Ill.**—The Chicago, Oak Park & Harlem Street Railway Company has been organized with a capital stock of \$50,000. The promoters are Jno. C. Schumacher, Jr., Frank Troost, Henry D. Schumacher, Jno. Gnaedinger, Gustav A. Pudewa.

### NEWS OF THE WEEK.

**Reading, Pa.**—Philadelphia capitalists have been negotiating for the past few days for the purchase of the franchise of the Perkiomen Turnpike Company from Reading to Pottstown. The matter is now in the hands of the Executive Committee—Wm. Arnold, of Reading; D. B. Mauger, of Douglassville, and F. M. Hobson, of Collegeville—and it is probable that the purchase will be consummated in a few days. A leading stockholder said: "The turnpike company is willing to sell out at par. It is capitalized at \$81,000." As to the object of the purchase, one of the interested parties said: "I understand that this is but another step toward a through electric railroad from Philadelphia to the coal regions. You know Philadelphia capitalists already control the electric railroads in Pottsville and Schuylkill County; they also control the electric railroads from Philadelphia to Norristown, and will soon run through to Royersford and Pottstown. It is only a question of a short time when they will run up from Pottstown to Reading, and thence north to the coal regions."

**Peekskill, N. Y.**—A company is being formed to build an electric trolley railroad through the principal streets of the village. The road will probably connect with Lake Mohegan, a favorite resort several miles out of town, and with the State Camp of Instruction. The men interested have ample capital. The directors are Charles E. Hammond, Dr. J. N. Tilden, T. D. Husted, J. W. Westbrook, Henry L. Armstrong, of Peekskill; A. E. Beach, E. B. Gallaher, G. D. Hiscox and B. J. Rogers, of New York. They have already purchased property for a power house and car sheds.

**Aurora, Ill.**—The residents of North View street have petitioned for a writ of mandamus to compel the Aurora Street Railway Company to operate its View street car line, which it abandoned last month. The residents claim that by permitting the company to lay its tracks on View street it acquired a right which it is bound to respect. They also claim that in consideration of 20 lots the company entered into an agreement to run its cars up View street to a certain real estate addition.

**Pottsville, Pa.**—At a special meeting last Tuesday of the Town Council of St. Clair, the franchise of the streets of that town was given to the Pottsville Traction Company, which will build

an electric road from Pottsville to St. Clair and over Broad Mountain to Gilberton, connecting with the network of trolley roads that are now in operation between Mahanoy City, Ashland, Spencetown and Girardville. The road is to be finished to St. Clair in 90 days.

**Brooklyn, N. Y.**—During the storm on Sept. 10 a large part of the ironwork on the new power house of the Nassau Electric Railroad, at the foot of Thirty-ninth street, was blown down. The workmen had all taken their departure before the accident occurred and the watchmen were at the other side of the building. The damage was estimated at \$8,000.

**Indianapolis, Ind.**—By an explosion of natural gas on Aug. 31 the West Washington street power house of the Citizens' Street Railway Company was damaged to the extent of \$20,000. Engineer Egan and Fireman J. H. Gallagher were struck by flying missiles and painfully, but not fatally, injured.

**Tarrytown, N. Y.**—Application has been made to the highway commissioners of the town of Greenburg by the White Plains, Elmsford & New York Railroad Company for the right to construct an electric railroad on the Tarrytown and White Plains road from White Plains to Elmsford.

**Des Moines, Ia.**—An action was recently instituted against the Des Moines Street Railway Company to annul its charter. The suit is brought by the city. It is alleged that the company has not performed certain acts prescribed by its franchises from the city.

**Toledo, O.**—The Toledo Electric Street Railway Company has decided to extend its asylum line over to Maumee and is now securing right of way to that town. This will give Toledo two lines to Perysburg and Maumee.

**Somerville, Pa.**—After two months of bitter fighting the Board of Commissioners of Somerville has granted the right of way through the main street of the town to the New York & Philadelphia Traction Company.

**Doylestown, Pa.**—After considering the matter several weeks the Doylestown City Council has voted to grant a franchise for an electric railway to the Bucks County Railway Company.

**Baltimore, Md.**—Work was begun on the Baltimore, Middle River & Sparrows Point Railroad last week. Several hundred invited guests were present when the ground was broken.

**Kansas City, Mo.**—Superintendent J. C. Klein, of the Elevated Street Railway Company, is causing extensive repairs to be made on all the branches of the system.

**Newark, N. J.**—Two experts have been employed to determine the damage to buried pipes caused by the action of electric currents leaking from street railway circuits.

**Lewiston, Me.**—Electric cars are now in regular operation. The electric railway was opened on Aug. 31.

**Omaha, Neb.**—The Dodge street cable road is to be converted into an electric line.

### PERSONALS.

**Mr. A. A. Wilson**, vice-president of the Metropolitan Street Railway Company, of Washington, has been acting as president since the death of Mr. Wm. J. Stephenson. A number of names have been mentioned in connection with this vacancy, and among these is that of Samuel Phillips. He is one of the large stockholders of the road, and, as is well known, has had large experience in the management of street railroads. He was for some time president of the Washington & Georgetown Railroad.

**Mr. David W. Dunn** has resigned his position with the Beggs Machinery Company, of New York, to accept a position with the Fort Wayne Electric Corporation. He will be connected with the Boston office, 17 Federal street, under the watchful care of Mr. E. I. Garfield.

**Mr. F. P. Little**, of the F. P. Little Electric Construction and Supply Company, of Buffalo, N. Y., was in New York a short time this week and left for a much needed rest and vacation in the Jersey woods, near Sparta.

### TRADE NOTES.

**E. W. Bliss & Co.'s** European business has been very large, as they have shipped to Switzerland within the last two months a special watchmakers' drop hammer and several punching presses fitted with sub-presses for watchwork, also a No. 1½ toggle drawing dress. A large shipment has been made to Germany, to one of the largest clock-making concerns in the world, of tools and machinery for the manufacture of clocks and their cases. France has received a large shipment of tools for the making of granite enameled ware and kitchen utensils. Several watch factories have



also been supplied with tools. Austria has not been behind the others, as it has received a No. 14 and No. 34 toggle drawing press and Nos. 18, 19, 20 and 21 adjustable power presses and Nos. 33½ and 39 power presses with a number of dies, and a No. 161 double action press with dies and special feed for making primers. A large improved automatic perforating press is now nearly completed and will be shipped to England for the manufacture of perforated metals up to 50 inches in width. This speaks well for American tools in competition with those of foreign make, and the firm is greatly encouraged in this direction.

**Mather Company's Motors.**—In a recent test made by a prospective purchaser of a 3 H. P. Manchester type motor, built by the Mather Electric Company, of Manchester, Conn., it is stated the phenomenal efficiency of 92 per cent. was obtained. Manufacturers of electric motors as a rule claim from 80 to 85 per cent. efficiency for their motors, and the Mather Electric Company determined to bend

every effort toward turning out a motor of far greater efficiency. The general design of the well known Manchester type was followed, and mica insulation was used exclusively. The fields are of cast steel, while the base, sub-base, etc., are of cast iron, with the result, as the company states, that the motor is much lighter for the output than any motor on the market. The armature shaft is very large in diameter, doing entirely away with springing of the shaft. This motor has been thoroughly tried, and has given great satisfaction.

The Pennsylvania Railroad Company calls attention to the superior service and fast schedule in effect by its lines between New York and Atlanta. Reduced rates have been made for those intending to visit Atlanta to attend the American Street Railway Convention, Oct. 17 to 20, and special cars will be assigned for their accommodation leaving New York Oct. 15. Information can be obtained from Samuel Carpenter, Eastern Passenger Agent, 1196 Broadway, New York.

The Berlin Iron Bridge Company, of East Berlin, Conn., is building a large addition to the machine shops of Henry R. Worthington, at Brooklyn, N. Y. The same company has received the contract for an annealing room building for the Naugatuck Malleable Iron Company, at Naugatuck, Conn. The building is 94 feet wide and 175 feet long, with brick walls and iron roof trusses covered with corrugated iron.

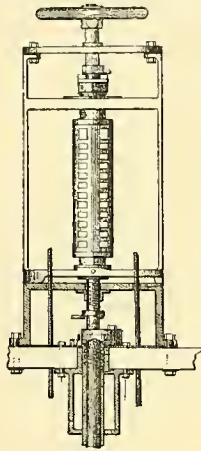
J. Holt Gates, 1139 and 1140 Monadnock Building, Chicago, Ill., general Western agent for the Mather Electric Company, is prepared to furnish complete estimates on all kinds of electrical transmission, including mining, factory and railway work.

Jenney Electric Motor Company, of Indianapolis, has decided to move its works to Springfield, O. The Board of Trade in the latter place made the company an offer of a cash bonus if it would remove its plant to Springfield.

## RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Aug. 28, 1894.

**525,336. Controlling Device for Electric Railway Cars;** William H. Conrad, Lebanon, Pa., Assignor of two-thirds to Jacob M. Shenk and William P. C. O'Brien, same place. Filed Jan. 8, 1891. The shaft is provided with means for turning on and off the current and a revoluble sleeve is secured to it. A ratchet

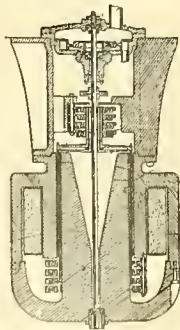


No. 525,336.

wheel is secured to the sleeve. A pawl is provided and there is an arm on the shaft to release the pawl and a brake-chain attached to the sleeve. (See illustration.)

**525,353. Dynamo-electric Machine;** James F. McElroy, Albany, N. Y. Assignor to the Consolidated Car Heating Company, Wheeling, W. Va. Filed Jan. 10, 1891. A series of electro-magnets is secured within the annular dynamo frame and is provided with radially inward extending cores placed at equal distances apart. A magnetizing circuit connects the coils of the alternate magnets and forms alternate positive and negative field magnets, and a generating circuit connects the coils of the intermediate magnets. A series of magnetically insulated armatures is mounted upon a revolving shaft, and each is provided with two radially extending poles corresponding in size with the poles of the electro-magnets adapted to magnetically connect the poles of two adjacent magnets simultaneously in all the armatures.

**525,354. Electrical-Current Director;** James F. McElroy, Albany, N. Y., Assignor to the Consolidated Car Heating Company, Wheeling, W. Va. Filed July 1, 1891. This is a method of producing direct from alternating currents, and consists in directing the alternating current through separate oppositely extending branches of the alternating current circuit and creating an opposing



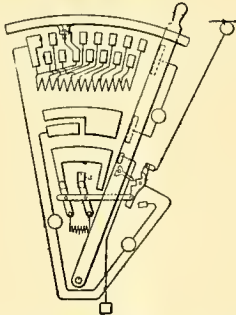
No. 525,350.

resistance alternately at opposite points of the branches and finally directing the current from one branch through a main line circuit and back through the other branch.

**525,390. Steam-Turbine Dynamo;** James F. McElroy, Albany, N. Y., Assignor to the Consolidated

Car-Heating Company, Wheeling, W. Va. Filed Dec. 19, 1893. The fourth claim reads as follows: "4. In a steam turbine dynamo, the combination of a hollow base, an electro-magnet mounted thereon vertically on its axis and forming a field of force concentric with said axis, an armature, an armature shaft flexibly carrying said armature in its vertical axis of rotation, a bearing for the upper end of said shaft and a steam turbine mounted in the hollow base and having the shaft of its rotating steam wheel united with the armature shaft." (See illustration.)

**525,394. Controller for Electric or Other Motors;** Elmer A. Sperry, Cleveland, O., Assignor to the Sperry Electric Railway Company, of Ohio. Filed July 21, 1891. Means are connected with the operating handle for varying the electric conductivity of the circuit. There is another and separate operating handle and means also connected with it for varying the conductivity of an electric circuit, each handle having a zone or position known as its critical position. The arrangement is such that by manipulation of either handle to or from such critical position the conductivity

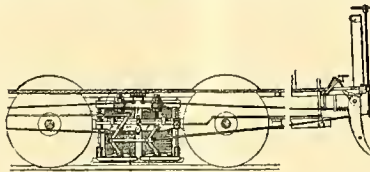


No. 525,395.

is gradually increased or decreased. There are interlocking devices between the handles whereby either is locked when the other is out of said critical position.

**525,395. System and Apparatus for Control of Electric Machines;** Elmer A. Sperry, Cleveland, O., Assignor to the Sperry Electric Railway Company of Ohio. Filed July 21, 1891. Means are provided for gradually increasing the current in the motor circuit from up to some predetermined point, and for then decreasing the counter electromotive force at constant speed of such motor and simultaneously decreasing the current flowing in the motor circuit as compared with that flowing previous to said change in the counter electromotive force, and means whereby the current in the motor circuit may be gradually increased from this point. (See illustration.)

**525,380. Electric Railway System;** Francis B. Badt, Chicago, Ill. Filed Oct. 22, 1892. A motor transformer on the car is adapted to be operated by an external multiphase supply circuit, one or more direct



No. 525,385.

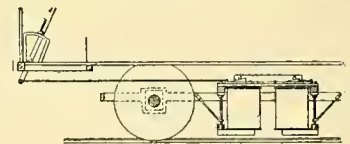
current motors are attached or geared to the vehicle axle or axles. Devices are provided to make or break the circuit to the direct current motor and to regulate the speed of the motor, and devices located in the circuit connecting the transformer to the direct current motor or motors.

**525,505. Electromagnetic Car-Brake;** Robert T. Murray and Charles M. Allen, San Francisco, Cal. Filed Oct. 24, 1891. The brake consists of vertically moving brakeshoes adapted to form contact with the line of rails, and an electromagnet which carries the brakeshoes and moves with them. Independent coils surround the core of the magnet, said coils being connected in series, and with switch plates arranged about a center. A lever is pivoted at this center and is movable to make connection between the various pairs of plates whereby the power of the magnet is increased, diminished or destroyed. (See illustration.)

**525,516. Car Fender;** Thomas Ross, Westerly, R. I. Filed March 8, 1891. The fender is composed of an upright member and a pilot member pivotally secured together, each being formed of strips of spring metal, the strips of the upright member curving over at the top and being furnished with roller bearings at their ends.

**525,523. Electromagnetic Traction Device;** Charles M. Allen, San Francisco, Cal., Assignor of one-half to Robert T. Murray, same place. Filed Aug. 22, 1893. The device consists of an electromagnet or magnets vertically movable toward and from the rails, movable inclined planes engaging the magnet or magnets for raising them, the latter being depressed by gravitation, or attraction when energized. (See illustration.)

**525,533. Car Brake;** Edward Cliff, Newark, N. J. Filed April 2, 1891. A pair of toggle arms is pivoted to



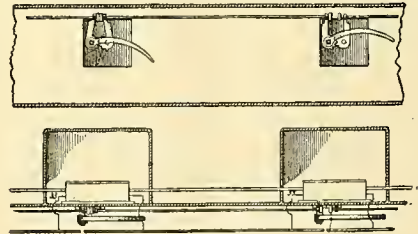
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each end of the brakebeam and a brakeshoe on the end of each of the said toggle arms, suitable means being provided at each end of the car to raise the brakebeam to apply the shoes to the wheels.

**525,539. Conduit Electric Railway System;** Oscar A. Enholm, New York, N. Y., Assignor to W. Dean Smith, same place. Filed April 17, 1894. The system comprises a main conductor, an auxiliary conductor composed of separate or insulated sections and switch mechanisms for connecting said sections with said main conductor. The switch mechanisms comprise contacts connected with the conductor sections, and a contact is connected with the main conductor. There is a movable contact for closing the circuit between the main conductor and two conductor sections. A crank or arm is connected with said movable contact and another crank or arm is operated conjointly with the first mentioned crank or arm. There is a lever or arm for actuating the cranks, and rods connecting the opposing cranks of succeeding switch mechanisms whereby when one switch is operated to close the circuit, another switch will be operated to break the circuit through it. (See illustration.)

**525,590. Street Car Track;** Ferdinand E. Canda, New York, N. Y. Filed Feb. 1, 1891. The supporting spring comprises an elliptic spring and a coil spring located one above the other. A follower is arranged on top of the upper spring and is adapted to rest on the lower spring when the upper spring is compressed to its full capacity. There is a hollow vertical column stand in which the follower has guided movement.

**525,592. Car Fender;** Henry W. Eaton, New York, N. Y. Filed Feb. 21, 1891. The frame is adapted to project in front of a car, and has an upwardly extending netted or covered frame hinged at its lower edge to the front end of the first frame to swing rearwardly and



No. 525,539.

downwardly when struck, means are provided for preventing the frame from swinging forwardly and downwardly, and a net extends from the hinged edge of the upwardly projecting frame over the first frame, and is provided with means for connecting it to the front of the car.

**525,598. Overhead Switch for Trolley Wires;** Hugh M. Greenwood, Brooklyn, N. Y. Filed Dec. 1, 1893. One of the wire arms is adjustably connected, whereby its position can be shifted to adapt it to the wires of the trolley line.



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Atlanta Street Railway Convention. Everything points to an exceptionally interesting convention of the American Street Railway Association in Atlanta next month. Certainly there is no lack of transportation facilities, and in all probability the attendance will be unusually large. Manufacturers are taking an unwonted interest in the exhibit of street railway apparatus, and if their statements are to be depended upon this feature of the meeting should far surpass all previous exhibitions.

Syracuse Street Railway Convention. A large part of our space this week is devoted to a report of the Syracuse Street Railway Convention, which was a meeting of more than ordinary interest. The attendance was larger than usual, though, in comparison with the number of companies in New York State operating street railways, the representation was small indeed. The relatively small attendance at some of the meetings of the State associations is exceedingly unfortunate. Legislation hostile to street railways is likely to be considered in all the great States, and the companies ought to be in a position where they can make their opposition to unfavorable laws as effective as possible. If all the companies in New York, for example, were organized into a strong association they could make a much more formidable resistance to legislation than is now possible. The papers at Syracuse were excellent. The long expected paper of Major G. W. McNulty on "Recent Improvements in Cable Traction" was presented, dealing with the solutions of the varied problems in the construction of the Broadway road, New York. The paper of Mr. J. B. Craven, which appears in this issue, was one of unusual excellence. The author viewed the matter of economy in power stations from the most practical point of view, and a number of his suggestions will prove, if adopted, of no little value. One point which he emphasizes is not new by any means, but it is always worth noting; this is, the utter folly of hiring cheap labor to take charge of expensive power plants.

The Trolley Current Much has been written from for Farm Purposes, time to time of the great advantages that would accrue to the farmer by the substitution of the electric motor for manual methods, treadmills, animal power, or the patronage of itinerant steam engines. This has all been very well, but where is the farmer to obtain his current? One might as well recommend a diet of champagne and terrapin to the pauper poor. Such a diet would doubtless meet the approval of the latter, but how is he going to provide it? The rapid extension of the trolley lines into suburban and country districts seems to open a way to the farmer by which he may avail himself of the hundred and one benefits which follow in the wake of the electric current. It would seem also that the railway companies might find it profitable to encourage this use of the current by supplying power from their feeder wires to consumers along and near the lines of their roads. It may be a little early for such a step just now, for the reason that not much farming land has as yet been brought

within reach of the trolley, but with several long inter-urban roads now proposed or in process of construction the conditions will be changed, and a profitable business with farms lying within two or three miles of these roads may well be considered among the possibilities, and as worthy of the attention of both parties in interest. One of the most valuable aids to the farmer would be the arc lamp, which would enable him to convert night into day during harvest time, when oftentimes a few hours of time, more or less, mean the saving or loss of a crop. Pumps also might be operated during seasons of extreme drought, for the purposes of irrigation, and thus in a measure make the farmer independent of climatic conditions. Is this not a field that both the farmer and the railway company will do well to cultivate?

Attacks on New York Surface Lines. One of the New York daily newspapers has been engaged of late in attacking systematically the surface lines of the metropolis. Some of the roads are by no means perfectly managed, but they do not deserve the wholesale abuse that is daily heaped upon them. It is not an easy matter to point out the way in which surface transportation in New York can be bettered when there is no possibility that the overhead trolley system will be permitted, and the complaining paper suggests no improvement. It simply confines itself to attacks, which are made as sensational as possible, and from which nothing useful can be learned. It goes without saying that much of the criticism is ridiculous, and that street railway managers are not the avaricious and bloodthirsty wretches that are described. The paper has attacked not only the lines in the city, but suburban electric roads come in for their share of condemnation. The speed of the cars on the latter has recently been criticised by one of the hysterical women that regularly contribute idiotic special articles to the paper in question. The following sentence illustrates the style in which the speed of the electric cars is described:

"Onward, with noise and dust, and the wild clangor of the alarm bell ringing out on the night air, we plunged, ever forward."

It is a satisfaction to realize that such twaddle as that contained in the article does not impose on people who know something about the trolley system. Here, for example, is what the *St. Louis Republic* has to say by way of comment: "Such sensational nonsense as this is ever to be found in the Eastern papers. Some of these editors ought to come into the West and learn of the comforts of the street railroad system—chiefly of the trolley car brand—that we have here in this city of biggest and best things. The trolley cars of St. Louis are not deadly, and the service that they offer is well-nigh perfect. A car may kill a man if he lies down on the track and gets run over; but even if he were foolish enough to do such a thing the chances are that the motorman would stop the car before harm was done. The Mississippi River and the Atlantic Ocean are dangerous things, but they have their uses. Everything is dangerous to people who don't use eyes and sense. The trolley is much less dangerous than buggy horses. The East will shiver a year over dreaded dangers and then drop into the procession."



**DENVER CITY CABLE RECEIVERSHIP.**

In the last issue mention was made of the fact that a bill had been filed in the United States Circuit Court by the Central Trust Company of New York asking for a foreclosure of the mortgages against the City Cable Company of Denver, and for a sale of the property. The case cannot be heard until the November term, and it is not likely that a final disposition of the matter can be made until the first of the year.

The Cable Company was placed in the hands of Cornelius S. Sweetland and George E. Randolph as receivers Nov. 10, 1893. This was done for the purpose of preserving the property and preventing attachments being levied by general creditors.

The complaint now filed is to secure a sale of the property to satisfy mortgage bonds amounting to nearly \$5,000,000. The recitals are made at length as to the issuance on July 1, 1888, of \$3,581,000 in bonds, secured by mortgage, and the general mortgage bonds of June 1, 1893, in amount \$919,000. There are no funds, the complaint states, in New York or elsewhere, to pay the installments of interest, and on August 30 the trust company elected to make the whole amount of principal and interest due and payable. The amount due on the first mortgage bonds is \$3,795,860 and on the general mortgage bonds \$974,140, together with some interest which has not been computed in the figures given. The bill is sworn to by E. Francis Hyde, president and the petitioners ask for the appointment of receivers and an injunction.

**OHIO STATE TRAMWAY ASSOCIATION.**

The Ohio State Tramway Association will hold its annual meeting in Toledo next Wednesday, September 26. The members and visitors will assemble at the Beebe House in the morning, but it is hoped that the number will be so large that the local committee will be warranted in chartering a steamer. If so the sessions will be held on board the boat while a trip is made to and from



J. B. Hanna, Secretary and Treasurer Ohio State Tramway Association.

the Islands. The journey can easily be made in a day. The officers of the association hope to see a large number of representatives of Ohio street railway companies in attendance, as many questions of no little importance are likely to be discussed. Portraits of three of the officers of the association are presented herewith: President, Albion E. Lang, President of the Toledo Consolidated Street Railroad Company; Vice-President, W. F. Kelly, General Superintendent of the Columbus Street Railway Company, of Columbus; and Secretary and Treasurer J. B. Hanna, Secretary of the Cleveland City Railway Company, of Cleveland.

**DISTURBANCE AT MUNCIE, IND.**

In Muncie, Ind., last Sunday a great deal of excitement was caused by a conflict between the Citizens' Street Railway Company and the Warren Scharf Asphalt Pavement Company. The latter has several miles of work to put in in Muncie, and contracted to use but two squares of street at one time. The street railway company delayed the work because its new girder rails for the pavement were not received. A few days since the two companies engaged in a war of words which caused a



Albion E. Lang, President of the Ohio State Tramway Association.

bad feeling. The paving company claimed that it has been subject to heavy loss on account of the delay. The papers give the following account of the conflict:

This morning the paving company attempted to tear out the street cars tracks north of Main on Walnut street. Teams were driven on the track to stop the cars and Manager Hilligoss on a motor car attempted to clear the track by running into them. One team was knocked off, but a negro driving the next team hit Mr. Hilligoss with a couple of stones as he made the second run for his team. About a thousand men and boys who assembled at the scene cheered the workmen and before Mr. Hilligoss could get the car out the rails had been removed and it was ditched. The track and ties were torn out and the earth was carted away. The force of 50 men was then shifted north, but was met with a dozen cars which were placed there to prevent taking up the track. When a man began picking at the splice wires or rails a car would drive him off the track. Finally some of the cars were dumped from the track here and the force moved to the crossing of Main and Walnut streets on the public square. Bolts were knocked off the rails and the track was being demolished, when a car was rushed into the crowd.

Other cars came and were flying back and forth on the sidewalk crossings when the police interfered. Mr. Hilligoss ignored Superintendent of Police Miller's orders and one of the motormen ran the car into the officer, nearly killing him. The excited crowd that had grown to several thousands then yelled "arrest him" and rushed onto Mr. Hilligoss, two motormen and Superintendent Petty. Policemen soon took charge of the four men and hurried them off to the police court.

A restraining order was issued at 2 o'clock at the instance of the railway company and a lawsuit will follow. This evening Mr. Hilligoss attempted to destroy a fence, built across Walnut street at Main, by running through it with a car. He was thrown to the ditch and injured.

**NEW PRESIDENT OF THE METROPOLITAN, WASHINGTON.**

Samuel F. Phillips has been elected to the presidency of the Metropolitan Street Railway Company, of Washington, to fill the vacancy caused by the death of W. S. Stephenson. Mr. Phillips has had an extended experience in street railway work in Washington and New York.

**TROLLEY MAIL SERVICE.**

No matter what the change may be, a certain class of persons is bound to find fault with every innovation. Of late efforts have been made to enlist electric cars in mail service in cities, and the movement has met with enthusiastic approval on all sides. There was bound to be a fault-finder, however, and a correspondent signing himself Will Seton has sent the following curious communication to the New York World urging the Attorney-General to secure the indictment for treason of officers of street-railway companies engaging in mail distribution:

The postmaster of Brooklyn has entered into a contract with the trolley lines of Brooklyn by which the latter are to transport mail and become part of the Federal mail service. By this act the trolley lines of Brooklyn become absolutely independent of municipal or State control. They can call upon the Federal Government at Washington to protect them as mail carriers from the enforcement of any local regulation which they may not care to obey, and they secure immunity from any criminal prosecution under State law, for all prosecution must be in Federal courts, which have no jurisdiction in State matters. Any attempt by the city or State to interfere with them will be "interference with the United States mail."

This is not only a violation of their charter, but it is treason against the State of New York. It is "a combination of two or more persons by force to usurp the government of the State." A trolley company is an agency of the State, created by the State, for the transportation of passengers exclusively. It has legally no right of existence except by the will of the State. These Brooklyn companies have, without the consent of the State, entered into a contract with a foreign government—a government as foreign to the State as that of Germany or China—by which they undertake to transport freight under the laws of the foreign state and in violation of the laws of New York, and the foreign government agrees to protect them with its army and navy from any interference by the State. The trolley companies transfer their allegiance from the State to the Federal Government, and the latter aids and abets them in their rebellion.

Practically, the Federal Government declares war on the State of New York. It arbitrarily



W. F. Kelly, Vice-President of the Ohio State Tramway Association.

seizes its sovereignty over this transportation agency created by it, and defies the State to help itself.

There is but one way the State can help itself. It can punish with death any "two or more" persons holding stock in these companies, and the Attorney-General should act promptly in having any person engaged in this conspiracy indicted for treason.

**Tiffin, O.**—The Sandusky Valley Electric Railway Company has filed a petition for a franchise for a railway in Tiffin. The company was organized to construct an electric railway to connect Marion with Pool Clinton, passing through Upper Sandusky, Tiffin and Fremont.



## SYRACUSE CONVENTION.

### Meeting of the New York Street Railway Association.

#### List of Members and Visitors in Attendance —The Exhibits—Papers Presented— President Hasbrouck's Address.

The twelfth annual meeting of the Street Railway Association of the State of New York was held in the assembly room of the Yates, Syracuse, last Tuesday. President D. B. Hasbrouck, of New York, presided. The following delegates and visitors were present:

Belden, A. J., New York City.  
Blake, Henry W., *Street Railway Journal*, New York.  
Brady, Paul T., Syracuse Street Railway Company.  
Clark, J. P. E., Treasurer Binghamton Street Railway Company.  
Craven, J. B., Buffalo Railway Company.  
Cole, W. W., West Side Street Railroad Company, Elmira.  
Cicott, Frank X., Pettingell-Andrews Company, Boston.  
Coles, Stephen L., *Electrical Review*, New York City.  
Crossman, T. E., Official Stenographer, Brooklyn.  
Crowell, Howard H., General Electric Company, Syracuse.  
Derr, C. A., Superintendent Rochester Electric Railway Company, Charlotte.  
Evans, H. C., Johnson Company, New York City.  
Foote, Allen R., Washington, D. C.  
Forby, William F., Okonite Company, New York City.  
Foster, H. H., Dreher Manufacturing Company, New York City.  
Fuller, Charles M., Davis Car Shade Company, Portland, Me.  
Gleason, P. J., President Long Island City & Newtown Railroad, Long Island City.  
Granger, John A., New York Car Wheel Works, New York City.  
Gannon, W. P., Secretary Syracuse Street Railway Company.  
Harrington, W. E., Cutter Electrical & Manufacturing Company, Philadelphia.  
Hasbrouck, D. B., Vice President Metropolitan Railway Company, New York.  
Hooker, Thomas, Syracuse Storage Battery Company, Syracuse.  
Issertel, Henry G., H. W. Johns Company, New York City.  
Kimball, W. R., President Syracuse Street Railway Company.  
Lawless, E. J., American Car Company, St. Louis.  
Le Van, Jr., W. B., Brooklyn Car Works, Brooklyn.  
McNamara, John W., President Albany Railway Company, Albany, N. Y.  
Magee, Frank A., The E. S. Greeley & Company, New York City.  
Meachem, T. W., New Process Rawhide Co., Syracuse.  
Moffett, John H., General Manager Syracuse Railway Company.  
Mercur, R. J., New York Car Wheel Works, Buffalo.  
Peckham, Edgar, Peckham Motor Truck and Wheel Company, Kingston, N. Y.  
Porter, H. C., Syracuse Storage Battery Company, Syracuse.  
Rogers, J. Tracy, President Binghamton Street Railway Company.  
Richardson, W. J., Atlantic Avenue Railroad Company.  
Ransom, H. N., Consolidated Car Heating Company, Albany.  
Russell, F. D., Rochester Car Wheel Works, Rochester.  
Seely, John A., Complete Electric Construction Company, New York City.  
Taylor, John, Taylor Electric Truck Company, Troy, N. Y.  
Sharp, Edward P., Webster & Beach, Boston.  
Stedman, J. H., Rochester Railway Company.  
Stump, C. E., *STREET RAILWAY GAZETTE*, New York City.  
Underwood, A. H., Treasurer Auburn City Railway Company.  
Vestburgh, A. C., New Process Rawhide Company, Syracuse.  
Wiley, F. W., Standard Underground Cable Company, Boston.  
Wardwell, John S., President Rome City Railway Company.  
Wyman, Edward B., Central Electric Heating Company, New York City.

Young, Jefferson, Stilwell-Bierce Company, Dayton, O.

President Hasbrouck made the following address:

#### THE PRESIDENT'S ADDRESS.

*Gentlemen of the Association:* As we "ring up" another point on the annual "indicator" of our association, congratulations are in order.

Though we have, in common with our fellow-citizens, felt the pressure of the times during the past year, we have not had a blizzard to obstruct the roads for a week, nor have we had a "tie-up" to vex us and deprive us of revenue for a like period. We may follow the example of that good Dutchman who, when he had broken his leg, thanked the Lord that it was not his neck. The continued growth of our cities and towns has increased the demand for street railways, and it is our business to supply the demand.

The work of consolidation in many localities has gone on, by which many small companies have been merged into greater organizations, thus securing greater efficiency and economy in operation and a more satisfactory service to the public. That thousands of horses have been relieved by the tireless trolley, that thousands are given a rest by the substitution of the cable, is a matter of congratulation to every humanitarian. And "more to follow." What the next decade may bring forth none of us will venture to predict. We will endeavor to keep up with the times if the "powers that be" will permit us.

The "weary load" of taxation under which we labor has been so clearly set forth in the paper prepared by the Hon. G. Hilton Scribner and read before this Association at one of its annual meetings, that nothing can be said to add to its force. Measures have been taken to bring to the notice of the Constitutional Convention, now in session, the subject in which we are all so deeply interested. We think we are entitled to even-handed justice. All taxes should be equal and uniform in their ratio to the value of the property taxed. Our present constitution is absolutely silent on this important matter, and the Legislature might, if it chose, put the entire public burden on any class of either property or persons. We confidently rely upon the intelligence of the convention to give the subject a careful consideration.

The selection of this city as the place of meeting brings to the speaker a bit of reminiscence. He was born hereabouts. At the date of his birth the site of Syracuse, and a long distance east of it, was a swamp, covered with blackened stumps. Hardly called by its present name, it was better known as "The Five Corners."

The completion of the Erie Canal, in the speaker's boyhood, gave an impetus to various business enterprises, and the "Salt City" has grown to its present proportions. In the early days of the canal it was regarded by travelers as the perfection of speed and comfort to take a packet boat here at evening, and find yourself safely landed at Utica the next morning.

We boys were on good terms with the Onondaga Indians. It is related that one of their chiefs, when the "Six Nations" were a powerful confederacy, once illustrated his point by taking a bundle of sticks, and, after endeavoring in vain to break them combinedly, found no difficulty in doing so when separated. In the language of Bunbury, "The bearings of this observation lays in the application on it," viz., the street railway companies of the State should act in concert in all matters in which they have a common interest; and there is a way in which they can better protect themselves than by acting together as members of this Association. The motto adopted by the Dutch founders of our city of Brooklyn, "Een Draght Mactt Maght," which may be freely translated, "One pull makes a strong pull," ought to teach us a profitable lesson. Measures have been taken which, it is hoped, will induce every company within the bounds of the State to unite with us for the common good.

Allusion will doubtless be made in the report of the Executive Committee to one who has rarely, if ever, been absent from our annual gathering, but who, since our last meeting, has departed this life. Having known him from the beginning of his railroad life, and even longer, I am constrained to say that by the death of William Richardson we are deprived of a genial associate, as well as a wise and prudent counselor. Next to his immediate family, the speaker has felt a personal grief in the loss of an old and faithful friend.

An employee of the company of which Mr. Richardson was for a long time president once said of him: "He was a fair man. We could always get a hearing when we appealed to him." He took a paternal interest in those under him, to an extent not usual in great corporations, and which, if generally cultivated, would help to lessen the friction between employers and employed, and ultimately make the fact apparent that their interests are identical.

Finally, in giving place to the gentleman who

shall be selected to preside over your deliberations, let me repeat my congratulations on the measure of success which has attended us under so many adverse influences, and to express the wish that you may long continue to serve the public acceptably, and achieve at least a "living profit" to yourselves.

The Executive Committee presented its report, of which the following is an abstract:

The membership now consists of 30 companies, the highest number yet reached. The Forty-second street, Manhattanville & St. Nicholas Avenue Railway Company has withdrawn, but the Syracuse Street Railroad Company, our host on this occasion, and the Hornellsville Electric Railway Company have more than taken the place of the first named company, its officers having always manifested but slight interest in the welfare of the association. This fact leads us to remark that the officers or members who have been most interested in the success of the association have been those most intimately connected with its work, especially in legislative matters, which indeed is the essential reason of its existence.

We are glad to welcome to the Brotherhood of State Associations the Michigan Street Railway Association, just organized. We hereby extend the hand of fraternal fellowship. The Street Railway Association, of the State of New York, having grown to be a sturdy youth, assures the newcomer of his hearty goodwill for a vigorous life.

One of the main features of the work accomplished by the association is that of giving careful attention to street railway interests, during and following the annual sessions of the legislature. In order that the best possible care be taken thereof, the association has secured the services for the past three years of special counsel, in the person of Charles J. Bissell, Esq., of Rochester, N. Y. We hereby express our appreciation of his faithful, devoted attention to the interests of our business before the legislature and the Governor. The successful result has been in large measure accomplished through the assistance rendered counsel by the extensive membership of the association, the officer of a relatively small company often having greater personal influence with his representative than the man in the great city. "In union is strength," and the truth of the adage has found very satisfactory demonstration in the history of our society.

For this special reason, therefore, is your committee desirous of having every street railway company in the State, no matter how small the company may be, a member of the Association.

William Richardson departed this life Dec. 31, 1893, in the 75th year of his age. He had been actively engaged in the street railway business for the last 30 years, first with the Dry Dock, East Broadway & Battery Railroad Company, of New York, and afterward with the Atlantic Avenue Railroad Company, of Brooklyn, both companies members of this Association. At the time of his death he was the acting president of the former company.

He rose to a high place in the esteem of all who knew him. He was always present at the meetings of the Association, and took a lively interest in its welfare. From 10 years of age he earned his own living in the world, and by indomitable energy and high resolves secured the high position he occupied among his fellows at the time of his death. We shall miss his rare counsel in our deliberations, and we sorrow that we shall not look upon his kindly face again.

Henry W. Slocum died April 14, 1894, in the sixty-seventh year of his age. He had risen to great eminence during the Civil War, and was a major-general in the Northern Army, with a brilliant record. Shortly after the close of the war he became interested in the Brooklyn Crosstown Railroad Company, and was elected president of the company in 1866, which position he held until the sale of the road to the Brooklyn City Railroad Company. In 1889 he became president of the Coney Island & Brooklyn Railroad Company, holding the office until a few months before his death, when he was succeeded by his son, Henry W. Slocum, Jr.

General Slocum was a man among men; clear-headed, far-sighted, and withal a genial companion and friend. Those who had the pleasure of his acquaintanceship mourn a sincere friend.

Edward F. Drayton departed this life May 27, 1894. He was the secretary and treasurer of the Coney Island & Brooklyn Railroad Company, having been connected with the company since 1860. Of a retiring disposition, he lived a quiet life, faithfully serving the company of which he had been for so many years a highly esteemed officer. His death caused sincere sorrow to his many friends.

We shall greatly miss the faithful and true friends who have gone out from our companionship. The report of the treasurer showed that the receipts of the year had been \$5,860.09 and the expenses \$5,361.20, leaving the balance \$478.89.



J. B. Craven, electrician of the Buffalo Railway Company, read a paper on "Economy in Electric Power Stations," which is presented elsewhere in this issue.

George W. McNulty read a paper on "Recent Improvements in Cable Traction," which is printed elsewhere in this issue.

Allen R. Foote, of Washington, read a paper on "Taxation."

The following officers were elected:

President, J. Tracy Rogers, Binghamton.  
First vice-president, John H. Moffit, Syracuse.  
Second vice-president, William W. Cole, Elmira.

Secretary and treasurer, William J. Richardson, Brooklyn.

Executive committee, D. B. Hasbrouck, New York City; John N. Beckley, Rochester; Daniel F. Lewis, Brooklyn.

It was voted to hold the next convention in Albany.

In the afternoon the visitors were driven around the city and shown the various points of interest. An inspection was made of the new track being laid by the Syracuse Street Railway Company. In the evening a complimentary banquet was tendered to all in attendance, and was a pleasant affair, breaking up just in time to enable those living out of the city to catch their trains.

There was no attempt at a general exhibit, but the following companies showed models or samples in a parlor adjoining the convention room:

H. W. Johns Manufacturing Company, of New York.

The Noiseless Gear Company, of Baldwinsville, N. Y.

The Dreher Manufacturing Company, of New York.

The Billings & Spencer Company, of Hartford, Conn.

Davis Car Shade Company, of Portland, Me.  
Brooklyn Car, Wood and Veneer Works, of Brooklyn, N. Y.

Cutter Electrical and Manufacturing Company, of Philadelphia.

Peckham Motor Truck and Wheel Company, Kingston, N. Y.

Consolidated Car Heating Company, of Albany, N. Y.

Central Electric Heating Company, of New York.

#### NEW PUBLICATIONS.

**ELECTRICITY AT THE WORLD'S COLUMBIAN EXPOSITION.**  
By John P. Barrett, Chief of the Electrical Department.

This is an exceedingly handsome volume of about 500 pages. The illustrations are excellent, and the book is well printed on heavy paper. It is a matter of regret that the praise for the mechanical execution cannot be extended to the matter of the book. The descriptions of exhibits in their indiscriminate praise resemble paid reading notices, and too little pains have been taken with the proof-reading.

**ELECTRICITY ONE HUNDRED YEARS AGO AND TO-DAY.**  
By Edwin J. Houston, Ph. D. Published by the W. J. Johnston Company, New York.

This volume contains the text of a lecture delivered before the Electrical Section of the Brooklyn Institute.

**AMERICAN STREET RAILWAY ASSOCIATION.** Report of the Twelfth Annual Meeting at Milwaukee. Published by the Association.

The verbatim report of the last convention in Milwaukee should find its way into the reference library of every member of the Association.

#### VICTORY FOR GENERAL ELECTRIC.

The suit brought in the United States Circuit Court at St. Louis, before Judge Hallett, by the Adams Electric Railway Company against the Lindell Railroad Company, has been decided in favor of the defendant. The plaintiff sought to recover for alleged infringement of the patent granted to Wellington Adams in 1884, for the application of electric motors to the axles of railway cars. The suit was defended by the General Electric Company. In his opinion the judge said:

"None of the elements of the combination described in the claims was new at the date of the application; the motor and its several parts, the car-axle, the axle-boxes, the field-supporting frame and all other things mentioned in the claims were in use before that time. The form of some of the elements was changed in the Adams combination, but it is clear that none of them was new at that time. Upon full examination of the record and the very able arguments of counsel I am not convinced of the merits of the patent."

#### ECONOMY OF POWER-HOUSE OPERATION.\*

BY J. B. CRAVEN.

"Economy of Power-House Operation" has been so often and so thoroughly discussed that I do not know that I can say much that is new on the subject, and yet being one that must ever come up before the management of a street railway system, I feel encouraged to beg the attention of this meeting for a few minutes, that we may see how and where, with intelligent management and proper attention, the best results may be obtained on the most economical basis. Starting from the boiler-room, we come at once to the place where in most cases the greatest waste will be found. It has been said that the waste due to improper firing is often of greater consequence than any other loss which is produced in the operation of a steam plant. There are two causes for this: First, poor construction of the boiler. Secondly, poor firing and lack of care of the boilers. Most of us think that any man can fire a boiler, and while looking with awe and wonder at the engine and generator, forget that all the power comes from the coal pile, and pay little attention as to the economy in transmitting that power from the coal to the engine. No greater mistake is made than to place the care of boilers in incompetent hands, for they require the highest degree of care, conscientiousness and constant attention.

The fireman must be ever on the watch to see that the water is kept at the proper level, to keep an even steam pressure, and to show by his steam, coal and water records that he is getting just as good cards as the engineer can show by the manipulation of the steam he uses in his engine. He must see that the fires are spread evenly over the grates and are of an even thickness, that the proper amount of air is admitted into the furnace to obtain good combustion.

If you could realize how easily from 1 to 20 per cent. of coal can be shoveled into the furnace and up the chimney without generating any more power you would see how essential it is to have something more than mere machines shoveling coal into a furnace. Another point of importance is to see that boilers are kept clean and free from scale, which is simply the result of improper attention.

If for a moment you will stop and think that in the construction of the boiler the maker has reduced the thickness of the tubes as much as possible consistent with safety, and then look at a tube with from one-eighth to one-half an inch of scale on it, you will at once see how great the loss must be transmitting the heat through this scale; not only that, but it leaves the iron exposed to the effects of the heat without the proper circulation of water back of it, which causes rapid deterioration and in some cases is liable to cause an explosion. I have used quite a number of boiler compounds for the prevention of scale, but have found the best to be plain coal oil. We have used it in Buffalo for the past two years with success, putting about one pint a day into each boiler and letting it enter with the feed water by means of a sight feed lubricator. However no one remedy will fill all cases, and each must be the subject of some experiment. Another source of loss comes from insufficiently covered boilers and pipes; see that all exposed parts, that possibly can be, are covered with some good non-conducting material, and prevent as much as possible radiation and condensation. The steam pipe should be kept tight and all leaks followed up at once and stopped, and in this way have as little loss as possible between the boilers and engines. See that the piping is well drained so that water will not carry over to the cylinder of the engine. This is accomplished by separators placed as near to the engine as possible, and the water thus separated is returned to the boilers. In a good many cases this water is allowed to go to waste; if this is found to be the case it should be remedied, as this water is separated at a very high temperature, and requires very little heat to turn it again into steam. Before entering the engine room I would like to say something on the subject of feed-water heaters. If your engines are running non-condensing the question is very easily settled; as, however, the majority of steam plants are run condensing, other factors are brought in. In the power-house of the Buffalo Railway Company one seventh of the engine capacity is run high pressure. In this way, taking the feed water from the hot well at an initial temperature of 110 degrees, and passing it through two heaters in the exhaust line of the high pressure system, we get a final temperature of 194 degrees before the water enters the boilers. It is claimed by some that this method of taking the water from the hot-well is not right, on account of the oil to be found in this water. But so small a portion of the hot-well water is used that the amount of oil in it is small, and by

this method we do away with secondary heaters in the exhaust line, between the engine and condenser, and not only save in the first cost, but I think obtain slightly better results. However, one thing is important; whatever means are used to heat the feed water, it should be done, for not only will there be a great saving in fuel, but the straining of the boilers due to putting cold water in will be done away with.

Passing from the boiler-room we come to the engines and generators, and the types seen here will be many and varied from the high speed belt driven machine, to the slow speed direct connected machine, of large units, as you all know the tendency of late has inclined to the use of the latter type. In my mind there is no doubt of the efficiency of the direct connected unit over the belted one. It is evident to all that where space is valuable it has the advantage of taking up less room. They can be thrown in and out of service with as much rapidity as the belt-driven machine, there is a saving of from 1½ to 3 per cent, due to the slipping of belts—very little in itself, but when figured up at the end of a year in a plant of any size will amount to considerable.

Added to this, there is the saving in labor and the decreased expense due to wear and tear, as this item is less in slow-speed than high-speed machinery. For the above reasons I have drawn the conclusion that direct connected units are more economical than high-speed ones. Regarding the size of unit used it depends entirely on the output of the plant. I would advocate as large as possible, yet not so large that the breaking down of one would cripple the output. However, in plants that have not these latest types of machines, great saving may be made in the operating of the engines. In many cases, after the constructing engineer has left, engines are oftentimes supposed to look after themselves, those in charge simply supplying them with steam and oil. What I said in reference to the man in charge of the boiler-room applies with equal force here. Put a thoroughly competent man in charge and you will find it a paying investment. Intelligence and experience are the best safeguards and the real insurance against accidents. Fifty dollars a month more to a capable engineer will probably be repaid a hundred times by the care taken and the high state of efficiency at which the machinery is kept. In such a state an engine is a reliable piece of mechanism. If neglected it is liable to fail at any time, causing delays and worries and not only adding to the expense in the cost of repairs, but a loss in the receipts outside. A capable engineer will see that his engines are indicated at least once a month, to see that the valves are properly set, and so keep the steam consumption down to a minimum. All pounding, knocking and leaks should be followed up and remedied at once, and the engines kept in such a state as at all times to be ready to perform the severe service exacted from them. Always keep the load as near the normal capacity of the engines as possible, as engines at that point are most economical; besides, you will have fewer machines in service and thus save in the oil supply. Here I will say a little on the subject of oil, as I think quite a saving may be made at this point: in fact I had one engineer use \$640 worth of oil more in six months than another engineer used in the same time, and the engine capacity was increased during the time the last man was in charge. The lowest priced oil is not always the cheapest; some oils will go much further than others, and the question of what to use should be settled only by careful examination. After being used once it can be filtered and used again on the lighter parts of the machinery.

If rags are used for wiping instead of waste they can be washed and used again, and the grease and oil extracted will be found useful in some part of the system. By washing the rags (80% eighty per cent, can be saved over what the cost would be if only used once and thrown away. Coming to the generator we find a machine that is usually well made and efficient. Keep them dry and thoroughly clean and have the commutator kept as smooth as possible. The principal trouble will be found in the sparking of the brushes and the heating of the armature and field coils. The causes for these troubles are too many to enter into here, but on the appearance of trouble the machine should be stopped as soon as possible, for the old maxim, "A stitch in time saves nine," can be applied here. Of the minor electrical apparatus in a station, everything such as switches, connections, and all instruments should be kept clean and in working order, especially in the case of lightning arresters, as they may be the means of saving an armature.

In conclusion I would call your attention to the necessity of having ample copper in the outside lines, and the rails well bonded, and where the system is large enough put in return wires. What is the use of expensive and economical machinery in the power-house if you allow 20 per cent. of the power to be expended heating up poor connections in the return circuit?

\* Read before the New York Street Railway Association, Sept. 18, 1894.



THE DISCUSSION.

Mr. COLE : I would like to ask Mr. Craven if he would advise direct connected engines on small roads, of fifteen to twenty-five cars, where the load is variable.

Mr. CRAVEN : I think I should.

Mr. COLE : Would you advise using the idler, and giving your belt good surface contact on the pulley?

Mr. CRAVEN : Yes.

Mr. SEELY : You speak of injecting oil into the boiler : do you refer to crude or refined oil?

Mr. CRAVEN : Refined oil.

Mr. SEELY : Have you had any experience in the use of crude oil?

Mr. CRAVEN : I have not. If you put in the refined oil it reduces the scale from a hard substance into a slime, which is easily blown out ; and when we open the boilers, as we do once a month, we find probably one-sixteenth of an inch of hard scale that is broken off very easily. We can clean the tubes in most cases as clean as when they were first put in.

Mr. SEELY : Do you inject the oil as you operate the machinery?

Mr. CRAVEN : Yes ; we inject a pint of oil in the course of a ten-hours run.

Mr. SEELY : I have heard it spoken of highly ; but never heard any one who employed it express an opinion. Is it entirely satisfactory?

Mr. CRAVEN : It has given better satisfaction than anything we have had.

Mr. ISSERTEL : The report refers to a road of a certain size using a return wire. How large a road ; how many miles would you suggest?

Mr. CRAVEN : Well, that would depend upon the number of cars, more than on the length of the road ; but a road six miles long, with ten cars, I should say would require a return wire, as well as the bonding of the rail.

Mr. ISSERTEL : The bonding of the rail also, not simply a cross-bond?

Mr. CRAVEN : The bonding of each rail to the next rail.

Mr. ISSERTEL : How large a wire do you use?

Mr. CRAVEN : That has to be figured out. I should say a No. 0 for the bond itself ; but when you commence to put in return wire it has to be calculated according to distance and number of cars.

Mr. ISSERTEL : You believe in a large return wire under any circumstances, do you?

Mr. CRAVEN : It is brought down to a simple question of calculation. A current requires so much area to return on, and if you do not supply it, more power will be consumed getting the current back to the station.

the carrying capacity. As it is a matter of a great deal of expense to use the return wire, I do not see why the rail should not be sufficient.

Mr. CRAVEN : I understand it costs a great deal of money to put it in ; but if you do not put it in, and do not get sufficient capacity for the return current, you are going to use much more coal to supply the extra demands.

Mr. SEELY : Do you believe, in using return wire, that they should be put in conduits, or the rail bonded back in sections—do you think there is any saving in placing return wire in contact with the earth, or should it be tapped in every thousand feet and then returned in conduits? I think that is the ideal construction, but it is extremely expensive.

Mr. CRAVEN : In Buffalo we run an underground feeder system, and we are bringing our return wires through these conduits.

Mr. SEELY : By that system you have the advantage of the fall of potential from the station to the point of contact of the rail. There is a small loss between that point and the generator. Small roads could not afford that.

Mr. CRAVEN : In cases where they have no underground system, lay the wire in the ground.

Mr. SEELY : And not tap in on the pole?

Mr. CRAVEN : No, sir.

Mr. SEELY : It is entirely a question of sectional area ; it all comes down to that point.

THE SPERRY ELECTRIC BRAKE.\*

E. A. Sperry, of the Sperry Electric Railway Company, Cleveland, has so far perfected his electric brake that it may now be said to have entered the commercial stage. The West Twenty-second Street electric line, of Chicago, has just equipped one of its cars with the device, and has found it in every way satisfactory.

The brake consists of a magnetic clutch, operated by a current from the motor acting as a generator, and bearing against the polished surface of a flat disc cast upon the wheel. One wheel on each axle is thus equipped. Figs. 1 and 2 show the arrangement of the coil and also the shape of the clutch; the latter for the purpose of removing it from the axle if desired. The same handle operates both brake and controller. When the "off" position is reached, a switch is automatically thrown which cuts off the trolley current and makes such connections that at the first point of the controller

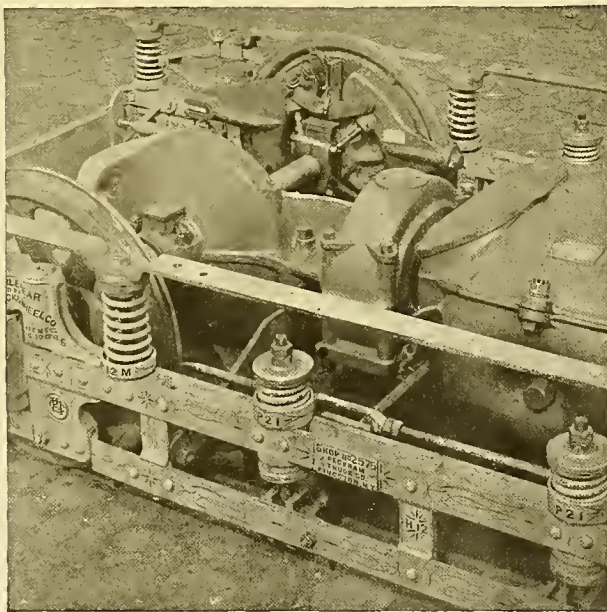


FIG. 3. SPERRY ELECTRIC BRAKE.

Mr. ISSERTEL : Yes, but with the rails they are using now, with two bonds, is it unnecessary to use return wire?

Mr. CRAVEN : They cannot do it, for the reason that you are carrying out of your station, say, twenty-eight feeders, with a cross-section all the way from a half-inch to an inch, and you cannot expect current to be brought back to the bonds, half an inch in diameter.

Mr. SEELY : The cross section of a ninety-pound girder rail has a capacity to carry back current equal to about 0000 copper wire.

Mr. ISSERTEL : That is the point ; and with four rails bonded together you would have four times

the motor and brake magnets are put in series with about 18 ohms resistance, when the motor "builds up" and sends a current through the brake magnets and resistance. When the controller is turned back to the "off" position it again trips a switch and throws in the trolley current. Fig. 3 shows the brake applied to a truck.

As soon as the wheels stop revolving the motor ceases to generate current, so that the slipping of the wheels is impossible. The stops are said to be

\* From the *Electrical Engineer*, New York.

remarkably quick and smooth, as the pressure of the brake is hardest at high speed, and is reduced gradually and automatically until the car stops.

QUESTIONS AND ANSWERS.

STRENGTH OF A MAGNET.

To the Editor of the STREET RAILWAY GAZETTE :

Not long since I wished to buy for experimental purposes a telegraphic relay, and upon asking the prices of the dealer, found he had several grades which he designated as high and low resistance relays—the former being the higher priced. He said the high resistance relays were the best, as their magnets were much stronger. It seems to me that if the coils were of high resistance they would take less current, and that therefore the magnets could not be as strong as they would be if the coils were of low resistance. Being in doubt about it and not really knowing what I did want, I concluded not to buy until I had informed myself. Can you help me in this matter?

N. K. W., Nashville, Tenn.

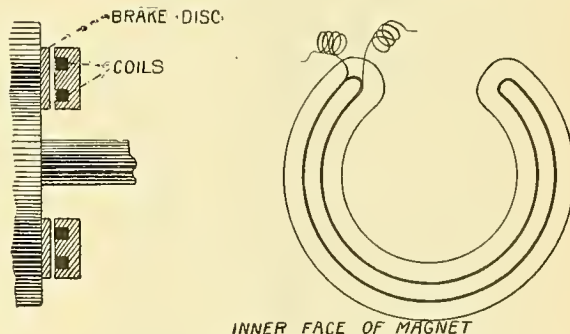
ANSWER.

The strength of a magnet is absolutely independent of the resistance of its coils, but is dependent, other things being equal, to the number of ampere turns. If you pass 100 amperes through a thick, heavy wire of one turn, it will give you the same strength of magnet as would be obtained by passing 1 ampere through a wire of greater resistance of 100 turns, or one-tenth ampere through a coil of 1,000 turns. You must, therefore, suit your magnet to the current at your disposal, or *vice versa*. In telegraphic work, where the current in amperes is usually very small, the number of turns in the coil must be large in order to give the requisite number of ampere turns. *Because* the current is small a small wire may be used, but the smallness of the wire has nothing to do with the strength of the magnet. A much larger wire having but a fraction of the resistance of the small one, but having the *same* number of turns, would, with the same current, produce the same strength. On the other hand, if you have a very large current at your disposal, as, for instance, in electric light circuits, a single turn of very thick wire would suffice. The ammeters in electric light and power stations are frequently operated by solenoids of but a single turn. The voltmeters, however, which are placed in shunt and intended to take but a very small fraction of the current, are purposely made of many turns of fine wire, and therefore of high resistance so that, while taking little current, they will have requisite strength.

FLASHING AT THE COMMUTATOR.

To the Editor of the STREET RAILWAY GAZETTE :

A car which was running last week began to flash violently at the commutator. I could not find what was the matter, and therefore reported it and was instructed to run the car into the car house. It has since gone to the repair shop, but I



Figs. 1 and 2. Sperry Electric Brake

have no means of finding out what the trouble was, because our superintendent will never answer questions of this kind. If we ask him he tells us it is none of our business, and that he will attend to it. I am anxious to learn the business thoroughly, and to know the reason for things. Will you oblige me by telling me what was the matter and how to cure it?

W. L. B.

ANSWER.

It is very unfortunate for the road with which you are connected that it has such a superintendent as you speak of. In Mr. Perry's forthcoming book on "Street Railway Motors: Their Construc-



tion, Operation and Maintenance," he pays his respects to men of this kind. He also treats at length of all such troubles as the one you speak of. We will be glad to step in between W. L. B. and his superintendent and supply all such information as is denied him by the one to whom he has a right to look for it. The description of the trouble in this case is not definite enough to enable us to identify it positively. It may be due to any one of three causes—high commutator bar, eccentricity of commutator, or broken circuit in armature. If the flashing continues to be bad when the motor is running very slowly, it is probably the latter, as the flashing will not occur in either of the other two cases at slow speeds. If the break occurs in the connections to the commutator bars, if it cannot be otherwise fixed at the time, a temporary remedy is to short circuit the broken coil in any convenient way. If the break occurs in the armature itself it will have to be rewound. Eccentricity or high bar may be detected by careful inspection. In case the trouble is due to eccentricity, the commutator must be turned off in a lathe. If due to high bar, the latter may be filed down.

#### TO PREVENT THE USE OF T-RAILS.

Three property owners in Philadelphia have just brought suit against the Philadelphia, Cheltenham & Jenkintown Passenger Railway Company to enjoin the latter from using T-rails.

The bill sets forth that the railway company is about to construct and operate a double-track railway, to be operated by the trolley system, from Rising Sun, at the intersection of Germantown avenue, to a point in the borough of Jenkintown. In pursuance thereof the company has begun the construction of its line at the southerly end, beginning at or near Nicetown lane, and is now laying T-rails from the point last mentioned to a point south of Branchtown, opposite the property of Owen J. Wister, one of the complainants, and has deposited along the side of the road a continuous line of the rails as far north as the toll-gate south of Ogontz.

The burden of complaint is that the only rail suitable for street passenger railways, and the one in common use and the only lawful rail, is the flat, or girder, rail, and that the kind of rail intended to be used by the company is not suitable for passenger railway construction, is not lawful for that purpose, and its use will present great obstruction to public travel along the line of the highway much greater than would be caused by the use of the ordinary flat or girder rail. It is averred that if the company is allowed to construct a double track railway, as it intends to do, its effect will be to exclude entirely travel in that portion of the public highway upon which the same is laid, and will prevent its use by the public in driving along and across the same with vehicles, and will greatly hinder and prevent access to the premises of the complainants and other property owners abutting on the road. It is asked that the company be enjoined by the Court from constructing any part of its line on the Old York road with the kind or style of rails known as "T" rails, or with any other kind of rails which will unnecessarily burden the said highway and place any unnecessary obstruction upon the travel thereon by the complainants and the public.

**Lockport, N. Y.**—The Common Council has granted a franchise to build and operate a street railroad to the Lockport City & Olcott Electric Railroad Company. The organization is composed of New York men and it will give a bond for \$10,000, to have the road in running order by April 1 next. The city turns over to the new company all the tracks and other property in the streets put there by the old company, which it is claimed has forfeited them to the city by the non-performance of its agreement to complete its undertaking by May 1 last. The property in question is estimated to be worth \$30,000.

#### RECENT IMPROVEMENTS IN CABLE TRACTION.\*

BY G. W. McNULTY.

##### PART I.

While the title of this paper is very general, it must be understood that the paper will be limited to a description of those improvements which have been embodied in the Broadway cable road of New York City. This limitation will perhaps appear reasonable when it is understood that the most recently completed road on the most important thoroughfare of the New World might naturally be expected to contain all the latest improvements. Indeed, in view of the writer's connection with the Broadway road from start to finish, he could hardly describe as an improvement something not used on that road without having to explain why it was not used—a task that might sometimes be awkward and occasionally invidious.

What, therefore, are considered to be more important improvements adopted in the construction will be briefly described under the following heads: 1. Power Houses. 2. Power Plants. 3. Cables. 4. Vault Work. 5. Track Work. 6. Cars. 7. Car Barns.

It must be distinctly stated that originality is not claimed for these improvements. Many of them had already been used on other roads, but not so long that they could properly be called "recent." Also, of those used on the Broadway road, the writer, while he had to decide as to the adoption of all, does not claim to have originated all, or even most of them. He was fortunate in being able to surround himself with able assistants, and to their suggestions many of these improvements are due. It is, however, very difficult to give exactly due credit in all cases for improvement, often the outcome of prolonged discussion and experiment; and to avoid possible injustice to any, the above general acknowledgment will alone be made.

To those who may not think that some of the devices hereinafter described are improvements at all, it can only be said that perfect unanimity of opinion on such points is not to be expected, and if, in adopting and describing such devices the writer is only credited with having honestly exercised his best judgment, and incidentally adding something to the sum of our knowledge of that difficult subject, the cable road, he will be more than satisfied.

1. *Improvements in Power Houses.*—As the upper part of the Houston street power house was to be rented for store and office business, it was important that no vibration from the machinery should be perceptible above the basement. Also, as the driving plant had to be installed and started before the building was completed above the first floor, and was everywhere pierced by columns supporting the upper floors, there was danger that with the imposition of the additional load of eight more stories, the compression of the soil might disturb the machinery foundation and throw the shaft bearings out of line. Fortunately, the remedy for both evils was the same, namely to isolate the column foundations, which were composed of "I" beam grillages resting on concrete. This was accomplished by surrounding each foundation by a steel cylinder driven to its full depth, six feet into the sand. The machinery foundations rested entirely on the sand outside of the cylinder, and when necessary the column foundations were bridged over by "I" beams. The cylinder made a sort of slip joint between the sand inside and out, so that they could settle independently of each other. The result was very satisfactory. There has been no trouble from vibration, or disturbance of the alignment of the shaft bearing.

The ventilation of the power room of the Houston street station was a somewhat difficult problem, which has not indeed been entirely solved, but it may be of interest to note the provision originally made for it. The power plant occupies the entire basement, which is about 40 feet deep and almost entirely below the street level. It is in plan about 125 × 200 feet, the side and both ends fronting on the street. The boiler room extends across the rear of the basement, and is separated from the machinery room by a brick partition, in which four openings were left for as many disc fans of an aggregate capacity of about 200,000 cubic feet per minute, sufficient to change the air of the entire machinery room every three minutes. This would undoubtedly have kept the room comfortable in the hottest weather. The air was to be discharged into the boiler room, where it would have had the effect of assisting the draft as well as reducing the temperature, since being drawn so rapidly through the machinery room it would not become much heated in transit. To insure a uniform circulation of the cool air it was to have been drawn in through openings just above the front sidewalk. Suitable screens and, if need be, the use of the front walk for a settling chamber,

were relied on to obviate any trouble from dust. Air could also have been drawn down from the roof of the building through the shaft containing the cylinders of piping for the hydraulic elevators, but while a cool and purer supply could thus have been obtained, it would, from the location of the shaft, have required ducts in the basement to insure proper distribution, and there would have been danger of piercing the cylinders, etc., in cold weather. The first plan of moving the air in mass from front to rear, by forcing it through an otherwise air tight partition, would, it is believed, have given good results, and, as far as known, is novel.

Provision for the health and comfort of the men was also made by ample bathrooms and convenient and well ventilated clothes lockers.

At the Houston street station the coal was dumped into vaults under the rear sidewalk wall, which were high enough above the boiler-room floor to permit the coal to run out into wheelbarrows, from which it was shoveled into the furnaces, the only handling it received in ordinary circumstances. Hoppers under each furnace discharged the ashes into wheelbarrows, whence they were dumped into the foot of a link belt elevator and raised to a bin, from which they were discharged into carts in the rear driveway, all without handling. A reserve of several hundred tons of coal is kept in some lower vaults, from which it can be wheeled to the elevator above mentioned and raised above the driveway and discharged by a chute into barrels on the boiler-room floor. An important part of the equipment of a power house is the system of hoists, by which not only the repairs and renewals of the plant, but also its installation, are vastly facilitated. The time saved by such appliances is of special importance where, as on the Broadway cable road, no stoppage of the machinery can be permitted.

At the Fifty-first street power house, where there were no columns, it was easy, by means of trolleys running on fixed and traveling beams, to command every part of the room, and by the use separately or in combination of a 5 and a 10 ton hoist to lift and transport any weight up to 15 tons.

This arrangement has practically nearly the convenience of a large traveling crane at very much less cost, and has the additional advantage that it can be used in two places at the same time, and cannot be disabled by a single breakdown.

At the Houston street power house the multitude of columns, combined with the limited headroom, made any complete system of trolley hoists out of the question, but by placing a trolley girder over the line of the engine shaft, and one over each line of the cable driver shafts, and a pair of trolley girders over the jackshaft, it was possible to lift any portion of these shafts or their attachments, and carry it to the side of the room where it could be conveniently got at, or removed. By a combination of four ton hoists it is possible to lift 16 tons at the jackshaft and 8 tons at any of the other shafts. Separate trolley beams are provided for each engine to lift cylinder heads and pistons. In the Fifty-first street house a steam capstan and a pair of winch heads, running at different speeds, have been found very convenient in the rapid handling of heavy weights and in pulling and hauling around the floor. Unfortunately there was no good place for anything of the kind at Houston street.

2. *Improvements in Power Plants.*—Following the course of the power from the boiler through the cable to the car, we find on each boiler an automatic valve, so called, through which the steam passes on its way to the main. In its ordinary operation it is simply a check valve in case of a rupture of any part of a boiler, to prevent all the rest of the battery from blowing through the injured one. There is nothing new about this, but the valve is so managed by moving a small lever it will also automatically close against the pressure of the steam; and by having the levers of all the valves on a battery of boilers connected together by a single chain which may be led to any convenient place, it is possible in case a steam main bursts or a general smashup occurs in the engine room to safely and certainly shut off all the boilers in a very few seconds by a single pull of the chain. Happily no accident has occurred to demonstrate the utility of this device, but such tests as we have been able to give it otherwise seem to leave no doubt of its efficiency, and the knowledge that it is there ready for use will give increased confidence in the time of threatened danger.

Following the power through the engines, which present no novel features, we come to the transmitting gear connecting them to the cable drivers. Here rope drivers were adopted, not only to avoid noise and vibration incident to the use of gearing which, as before stated, would have been very objectionable in a building used for business purposes, but to give a degree of flexibility in the relative motions of the cable drivers that could not otherwise have been obtained.

The latter object was obtained by transmitting power to each shaft of the cable drivers by a sepa-

\* Read before the New York Street Railway Association, September 18, 1891.



rate set of cotton ropes whose elasticity permitted instantaneous slight changes in the relative speed of the drivers to accommodate sudden changes in the stress on the cable due to the variations in load, and also allowed a slight and continuous difference in that relative speed if required to compensate for the shrinkage or creep of the cable, due to reduced tension as it leaves the drivers. A continuous variation, however slight, in the relative speed of drivers without slip of the cotton ropes does not at first sight seem possible without corresponding vibration in the ratio of the diameters, but a little study of the conditions which are obtained while transmitting power by an elastic medium will show that such variations of speed cannot be avoided if the resistance varies. In this case such variations accomplish measurably the purpose of loose differential rings in avoiding undue stress on the cables while passing over the drivers, and the unequal wear of the grooves resulting therefrom. An experience of over a year shows that the grooves wear very uniformly.

Another feature of the plant that has been carefully studied has been the interchangeability, so to speak, of its different parts. By this is not meant the ability to move and replace, but to make a variety of different combinations, so that the plant can never be totally disabled by a single accident. For instance, in the Houston street plant there are four engines and four cable drivers, and any engine can be connected to any pair of drivers, making sixteen possible combinations. All important pipes are also duplicated, so that really our only sole dependence may be said to be the smoke-stack.

The signal system is believed to be a marked improvement over anything that has been done before, and while a large part of it is necessarily connected with the street work, it may on the whole be the best described here. Its operation is as follows:

When an employe wishes to communicate with the power house, he goes to one of the signal boxes, which are located a few hundred feet apart and just outside the train rail; he lifts a small, cast iron cover, opens the box inside and pulls a handle a certain number of times, corresponding to the signal he wishes to send in. In the engine room a large gong strikes the same number and a hand on a large dial points to the corresponding signal. When this has been done, the number of the box from which the signal has been sent in is struck on a small gong and at the same time both numbers are printed on a tape for future reference. Besides the usual signals for starting or stopping the cable, etc., and sending assistance, provision is made for "plugging in" a portable telephone at any signal box. A separate signal system is provided for each of the three cable divisions.

**3. Improvements in Cables.**—There is nothing novel about the cables, except their size—one and a half inches diameter—which is believed to be larger than any previously used on street railways. Those on the lower sections are about four miles long, and at a speed of six miles an hour and forty seconds headway, may sometimes be hauling as many as sixty cars at once. Doubtless, a one and a quarter inch rope would have been strong enough, as well as cheaper and lighter, but it would have stretched nearly 50 per cent. more under varying loads, giving a more irregular motion to the cars, and increasing the travel of the tension weights and the wear on the cable drivers. Its durability would for this reason have perhaps been decreased and in an even greater ratio, and as frequent change of cables is a serious inconvenience, as well as expense, the larger cable will probably prove cheaper as well as better.

The large cables weigh nearly 40 tons each, a little over that indeed when mounted on the spools for shipment. They are delivered by a floating derrick to a special truck on which they are hauled to the power station by many pairs of horses. There a square cast iron shaft is put through the square hole in the spool and secured and centered by cast iron wedges drawn together by large bolts. The spool is then mounted in a wrought iron frame, the pillow block having spherical bearings so that no cramping of the shaft can occur. The old rope is then cut, and the new one having been led over permanent sheaves to the tension run is spliced on the other end of the old rope, brought up over the other permanent sheaves to a reel on which it is wound by a pair of engines geared to it, and having sufficient power to draw the old rope out and the new one in without assistance from the main engines. The shears, used to cut the old rope into convenient lengths for handling, can also be used for shearing and punching metal plates, often very convenient in repairing.

With these arrangements an old rope can be drawn out and a new one substituted and started up and the cars shifted over to it in a very short time and without the gripmen being aware that any change has been made. The old rope can be cut up at leisure, being wound off by reversing the engines that wound it on.

**4. Improvements in Vault Work.**—Under this head is included all work below the street surface, except that immediately connected with the track. Perhaps the most important improvement here was the side motion gypsy. In this device, the cable as it enters the conduit and just before it is engaged by the grip, goes over a vertical sheave which carries the cable at the proper height to enter the grip which, after it has passed the sheave, strikes a lever which forces the sheave horizontally into the conduit and lays the cable in the open jaws of the grip. When the grip leaves the lever the sheave is withdrawn by a spring. The arrangement is entirely automatic and has worked very well; it cannot, however, be used except where the cable enters the conduit.

Another gypsy, intended for use in all parts of the line, raised the cable from below the grip by a spiral wheel which, while revolving, had the requisite lateral motion given by cams on its shaft. The motive power was supplied by cable which entered a V groove in the spiral, and at the last of the revolution compressed a spring which, when released by the passage of the next grip, threw the spiral into part engagement with the cable. The device was ingenious and for a time worked well, but as its operation depended entirely on the friction of the cable in the groove, it was soon found that when the rope became well lubricated and the groove a little worn its action was unreliable and its use was discontinued. This gypsy being actuated only by the live cable, could not under any circumstances throw it in the dead one, a point of much importance where two cables are run in the same conduit.

Another gypsy has since been devised which can also be placed on any part of the line, which will automatically select the right cable, and is much simpler in construction, as well as more reliable in operation. As it has not yet been protected by patent, its operation will not be further described.

The problem of "floating" a hundred feet or so up a 1 per cent. grade from the middle to the lower section of cables in front of the Houston Street power house received much attention. Although it was believed that it could be successfully done, it was feared that where so many vehicles are passing frequent delays must occur from obstructions of various kinds; so to avoid the trouble and expense of keeping men and horses on hand in case of any emergency, a so-called "lazy chain" was installed. This consisted of a heavy endless chain of the link-belt type running in a trough under the slot and just below the grips, which were to be engaged by projecting books attached to the chain and held up by springs to permit them to recede when the grips moved faster than the chain, and when the cars slowed down they would catch and propel it. To enable the gripman to stop after the lazy chain had caught, the chain was driven through a friction clutch adjusted to slip if the gripman put on the brake, and, as an additional precaution, and to prevent the friction clutch from being destroyed by a long stoppage of the car, a reducing valve was put on the steam pipe by which the pressure was kept too low to permit the engine to slip the clutch for more than one or two revolutions. As the engine was double, it would start again as soon as the brake was taken off the car, so that as far as the gripman was concerned its manipulation was much the same as if he had hold of the cable or was on a down grade.

Fortunately, further experience showed that with proper care the track could be kept clean, so that the cars would always float over without trouble, especially as in reaching this point they were gripped to a high speed cable which gave the requisite velocity.

A modification of this device, with the lazy chain working in a horizontal position, was intended to be used to operate a curved cut-off or short circuit at Bowling Green or State Street in case of accident or congestion at South Ferry, but that also has so far proved unnecessary.

As it was very difficult to lubricate by hand the bearings of the deflecting wheels in the vaults while in motion, a grease reservoir clamped to some convenient point on the V frame and connected to the bedrings by lead pipes, through which the grease was forced at intervals by screwing down on a piston in the reservoir and directed by cocks to the upper or lower bearings as required.

**5. Improvements in Track Work.**—The first and greatest improvement was in the rails, which were especially designed for this road. To simplify the yokes they were made of the same depth, and for convenience of paving that depth was made seven inches. In the slot rail to secure a good support for the paving blocks, the web was made vertical, with very satisfactory results. The head of the tram rail was made with a groove just large enough to take the wheel flanges and enable them to crowd out the dirt, but too small to permit a wagon tire to catch in it. The flange was 5 inches wide, and contained enough metal to bring the vertical axis down to pretty near the center of depth, thus giving a very efficient girder section. The joint

was made by a combination of a pair of four hole splice plates, with a McConway & Torley clamp, the former taking the transverse and the latter the shearing stress and together making a very effective joint. Owing to lugs on the yokes, and to the tie rods supporting the slot rail being half way between the yokes, the tram rail joints had to be one quarter of a yoke space, or thirteen and a half inches, away from the yoke center, being thus not exactly suspended or supported. The result was satisfactory.

All slot rail joints were made on the yokes and no splice plates were used; only a larger and stronger washer being placed on the tie rod supporting the joint. This has answered fairly well. A drop forged three-hole splice plate joint, originally designed for the Broadway slot rail, is being used on the uptown extensions with promise of very good results.

(To be continued.)

#### GOODWIN ADJUSTABLE ADVERTISING GATE.

The accompanying cuts illustrate an adjustable advertising street-car gate for which a patent was recently issued to L. R. Goodwin, secretary and treasurer of the Citizens' Street Railroad Company, of Memphis, Tenn. Fig. 1 illustrates the simple

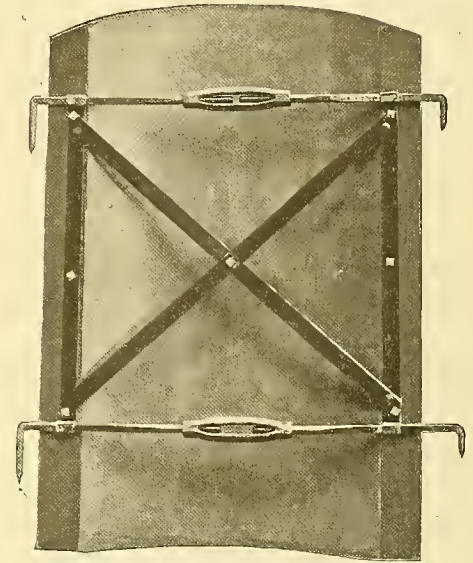


Fig. 1. Goodwin Adjustable Advertising Gate.

construction of the gate, and the advertising side is shown in Fig. 2. The patent covers a solid faced gate with the advertising feature if desired. It is apparent that by means of turnbuckles it is adjustable, so that it may be used on any width of platform

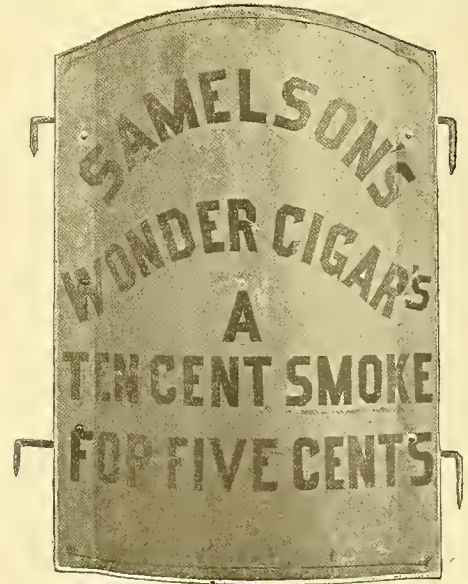


Fig. 2. Goodwin Adjustable Advertising Gate

and may be transferred from one car to another. The frame can be tightened up so that the gate will be entirely noiseless, and it will act as a brace for the platform and tend to prevent sagging caused by the action of the brake handle. The frame is separate from the face and can easily be



removed for repairs, renewal of the face or changing the advertisement. The fact that the gate is solid is regarded as an advantage, as it tends to protect employes and passengers against dust, rain, wind, etc., and at the same time it is claimed that it improves the looks of the car. The gate can be made in any blacksmith shop. The frame is practically indestructible. The face can be renewed at a small cost whenever it is desired to change the advertisements.

The gate soon pays for itself, as it is stated that the revenue from advertising should be nearly as large as that derived from the inside advertising privilege. The gate is not manufactured, but the inventor sells to street railway companies the privilege of using it.

**TORONTO STREET RAILWAY EARNINGS.**

The following figures show the daily earnings of the Toronto Railway Company during the two weeks in which the exposition was open, and the increase in the receipts as compared with last year:

Monday.....	\$3,594.58	Increase.....	\$545.40
Tuesday.....	3,523.32	".....	398.74
Wednesday.....	3,523.32	".....	470.73
Thursday.....	3,791.72	".....	663.83
Friday.....	4,455.78	".....	401.90
Saturday.....	5,003.53	".....	521.45
Monday.....	5,692.15	".....	282.07
Tuesday.....	6,122.13	".....	842.81
Wednesday.....	7,172.37	".....	952.55
Thursday.....	6,725.75	".....	511.51
Friday.....	6,177.22	".....	1,222.25
Saturday.....	5,290.27	".....	1,190.81

**ELECTRIC RAILWAYS AND STEAM RAILROADS.**

In the annual report of the New York, New Haven & Hartford Railroad Company, the following reference is made to the construction of electric railways in the vicinity of railroad property:

"The construction of electric railroads in the neighborhood of our property continues throughout all its territory. Whenever they seriously reduce the revenue of this property we shall be compelled to lessen local service in a corresponding degree, as pointed out in our last annual report. This company has resisted at every point the imposition of additional burden and new public peril by the construction of level crossings, and it will continue to do so in the performance of a duty to its stockholders and its customers and to all people using these conveyances. The creation of level crossings of steam railroads by electric roads, whether by legislative or judicial permission, must lead to dreadful accidents. The people are calling for large expenditures by the steam railroads for the elimination of all grade crossings, and simultaneously their agents are increasing the danger to those which exist by allowing the electric roads to use them."

**COMMENTS AND VIEWS OF CONTEMPORARIES.**

**RELIABLE BRAKES NEEDED.**—Trolley cars are apt to be dreadfully crowded at times, and they frequently traverse grades which, on any other kind of a railroad, would be considered dangerous, and as necessitating special provisions for safety, but, as the trolley cars go up and down everywhere and are used all the time by everybody, the danger is not realized as it would be on a mountain railroad. Traction companies will consult their own interests, as well as the safety of their patrons, in providing every car with a series of brakes that can be relied on under all circumstances.—*Reading (Pa.) Herald.*

**CANDID OPINION ON FENDERS.**—As we have repeatedly pointed out, the entire question of the right fender for trolley cars is by no means so decided that any one fender can be urged as meeting all the difficulties presented by two and three ton single truck cars. The fender placed in Massachusetts on double truck six and eight ton cars is far from satisfactory. In fact, no fender has yet been proposed, so far as we are aware, which any fair-minded man able to judge would care to force upon a railroad company, particularly as the requirement of a defective fender would shift some if not all the responsibility for accident from the trolley company to the lawmaking power.—*Philadelphia Press.*

**A COMMON OCCURRENCE.**—Ahasuerus Hubbard had an appointment at his office at 10 o'clock, but he awoke early, and so it happened that at 8:30 he had finished his breakfast and read his morning paper. He went out onto the doorstep with his hat on, and having nothing to do, walked leisurely

over toward the cable line. It was a 12 minute ride to the office. He had therefore over an hour and a quarter to spare. A crowded cable car came along, the passengers hanging onto the seat handles and wedged together on the platforms. Just behind it was another train, and behind that still another, almost empty. The first car did not slacken speed at the crossing where Ahasuerus stood. And then Ahasuerus Jones, with 75 minutes of time at his disposal and a chance to ride down-town in comfort a few seconds later, made a rush for the crowded train, missed his footing, hurt his ankle, and was finally dragged on board bruised and breathless. When he got to his office he waited an hour in idleness. Will some psychologist kindly ascertain and describe the cerebral action which impels Ahasuerus and several thousand other esteemed citizens to do this sort of thing every day in the year?—*Chicago Record.*

**STIMULANT TO MUNICIPAL GROWTH.**—There is not the slightest doubt that the electric railways, even the much-abused and by-no-means-perfect trolley lines, are working a gradual revolution in our cities and that they are acting as a powerful stimulant to municipal growth all over the United States. If the storage battery ever reaches the stage of perfection that will make it uniformly practicable, there will be immediate revolution in transportation. But even in the absence of this a great revolution is silently and almost imperceptibly changing the conditions of life in our cities. Nothing in the world can now prevent the country for 100 miles around all our great cities from being gridironed within a few years by electric lines. It is absolutely sure that this work, now swiftly going on, will continue, even without the storage battery. Though the electric lines stimulate municipal growth, they have at the same time a beneficent influence in spreading out the people over a larger area and giving them more breathing space. For this reason, if for no other, the trolley car deserves to be commended.—*Chicago Evening Journal.*

**FINANCIAL DEPARTMENT.**

**Eastern Stock and Bond Market.**

(From Our Wall Street Correspondent.)

The bettered demand for street railway securities noted in these columns last week has continued to manifest itself during the financial week just passed. As evidences of the improved condition of affairs, it may be related that the Wall Street house mentioned last week as having for sale \$250,000 of the bonds of a Connecticut street railway—the Bridgeport Traction Company—managed to dispose of all of them within a short time after the subscription lists were opened. Then it is announced that Jamison & Co., the bankers of Chicago, who have had a good deal to do in the West with the promotion of traction enterprises, are about to open an office in New York, and will give particular attention to buying and selling of street railway stocks and bonds. Their presence in the East is, therefore, likely to lead to increased activity of traction stocks in this market. Philadelphia traction stocks are again enjoying a boom on the Quaker City Exchange, popular favor having been restored to these speculative issues, and there is no reason why many local issues should not enjoy equally as profitable a prominence.

Dealers assert that just at present the main buyers are out-of-town investors. Indeed they generally agree that outsiders are in the market on a larger scale than for a long time past. The value of street railway issues as a medium of safe investment is becoming rather well recognized everywhere, and, as New York is getting to be headquarters for dealings in this class of securities—as in fact it is for all other classes—local dealers are beginning to receive numerous inquiries. This increased demand, so remarkable because of its sudden inception, has, however, for the moment, deadened instead of stimulating trading, and this for the reason that many holders of street railway stocks and bonds, believing that buyers are anxious for the issues of street railroads at any price, are only offering them at prices so high as to offer no inducement at all to would-be purchasers. But they will recede from their lofty position, and prices must reach a more normal level.

Dry Dock has at last declared a dividend, but it is only 1½ per cent, instead of the old quarterly rate of 2 per cent, as had been the intention of the directors when they again resumed the payment of dividends. However, there is a good demand for the stock, and it is now bid at 135-6, with none at all offering. Sales prior to the declaration of the dividend were made at 132 bid.

Second Avenue has also moved up several points on the declaration of the regular 1½ per cent. quarterly dividend. Some large buying orders for the stock are noted, and there is apparently no likelihood of filling them at current quotations, as the stock is very closely held.

Third Avenue has not depreciated any on the

confessed acknowledgment of defeat in the fight with the Metropolitan Traction Company for a purchase for the St. Nicholas and Manhattan Avenues' lines. It may be merely a case of "sour grapes," but an officer of the Third Avenue road says that the company wasn't really anxious for the franchise. It has all it can do, according to him, with its present lines. Earnings, instead of diminishing, as was expected, with the decrease of excursion business at the end of summer, continued to increase. Over 300 cars and 60 trailers are in use during rush hours, and they are so crowded that many fares are missed through the inability of the conductors to get through the crush. A cable car takes in as much on one trip as a horse car did the whole day. One car broke the record last week by taking in over \$18 on one round trip.

The Metropolitan Traction Company is having things its own way in this city. The Board of Aldermen this week voted to give it the right to extend its Columbus avenue line through One Hundred and Ninth street and Manhattan avenue to One Hundred and Sixteenth street, there to connect with its cross-town line, its Lenox avenue line and its proposed new line up St. Nicholas avenue, the franchise for which will, it is now admitted, be surely granted to the Crimmins syndicate. Work on the tracklaying begun some three weeks ago, and stopped by the Commissioner of Public Works the other day, can now be legally resumed.

Long Island Traction has been somewhat weak since the publication of the annual report, but the fact that taxes were increased some 80 per cent, will account for a deal of the poor results. Stockholders now have the right to subscribe *pro rata* at 85 for the \$2,500,000 six per cent. collateral trust notes recently offered.

**Financial Notes.**

**West End, Boston, Statement.**—The West End Street Railway closes its fiscal year Sept. 30, and for the first time in its history it will this year balance its books without floating debt. The management is of the opinion that its present cash on hand and future surplus earnings will meet all construction expenses hereafter. As the last horses are sold there is a depreciation account in the capital which must be met by placing earnings in improvements or construction, and the directors have voted to charge out of earnings \$300,000 for depreciation this year. The gross earnings this year will be about \$6,700,000 and the net about \$2,100,000, or not far from last year; \$300,000 of the net will be credited to depreciation, leaving the company with an exhibit of its charges and 6 per cent. dividends earned. Gross earnings are increasing about \$20,000 a month, and expenses have been reduced by more than \$20,000 per month, so that it is believed that for the future the company will show a handsome surplus over its dividends and depreciation account, but it is not expected that the dividend rate will be raised above 6 per cent, for two or three years. The capital account now stands at about \$25,000,000, more than one-half of which is chargeable to the development under the electricity period.

**Brooklyn Traction Earnings.**—The annual reports of the Atlantic Avenue and West End railroads, comprising the Brooklyn Traction system, are as follows:

	Brooklyn Traction system, 1893-4.	Cos. comprising same system, 1892-3.
Gross.....	\$1,004,839	\$825,513
Operating expenses.....	691,302	783,819
Earnings from operation.....	\$313,537	\$108,694
Other income.....	69,245	64,275
Gross earnings.....	\$382,782	\$172,969
Fixed charges.....	282,386	182,408
Net income.....	\$100,396	\$89,439
Dividends.....	100,000	17,306
Surplus for year.....	\$396	\$72,133

\*Deficit.

It should be noted that the profits of the present year include \$100,000 in dividends paid on Atlantic Avenue railroad stock. The item of net income is the proper standard of comparison. It shows that the system did better than last year by \$109,835, despite the fact that the fixed charges were \$100,000 heavier, comprising, as they did, a large increase in taxes.

**Receiver Appointed.**—Judge Howard Carrow, of Camden, N. J., was appointed on Sept. 17 temporary receiver for the Brigantine Beach Railroad Company by Chancellor McGill, on motion of Buchanan & Rellstab, counsel for Samuel R. Shipley, of Philadelphia. Argument for a permanent receiver of the railroad will be heard at the State House on the morning of Sept. 25. Mr. Shipley is a stockholder and creditor of the company, and in his bill he says that the Brigantine Beach Railroad Company was organized Sept. 9, 1889, to construct and maintain a railroad beginning at Pomona, Atlantic County, and terminat-



ing at Brigantine Beach, in said county. The road was built and in November, 1889, the company issued 700 bonds for the sum of \$500 each, with interest coupons attached, the principal and bonds being payable 30 years after date of issue. To secure payment of these bonds a mortgage was executed to the Holland Trust Company, of New York, which mortgage is now recorded in Atlantic County. The company sold bonds aggregating in all \$350,000. Not one penny of the interest due on these bonds has been paid, and, therefore, as the company has defaulted, the receiver is ordered to take possession of all the property at once.

**West Chicago Stock.**—President Charles T. Yerkes, of the West Chicago Street Railroad Company, has been interviewed regarding the company. He declared that the present quotations are ridiculously low, and that with the prospects that are before the company the stock ought to be selling a great deal higher. He said, too, that no new stock will be issued for a long time to come, and that there was to be no issue of bonds or debentures either. The surplus, he appears to think, is equal to any demand that can be imposed upon it, for he proposes not only to make up for the deficiency in dividends, but to convert the horse car lines into electric lines with funds from the same quarters. Regarding the company's earnings Mr. Yerkes said it was doing all in that direction that could be expected. He admitted they had fallen off, but so have earnings in every other line of business. Street railways, he thought, will be the first to feel any improvement, and this they are already doing.

**Buffalo Railway Earnings.**—The comparative statement of the operations of the Buffalo Railway Company for the month of August shows gross earnings to have increased \$493.78 to \$146,010.61, while operating expenses decreased \$2,141.06 to \$74,766.16. Net earnings were, therefore, \$65,244.45, an increase of \$2,635.84 compared with the same month last year. For the eight months ended Aug. 31 gross earnings increased \$32,509.36 to \$1,006,974.82; operating expenses decreased \$38,354.14 to \$573,407.85, while net earnings increased \$70,883.50 to \$433,466.97. It will be seen from the above figures that operating expenses, both for August and eight months, are slightly in excess of 50 per cent. of gross earnings.

**Kings County Elevated, Brooklyn.**—The report of the Kings County Elevated Railroad for the year ended June 30 has just been filed and shows: Gross earnings from operations, \$742,230; operating expenses, \$508,972; net earnings from operations, \$233,257; fixed charges, \$335,479; deficit from all sources for the year, \$102,221; cash on hand, \$90,188; profit and loss (deficiency), \$86,627.

**McKeesport, Pa.**—The McKeesport & Wilmerding Electric Railway has absorbed the Citizens' Railway Company by purchasing all its property, which will be joined to and form with the Wilmerding road a new railway system covering the hill territory and a route to Brinton.

**Westinghouse Dividend.**—The Westinghouse Electric and Manufacturing Company has declared the regular quarterly preferred dividend of 1½ per cent., payable Oct. 1, to stockholders of record Sept. 22. Books close Sept. 22 at 3 P. M., and open Oct. 2 at 10 A. M.

**Rochester (N. Y.) Railway Leased.**—A lease was executed last week by President Arthur Luetchford and Secretary Marsenus H. Briggs, of the Rochester Electric Railway, by which the road is leased to the Rochester Railroad Company for a period of 50 years.

**Clinton (Mass.) Street Railway.**—The following figures are given for the first year of operation of the Clinton Street Railway Company: Number of passengers carried, 262,846; cash receipts, \$10,142.30; miles traveled, 51,608; accidents of every variety, 19.

**Concord (N. H.) Railway Annual Statement.**—The Concord Street Railway Company carried during the year ending June 30, 846,676 passengers. The total income was \$43,337 and the operating expenses \$32,980; net income, \$10,356.

## NEW INCORPORATIONS.

**Philadelphia, Pa.**—The Northern Electric Passenger Railway Company has been incorporated. The line begins at a point on the Limekiln pike, Abington township, Montgomery County, near Edge Hill station, runs east and south to Twentieth street, Philadelphia, in Twentieth to Godfrey, to Stenton, to Bellfield, to Eighteenth, to Roberts, to Sixteenth, to Roxborough, to Nicetown lane, to Luzerne, to Fifth, to Roxborough, to Marshall, to Luzerne; also an extension from Limekiln pike and Twentieth to Cheltenham and Willow Grove turnpike; also an extension from Godfrey in Stenton to Cheltenham avenue and to Bethlehem and Spring House turnpike; also from Eighteenth and Roberts in Eighteenth to German-town avenue; also from Sixteenth and Nicetown

to Pulaski avenue; also from Stenton and Haines in Haines to Old York road; also from Stenton and Mt. Airy avenues to Ivy Hill Cemetery. The capital is \$100,000, and the incorporators are A. C. Milliken, Pottsville; Charles H. Davis, S. S. Evans, G. L. Martin, N. A. Waldron, Philadelphia and W. B. Perry, Langhorne.

**Paterson, N. J.**—The certificate of incorporation of the Rockwell Construction Company has been filed in the county clerk's office. The objects of the company are to build and construct electric railroads and electric works and to furnish cars therefor. It will operate in Paterson, Jersey City, Trenton and Camden, and its main offices will be in Middletown, N. Y., where the company has been located for some time. The capital stock, which is all paid in, amounts to \$30,000, and is held in equal amounts by William B. Rockwell, James C. Hinchliffe, Benjamin H. Throop, Merle J. Wightman and Ernest G. Wightman.

**Indianapolis, Ind.**—The Indianapolis, Anderson, Alexandria & Marion Electric Railway Company has been incorporated. Its capital stock is \$100,000. The proposed line will pass through the gas belt, touching McCordsville, Ingalls, Pendleton, Anderson, Alexandria, Summitville, Fairmount, Jonesboro, Gas City and Marion. The directors of the company are: Francis M. Dice, N. J. Clodfelter, A. M. Painter, V. C. Quick, Charles A. Miller and W. L. Miller and G. F. Huggins.

**Lancaster, Pa.**—A charter has been granted to the Lancaster & Susquehanna Railway Company, to run an electric line from Lancaster to Marietta. Capital \$100,000. The proposed road is to be 14 miles long. The directors are: John S. Graybill, President; William B. Given, Columbia; Sam Matt Fridy, Mountainville; Horace L. Haldeman, Marietta; Samuel O. Frantz, Rohrerstown; J. W. B. Bausmau, Lancaster.

**Philadelphia, Pa.**—A charter has been granted to the Chester & Delaware Railroad Company, capital \$150,000, to run a line from Philadelphia to a point near Paoli. The incorporators are J. J. Paterson, President; Directors, William B. Given, J. Hay Brown, J. W. B. Bausman, John Hertzler, John D. Skiles, B. Frank Breneman.

**El Paso, Tex.**—The El Paso Northern Railway Company has been incorporated with a capital stock of \$300,000. The following are the promoters: Geo. J. Gould, Chas. E. Satterlee, Edw. M. Gould, Howard Gould, New York City, N. Y.; R. H. Davis, C. H. Morehead, L. S. Thorn, J. Magoffin, W. H. Abrams, E. L. Sargent.

**Port Chester, N. Y.**—The Port Chester, Rye & Mamaroneck Electric Railway Company has been incorporated. The capital stock is \$150,000. The promoters are: Wm. Ryan, H. M. Henderson, N. J. Sands, J. F. Mills, J. M. Sullivan, Port Chester, N. Y.; C. D. Haines, T. F. Woodworth, Port Chester, N. Y.

**Paterson, N. J.**—The New Jersey Electric Railway Company has been incorporated with a capital stock of \$2,000,000. The promoters are: Chas. A. Johnson, Brooklyn, N. Y.; Geo. V. Turner, New York City, N. Y.; Frank Irving, Jersey City, N. J.; John McGuinness, Jr., Ridgewood, N. J.

**Fort Worth, Tex.**—The Glenwood & Polytechnic College Street Railway Company has been incorporated to build a railway in Fort Worth. The capital stock is \$100,000. The promoters are R. Vickery, S. C. Ash, Waxahachie, Tex.; Geo. E. Tandy, Fort Worth, Tex.

**Helena, Mont.**—The Summit Mineral Railway Company has been incorporated with a capital stock of \$300,000. The promoters are: Arthur G. Lombard, Cornelius Hedges, Wm. Dyer, Jno. D. Wilson, Ogden A. Southmayd.

**Pittsburg, Pa.**—The Highland Park & Butler Street Railway Company has been incorporated. The capital stock is \$12,000. The promoters are H. S. A. Stewart, Jas. J. Donnell, Jno. G. Holmes, Pittsburg, Pa.

## NEWS OF THE WEEK.

**Philadelphia, Pa.**—Plans have been approved by the building inspectors for the power station to be erected on the site of McBride Bros.' old coal wharves, Twenty-fifth and South streets, for the Electric Traction Company. The structure will be of stone, iron and copper, 141 by 90 feet, and will be built on driven piles. There are to be four engines and four boilers in the building, which, with the machinery, will cost about \$225,000. Charles McCaul has the contract, and he will begin work at once, and have the building completed as soon as possible. The station will supply the Lombard and South Streets Line and the West Philadelphia branch with power.

**Woodbury, N. I.**—The committee of citizens of Mantua, who have for some time been negotiating for the right of way for the Camden, Gloucester & Woodbury Electric Railway to that place, reported at a recent meeting that, with the exception of two property owners along the proposed route, the privilege had been granted. President Morgan

has assured them that if the franchise is secured and the roadbed graded the road will be extended. A company is being organized at Glassboro to build a trolley road from that place to Mantua to connect with the Woodbury extension if built.

**Norristown, Pa.**—Two of the thirteen trolley line suits pending in court were disposed of this week, when an injunction was denied the township of Plymouth to restrain the Norristown and Chestnut Hill Company from constructing its line. This practically carries with it, it is claimed, notice to the Conshohocken Railway Company that if it attempts to occupy Plymouth roads covered by the Chestnut Hill Company's franchise, it will be restrained by injunction.

**New York, N. Y.**—The Board of Aldermen has granted the joint application of the Columbus & Ninth Avenue Railroad Company and the Metropolitan Traction Company for permission to extend their lines, the former from Columbus avenue and 109th street easterly along that street and up Manhattan avenue to Cathedral Parkway, and the latter to go from 116th street down Manhattan avenue to connect with the other extension.

**Towanda, Pa.**—The Board of Trade has appointed a committee consisting of R. A. Mercur, J. K. Newell, N. N. Betts, D. T. Evans and C. P. Welles to co-operate with several Philadelphia capitalists who are thinking of building a road to Troy. The latter express themselves as ready to take two-thirds of the stock, if the remainder is raised in Towanda. The estimated cost of the road is \$250,000.

**Pittsburgh, Pa.**—The suits entered by the Department of Public Safety against the traction car companies that had neglected to properly equip their cars with the Crawford safety guard or fender which Councils adopted, were called Monday before Magistrate Doherty. The case against the Pittsburgh Traction Company was withdrawn, as it was shown this company had equipped all its cars. The other cases were continued.

**Philadelphia, Pa.**—Park Commissioner David W. Sellers has formed a plan for a trolley line on Belmont avenue in Fairmount Park. The plan involves the construction of a double-tracked line for a distance of one mile. The estimated cost of the line is \$60,000. It is to be raised by the rapid transit companies which will be able to make connections with the Park trolley at Belmont avenue.

**Chicago, Ill.**—City Auditor Gore is said to have commenced proceedings against the Lake Street Elevated Railroad Company, to compel it to file a sworn statement of the amount of its property with the State Board of Equalization. The officials of the road claim that the concern only does a street railway business, and is therefore not a common carrier.

**Albany, N. Y.**—The first loaded electric freight car to run over the tracks of the Albany Railway system left the freight house on State street, Albany, last week. The car contained a consignment of freight for merchants in Troy and West Troy, and traveled at about the usual speed of the passenger cars.

**St. Joseph, Mo.**—W. W. Bean, president of the St. Joseph & Benton Harbor street railway company, charged with shooting Ald. Shriver while the latter was helping to tear up tracks, has waived examination and has given bonds for his appearance in the Circuit Court.

**Grand Rapids, Mich.**—The Consolidated Street Railway Company reduced the wages of the employees 10 per cent. on Sept. 17. The management promises to restore wages when times will permit, but will not fix any definite date. The men are disposed to accept the reduction.

**Chicago, Ill.**—The North Chicago Street Railroad Company has applied to Commissioner Jones, of the Department of Public Works, for a permit to construct a system of poles for the electric lines on the North Side for a distance covering a territory of over five miles.

**Norristown.**—The Court has appointed a jury to assess damages to the Perkiomen & Reading Turnpike Company against the Sanatoga, Royersford & Collegeville Electric Railway Company, which proposes to occupy several miles of turnpike with its tracks.

**Sandusky, O.**—The Sandusky, Milan & Norwalk electric railway has perfected arrangements to extend its line west from Norfolk, O., to Monceville and Sandusky. The road is to be running in two months.

**Junction City, Kan.**—E. E. Godlove, who was until recently a director of the Leavenworth Electric Railway Company, is promoting a scheme to build an electric railway to Fort Riley.

**Houston, Tex.**—The County Commissioners have granted to the Houston Suburban Street Railway the right to construct and operate a road.

**Danbury, Conn.**—Work on the electric railway has been begun. Fred S. Wardwell is supervising the construction.



PERSONALS.

Mr. Thomas Ahearn, of Ottawa, Ont., arrived from Europe on the State of Nebraska last week. Mr. Ahearn is a member of the firm of Ahearn & Soper, Canadian representatives of the Westinghouse Electric Company.

Mr. W. A. Martin, superintendent of the Pueblo (Col.) Street Railway, recently resigned his position. He was presented a watch, chain and charm by the employes of the road.

Mr. Edgar K. Ray has been elected president of the Woonsocket Street Railway Company, to fill the vacancy caused by the death of James P. Ray.

TRADE NOTES.

The Mather Electric Company, of Manchester, Ct., reports through its New York contractors, H. B. Cohn & Co., 203 Broadway, the sale of all the electrical machinery for the new Odd Fellows' Hall at Philadelphia, consisting of one 30 k. w., one 50 k. w. and one 80 k. w. direct connected generator and five Manchester type slow speed motors from 1 to 40 H. P.; also the sale to Henry R. Worthington Company for the Brooklyn Hydraulic Works, one 600 light dynamo, one 50 H. P. 220 volt generator and one 10 H. P. motor.

The Mather Electric Company, of Manchester, Ct., reports, as a sign of the revival in the electrical business, the closing in three consecutive days last week of contracts for more than 1,500

H. P. of its standard apparatus, consisting of direct connected and belted generators and its Manchester type slow speed motors. This with the other work the Mather company now has on hand will compel it to increase at once its working force, although part of the works is now being operated at night.

The Southern Railway Company has arranged an optional route to Atlanta, going by the way of Washington, Danville and Charlotte, and returning by way of Chattanooga, Asheville and Salisbury. A large number of prominent street railway men have signified their intention of going by this route.

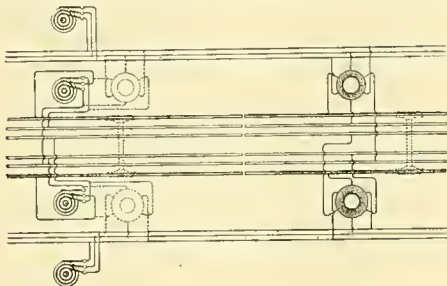
The Genett Air Brake Company, of New York, has closed a contract with the Buffalo Railway Company for 25 additional brake outfits.

RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Sept. 11, 1894.

**525,690. Electric Railway System;** Charles S. Bradley, Avon, N. Y. Filed Jan. 2, 1894. The system comprises a plurality of stationary supply generators adapted to develop polyphase alternating currents of different frequency, and distributing lines severally connected with such generators, and motor cars provided with polyphase motors adapted to connect with any of the several lines. (See illustration.)

**525,697. Winding for Drum-Armatures in Dynamo Machines;** Rudolf Eickemeyer, Yonkers, N. Y. Filed March 9, 1892. The winding is com-



No. 525,690.

posed of divisions, each of which is made up by a group of two or more independent or individual coils. Each of the latter has a long side and a short side lying along the periphery of the drum in two or more layers, and inclined ends lying across the heads of the drum in a flattened web. The long and short sides of the individual coils in each group are separated upon the periphery of the drum by spaces which receive respectively the short and long sides of other similar groups, the long sides in each group being arranged on the periphery of the drum in the reverse order of the short sides.

**525,698. Armature for Dynamo-electric Machines;** Rudolf Eickemeyer, Yonkers, N. Y. Filed April 3, 1894. There are groups of specially formed rectangular coils having sides of equal length in each group, but differing in such length from the coils of other groups, the several sides of the coils in each group lying side by side at the faces of the armature. (See illustration.)

**525,708. Gus-bar Insulating Support;** Albert D. Herrick, Schenectady, N. Y., Assignor to the General Electric Company of New York. Filed April 11, 1891. The L-shaped section for an insulating block is formed with a transverse passageway for a conductor or the inner face of the long and short arm of the L-shaped piece, and with means on the outer face for securing the section in a frame.

**525,755. Station Indicator;** Stephen N. Ashmore, St. Louis, Mo. Filed July 10, 1893. This device is constructed with two separate casings each having a single horizontal apron-slot and containing rolls for supporting an apron, and separated a distance apart. An apron marked with the names of streets or stations is arranged to engage said rolls in each casing simultaneously, and means are provided in one of the casings for moving said apron in either direction.

**525,782. Combined Brake and Electric Switch for Street Railway Cars;** George Brown, Long Island City, N. Y. Filed Jan. 20, 1894. The automatic



No. 525,698.

brake and electric switch for street and other railway cars comprises the car brakes and a plurality of switches adapted to gradually increase or decrease the current, and means for applying or releasing the brakes and actuating the switches successively at the same movement. (See illustration.)

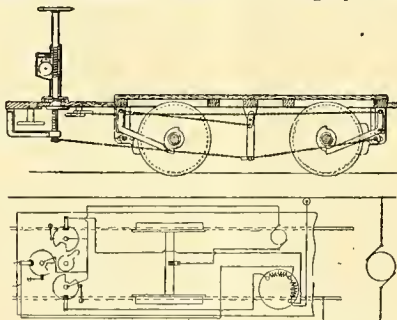
**525,789. Trolley-pole Connection;** Maurice R. Mahon and John M. Crane, Newark, N. J. Filed Nov. 10, 1893. The frame or holder is adapted to connect with the trolley socket and has a hollow bridge or way, and an arm connecting with the pole and pivotally secured to the holder and working in the bridge or way.

**525,836. Self-Adjusting Brush for Dynamo-electric Machines;** William I. Bliss, Brooklyn, N. Y. Filed April 12, 1891. A pivotal support upon which the brush carrier is fitted to rotate freely in either di-

rection, and a fixed stop is provided against which the brush-carrier rotated by the friction of the commutator on the brushes is positively arrested in either direction so as to stop the brushes in positions the reverse of that which they occupy when their carrier is arrested in the opposite direction.

**525,840. Lightning Arrester;** Archibald L. Court-right, Keokuk, Iowa. Filed February 1, 1894. This is an electrical difference of potential valve, comprising in combination two similar sections, one of which is adjustable with relation to the other. Each section is composed substantially of a block or base of non-conducting material, copper plates secured on each side thereof, a binding post projected through the copper plates and insulating material, with means for securing it therewith, and electrodes in contact with both of said copper plates.

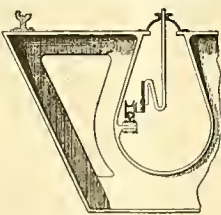
**525,859. Ammoniacal-gas Motor;** Patrick J. McMahon, Tangipahoa, La., Assignor to the Standard Fireless Company, Chicago, Ill. Filed Dec. 12, 1891. The gas motor has an exterior shell or tank reservoir containing within its interior one or more anhydrous ammonia tanks having a gas chamber in combination with an engine cylinder or cylinders located within the shell or tank reservoir. A series of tubes and chambers is formed by tube sheets and covers located beneath the ammonia tanks, and having open connec-



No. 525,782.

tions therewith. A pipe connected with the chambers is formed by the tube sheets and their covers whereby the ammonia tanks, tubes and chambers may be charged with anhydrous ammonia.

**525,861. Electric Railway;** Herbert E. Rider, New York, N. Y., Assignor to Adolph Falck, same place. Filed Feb. 26, 1894. This is the combination of a slotted conduit, one or more conductors arranged therein, an arm carried upon a car and projecting downward through the slot and into the conduit. One or more upturned branches extend from the arm, and current collectors are carried by the uplited branches and insulated therefrom and arranged to move in contact with the conductor. A conducting wire or wires pass through the arm and branch or branches and are insulated therefrom and electrically connected to the current collecting device. The arm and branch or branches encase the conducting wire or



No. 525,864.

wires from a point above the slot of the conduit to where said wire or wires are connected to the current collecting devices. (See illustration.)

**525,886. Trolley for Electric Railroads;** Edward Dawson, Terre Haute, Ind. Filed Dec. 26, 1893. A socket is adapted to be secured to a trolley pole, and is provided with a conical upper end, and circumferentially elongated holes in its said end; there are two brackets for carrying the trolley wheel, a bolt passes through the brackets and holes permitting the brackets to be adjusted. (See illustration.)

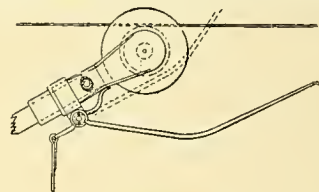
**525,891. Fastener for Electric Wires;** Harry C. Fricke, Pittsburg, Pa. Filed June 11, 1891. An insulating piece is bent in the form of a cylinder when closed, and has radial projecting edges.

**525,892. Switch-Operating Device;** George A. Fullford, Providence, R. I., Assignor of one-half to Stephen C. Howard, same place. Filed Jan. 10, 1894. Brackets are secured to the car, and an actuating rod is removably supported in the brackets. The latter has a handle, and a wheel furnished with a thin edge rotatably mounted at the lower portion of the rod.

**525,902. Fender for Street-railway Cars;** Alfred J. Hollingsworth, West New Brighton, and Joseph A. Weaver, New York, N. Y. Filed March 10, 1894. The fender consists of folding side bars and detachable net.

**525,936. Electric Switch;** George Baehr, Jersey City, N. J., Assignor to Samuel O'Connor, Brooklyn, N. Y. Filed Jan. 9, 1891. This combination of a pair of circuit controlling blades, a cross bar of insulating material mechanically connecting them together, a pair of jaws carried by the cross bar, a manually operated swinging lever provided with an extension which is loosely embraced by the jaws, and a spring bearing at one end against the lever and at the other end against the cross bar.

**525,945. Conduit System for Electric Railways;** William G. Creighton, Chicago, Ill. Filed Feb. 28, 1894. Claim 3 reads: "In combination with a perforated support, a movable contact or circuit closer a fixed contact connected with a conductor, a spring nor-



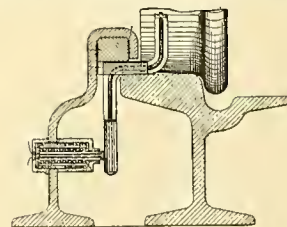
No. 525,886.

mally pressing the movable contact away from the other and means to attach the same to the support comprising threaded thimbles inclosing the same and engaging opposite sides of the support." (See illustration.)

**525,977. Car-Fender;** Samuel A. Darrach, Newark, N. J., Assignor to the Darrach Car Fender Company, same place. Filed Jan. 11, 1894. The fender is composed of two sets of springs jointed together, a swinging brace for keeping one set of the springs distended, and a scoop hinged to said fender.

**525,992. System of Lighting and Heating Cars by Electricity;** Morris Moskowitz, Newark, N. J., Assignor, by direct and mesne assignments, to the National Electric Car Lighting Company. Filed March 31, 1894. This is the combination with a working circuit and a lamp circuit containing lamps or other translating devices, of a pair of storage batteries, a dynamo, and a switch for connecting either one of the batteries directly in circuit with the dynamo, and the other batteries in circuit with the lamp circuit.

**525,993. Means for Equalizing Electro-motive Force of Dynamos;** Morris Moskowitz, Newark, N. J., Assignor by direct and mesne assignments to the National Electric Car Lighting Company. Filed June 15, 1894. Claim 1 is as follows: "In a means for the purpose of equalizing the electro-motive force of dynamos or other electrical apparatus running under variable speed, the combination, of a dynamo-electric generator, and a combined motor and regulating dynamo, the armature circuit of said regulating dynamo being in circuit with the magnetic fields of said dynamo-electric generator, so that the electro-motive force of said regulating dynamo excites and controls the intensity of the magnetic fields of said dynamo electric machine, and means connected with the combined motor and dynamo shaft for operating the same, and an opposing circuit connecting the field coils of said regulating dynamo with the main circuit connected with said dynamo-electric generator, counteracting the electro-motive force of said regulating



No. 525,945.

dynamo to maintain the electro-motive force of the dynamo-electric generator constant."

**526,016. Electric Motor;** John S. Losch, Summit Station, Pa. Filed March 6, 1894. This is the combination of an armature, an annular non-magnetic casing surrounding the same, openings in the casing, magnets carried by yokes secured to their outer ends and with their inner ends projecting through the openings in the casing, and bolts passed through the yokes and seated in the casing, by which the magnets are retained in place.



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**Michigan Street Railway Association.** The Michigan Street Railway Association last week held its first convention, and a brief report of the meeting is presented elsewhere in this issue. About half the companies in the State were represented, and a great deal of interest was manifested. The organization ought to make itself felt in preventing the passage of the hostile legislation that has been proposed in the State.

**Steam Railroads and Trolley Lines.** That railroad officials are beginning to realize that the competition of electric railways is a matter of serious importance is proved by the annual report of the New York, New Haven & Hartford road that has just been printed. One railroad official recently remarked that the time may soon come when the two outer tracks of four-track roads will be electrically equipped, and the trolley lines he met, therefore, on their own ground.

**Improvements in Cable Traction.** Major G. W. McNulty's entertaining paper on improvements in cable traction is concluded in this issue. The paper, which was read at the New York State Street Railway Convention, deals exclusively with the Broadway cable line in New York city, and gives in condensed form some of the more important characteristic features of that engineering triumph. It is, as the author says, an achievement of which any corporation may well be proud to construct and put in running order in such a labyrinth as Broadway "a complicated machine five miles in length to be jointly operated by an army of engineers and gripmen with reasonable precision and freedom from derangement."

**The Vote on Municipal Construction.** The New York Rapid Transit Commissioners have taken action to submit to the people the question of municipal construction at the coming election. It has seemed to certain persons that it is regrettable that the matter should be considered by voters at a time when other questions of great political interest are attracting their attention, but there is at least one reason for thinking it not altogether unfortunate. Coming before the people at this time the question is bound to attract some attention and elicit some sort of an expression of opinion. If we may judge by the Boston experience, rapid transit is not a matter of sufficient public interest to cause the average citizen to vote at a special election.

**The Electric Brake in Practice.** The braking mechanism of a street car is such an important part of its equipment, and its improvement is so urgently demanded, that every serious effort to increase its efficiency is a matter of great interest, for in the betterment of the brake lies the best hope of reducing the number of accidents which at times seem fairly alarming. Not a few attempts have been made to solve the problem by the production of an efficient form of electric brake, but little headway hitherto appears to have been made in this direction. Experiments in this particular field are in progress, in several places, and for one or two of them, notably that in Melbourne, substantial success has been claimed. The form of electric brake which Elmer A. Sperry describes in this issue has passed, it is stated, the experimental stage, and may now be regarded as a

device far in advance of that ordinarily used on street railways. The brake is now in practical use in several places, and experience should soon demonstrate its value. The current for the operation of the Sperry brake is not obtained from the trolley circuit, but is derived from the motors, which are automatically converted into generators. Mr. Sperry's description of the invention is contained in a paper read before the American Institute of Electrical Engineers, which we publish in this issue.

**Attendance at Street Railway Exhibits.** One suggestion may be made to the companies who are now planning to send exhibits to the Atlanta convention of the American Street Railway Association. Let them make adequate provision for attendance at the space where their machinery or their goods will be displayed. It seems a curious fact that companies will spend perhaps several hundred dollars to make a creditable showing of their goods and then almost utterly neglect the matter of attendance, which is an item of only slightly less importance. It is probably not an exaggeration to state that in Milwaukee last year fully one-third the exhibits were deserted three-quarters of the time by the persons that were supposed to have charge of them. These were by no means only exhibits of the small class; some of the largest were thus abandoned. It is perfectly apparent that such a course is exceeding ill-advised, for in this way more than half the benefit that should accrue to the exhibitor from sending his goods to a convention is utterly lost. When visitors inspect the apparatus or the supplies in any particular exhibit, some one should be on hand to point out features of importance and to answer questions. Otherwise the interest of visitors may be merely temporary or perhaps may not be excited at all. We recall a number of times at conventions when delegates were hunting after representatives to learn some fact about an exhibit and utterly failed to secure the desired information. If proper attendance had been provided such cases could not occur. It is easy enough to understand just how it happens that exhibits are deserted, and that information is sometimes hard to secure. An officer of a company or a salesman attends the convention with the expectation of making his headquarters at the booth where his goods are exhibited, but he finds the attendance at the exhibit hall is less than he anticipated during certain hours of the day, so he remains at the hotel where he can meet a greater number of visitors, or he may get on the scent of an order and does not find time to return to his exhibit. In any event it is often practically impossible to find him at a given time. This being the fact it would seem to be a wise course for companies to make a special provision for attendance at exhibits. Let them send some of their young men to the convention to assume charge if the older representatives are to be busy in other work. If they propose to spend a round sum for an exhibit let them add a few dollars to the amount and send another man. We would not say that it will not pay to send an exhibit to Atlanta unless it is accompanied by some one prepared to take charge of it, but it is safe to assert that a competent attendant ought to make the exhibit worth many times what it would be if he were not present.



## ATLANTA STREET RAILWAY CONVENTION.

The attendance at the Atlanta convention of the American Street Railway Association should be exceptionally large if one may judge from the interest in the meeting now shown by both street railway men and manufacturers. A large number of companies have already signified their intention of making exhibits, and this feature of the convention should be of exceptional interest.

The local committees consist of the following Atlanta gentlemen:

Hotel—Wm. W. Kingston, Walter M. Kelley, S. W. Travick, E. P. Thomas, A. F. Giles.  
Exhibits—N. W. L. Brown, Walter M. Kelley, Dana R. Bullen, W. W. Kingston.  
Transportation—W. M. Kelley, J. H. Allen.  
Entertainment—R. J. Lowry, J. Carroll Payne, T. K. Glenn, W. W. Kingston, Henry Inman, J. W. English, Jr., Livingston Mims, H. N. Hurt.  
Banquet—H. E. W. Palmer, J. Carroll Payne, E. Woodruff, R. J. Lowry, Henry Jackson, T. B. Felder, Jr., Livingston Mims.  
Excursion—W. M. Kelley, E. Woodruff, H. N. Hurt.  
Finance—E. Woodruff, R. J. Lowry, T. B. Felder, Jr., Jas. W. English, Jr., W. C. Sanders.

The programme of the convention is as follows:

Special committees will report on the following subjects: "A Standard Form for Street Railway Accounts;" "Can the T Rail Be Satisfactorily Used in Paved Streets?" "City and Suburban Electric Railways;" "Mail, Express and Freight Service on Street Railway Cars;" "Standards for Electric Street Railways;" "Street Car Wheels and Axles;" "The Best Method of Treating Accidents and Complaints;" "The T Rail Construction of the Terre Haute Street Railway Company," and "Transfers and Commutation." Notice has been received by the secretary that special papers will be read on the following subjects: "A Practical System of Long-Distance Electric Railway Work;" "Brake-shoes," and "Destructive Arcing of 500-Volt Fuses."

The Executive Committee has secured Machinery Hall, at Piedmont Park, Atlanta, for the exhibition of supplies of every nature used in the street railway business. The building has been engaged for two entire weeks, beginning October 10 and ending October 24, thereby giving ample time for the setting up and removal of the largest exhibits. The room for the meeting is also in the same building on the main floor, and delegates will therefore be enabled to examine the exhibits to the best advantage and with the least possible loss of time. The exposition will be in charge of the secretary, assisted by Mr. N. W. L. Brown, of the Atlanta Consolidated Street Railway Company. Applications for space, if not already made, should be sent without delay direct to Mr. Brown, at Atlanta. The Atlanta Consolidated Street Railway Company proposes to entertain all who attend the meeting, with an excursion. In connection therewith, a typical "Georgia barbecue" will be a prominent feature of the occasion.

The annual dinner will take place on Thursday evening, Oct. 18. Each company that is a member is entitled to the free admission to the banquet of two of its officers. Each additional officer, or any other gentleman in attendance at the meeting not an officer of a member company, will be charged \$10; ladies' tickets, \$5 each.

There will be ample hotel accommodations for all who attend the meeting. The headquarters of the association will be at the Hotel Aragon. The rates at the hotels are as follows: Hotel Aragon, American plan, \$3 to \$5 per day; European plan, \$1.50 to \$3 per day. Kimball House, \$2.50 to \$5 per day. Markham House, \$2 to \$4 per day. Hotel Marion, \$2 to \$4 per day. National Hotel, \$2 to \$3 per day.

Rooms will be assigned in the order of the applications received, and, as far as possible, in accordance with the expressed wishes of the applicants. Those who expect to be present are urged to communicate with Mr. W. W. Kingston, Equitable Building, Atlanta, Ga., at once.

## MASSACHUSETTS STREET RAILWAY ASSOCIATION.

The annual dinner of the Massachusetts Street Railway Association took place at Young's Hotel, Boston, Sept. 20. After the dinner addresses were made by the president Col. T. H. Cunningham, Hon. E. F. Shaw, A. A. Glasse, and R. F. Straine and R. S. Brown, the last two the special guests of the evening.

The president, Col. Cunningham, and the secretary and treasurer, A. S. Butler, of Lawrence, were re-elected. The next meeting of the association will be held the first Monday in January.

## MICHIGAN STATE STREET RAILWAY CONVENTION.

The Michigan Street Railway Association held its first meeting last week in Grand Rapids. Papers were read as follows:

"Suburban Electric Railways and Their Possibilities," by C. M. Swift, of Detroit.

"Construction, Maintenance and Operation of Small Street Railways," by W. Worth Bean, of St. Joseph.

"Street Railway Accidents and Fire Insurance," by David D. Erwin, of Muskegon.

An informal banquet was held in the evening at Reed's Lake and toasts were responded to by: David H. Jerome, Saginaw; W. L. Jenks, of Port Huron; G. A. E. Kohler and P. F. Leach. The following officers were elected: President, W. L. Jenks, Port Huron; Vice-President, W. Worth Bean, St. Joseph; Secretary and Treasurer, B. S. Hanchett, Jr., Grand Rapids; Executive Committee, the officers and David H. Jerome, Saginaw, and Strathern Hendrie, Detroit.

The next meeting will be held in Grand Rapids next December.

Among those present were the following:

Bean, W. Worth, St. Joseph & Benton Harbor Street Railway Company, Benton Harbor.

Canham, W., City Electric Railway Company, Port Huron.

Erwin, D. P., Muskegon Railway Company, Muskegon.

Hart, George A., Manistee, Filer City & East Lake Railway Company, Manistee.

Hanchett, B. S., Jr., Consolidated Street Railway Company, Grand Rapids.

Harry, C. L., Bay Cities Consolidated Railway Company, Bay City.

Jenks, W. L., City Electric Railway Company, Port Huron.

Jerome, David H., City of Saginaw Street Railroad Company, Saginaw.

Johnson, G. L., Consolidated Street Railway Company, Grand Rapids.

Kobler, G. A. E., Chicago, representing Walker Manufacturing Company, Cleveland, O.

Lee, J. P., Lansing City Railway Company, Lansing.

Louttit, W. S., Pullman Company, Chicago, Ill.

Leach, P. F., Bass Foundry & Machine Company, Chicago, Ill.

Myers, Garson, Standard Railway Supply Company, Chicago.

Myers, L. E., Electrical Installation Company, Chicago, Ill.

Morton, H. T., Ann Arbor Street Railway Company, Ann Arbor.

Randall, F. C., Chicago, representing J. G. Brill Company, Philadelphia, Pa.

Smith, E. A., Consolidated Car Heating Company, Albany, N. Y.

Thomson, F. W., Muskegon Railway Company, Muskegon.

## MOTORMAN CONVICTED OF MAN-SLAUGHTER.

Michael Lewis, a motorman on the Newark & South Orange (N. J.) line, was convicted of manslaughter last Saturday for having caused the death of a four-year-old child last August. The testimony, as brought out by the prosecution, showed that the motorman was looking toward the rear of the car when the accident happened. It was testified that he did not have hold of the brake, and that no warning had been given. The defendant, however, swore that the child "ran right in the front of the car," that he was ringing the bell at the time, and had the car under control.

On Monday Judge Kirkpatrick sentenced Lewis to a year at hard labor in the county penitentiary. The Court said in pronouncing sentence that he felt that it was his duty to make an example of him, as there was too much carelessness upon the part of motormen in Newark. He added: "You have been convicted of manslaughter in causing the death of a child while you were in charge as motorman of the car that ran over her. It has appeared to the satisfaction of the court that the car was run in a negligent manner. People who accept positions as motormen must understand that there is a great deal of responsibility attached to their work. There

have been so many deaths caused in this manner that an accident like this, caused by negligence, must be punished."

## FEET ON CAR SEATS.

A New York paper contains the following account of the result of violating a familiar street-car rule:

S. Gregor Doran, a broker, of No. 2100 Boulevard, took his wife and several friends for a ride last night on the 125th street cable line. Doran used the seat in front of him as a foot-rest. Conductor Ainhorn ordered him to take his feet down, which, after some argument, he did.

Mrs. Doran, to show her utter disdain for street-car ethics in general and the conductor in particular, placed her feet on the seat. The toes of two trim shoes pointed defiantly upward, and the other passengers gazed in astonishment.

The conductor was puzzled. He asked her to take down her feet, but she declined. He did not want to remove them forcibly. Finally he thought of a brilliant idea. He turned the back of the seat over and it came down on Mrs. Doran's legs and held them as if they were in a vise.

Mrs. Doran screamed, but could not move. Mr. Doran grabbed the conductor by the throat, while another member of the party hit him on the head with a cane. All were engaged in a general fight when a policeman came along and took them to the East 126th street station after Mrs. Doran's legs had been freed.

The conductor charged Doran with disorderly conduct, and Mrs. Doran accused the conductor of assault. After some hot talk on both sides the charges were withdrawn.

## OHIO STATE TRAMWAY ASSOCIATION.

The annual meeting of the Ohio State Tramway Association—the pioneer of street railroad associations—took place at the Boody House, Toledo, O., Sept. 26th. The president, Albion E. Lang, of the Consolidated Street Railroad Company of Toledo, welcomed the members in a short address. The papers under discussion were: 1st. "The best method of collecting fares;" 2d. "A desirable and satisfactory fender;" 3d. "What are the best qualifications for car and motor men?" 4th. "The treatment of low joints in rails and how to prevent them."

Among those present were Albion E. Lang, Consolidated Street Railroad Company, Toledo; James Robison, Toledo Street Railroad, Toledo; J. K. Newcomer, Delaware Electric Railroad Company, Delaware, O.; R. Carpenter, Mansfield Street Railroad Company, Mansfield, O.; B. P. Foster, Toledo & Maumee Valley Railroad Company; W. F. Kelley, Columbus Street Railroad, Columbus, O.; W. S. Jewell, Consolidated Street Railroad, Toledo; J. B. Hanna, Cleveland City Railroad; W. G. Owens, Des Moines Street Railroad, Des Moines, Ia., and others.

The supply trade was represented by C. M. Fuller, of the Davis Car Shade Company; H. H. Foster, The Dreher Manufacturing Company, New York; John Dale, of the Dale Manufacturing Company; E. A. Smith, Consolidated Car Heating Company, and others.

The members and guests were entertained by visits to various industries in Toledo and by a banquet in the evening at the Toledo Club. The place for the next meeting was referred to a committee which is to report at a later date.

Pottstown, Pa.—The Ringing Rocks Electric Railway Company, whose original charter granted the privilege of building a line from Pottstown to Ringing Rocks and thence to Falckner Swamp, has obtained additional charter privileges by which it can extend the road from Falckner Swamp to Gilbertsville, Boyertown and New Berlinville. The road, as now built, from Pottstown to Ringing Rocks, is about four miles long; from thence to New Berlinville the distance is seven miles, making a trolley line of eleven miles. The company will make surveys at once, and if the right of way is granted by the townships and Boyertown Borough Council, it is probable the work of construction will be commenced this fall,



**COMPRESSED AIR TRAMWAY SYSTEM IN PARIS.**

One of the most interesting applications of compressed air in Paris will be that for the propulsion of tramscars on the Conti system, a system already in experimental use in Vienna. Some preliminary trials have been made at Nantes, and at Nogent, and the results obtained seemed sufficiently good to justify the Compagnie Générale des Omnibus in constructing three new lines in Paris, which will

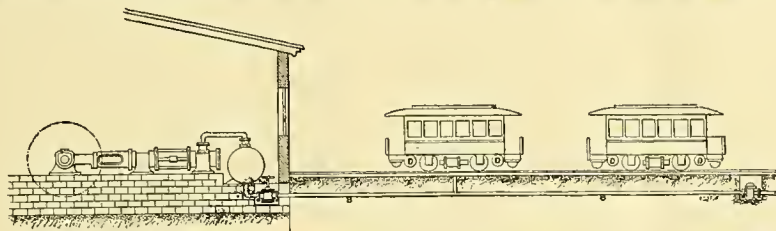


FIG. 1.

be opened for traffic during the present year. In the Conti system the air is compressed at a relatively high pressure at a central station; it is then admitted into the mains *B* placed beneath the rails, Figs. 1 and 2.

Branches *C* lead the air nearly to the surface into automatic devices by which the car reservoirs can be charged. By this arrangement it is considered that one central station will be sufficient,



Fig. 2.

whatever the length of the line may be; and as the charging devices can be introduced at short intervals, the dead weight of reservoirs to be carried is relatively small. The distance between the charging stations varies according to circumstances, but for convenience they should be located at the recognized stopping places. Fig. 3 is a diagram that gives some idea of the arrangement. An iron box is sunk into the roadway to inclose the mechanism, and this box is covered in by a plate containing two hinged flaps *F* placed immediately over the air nozzle *E*. This nozzle is the continuation of a plunger working in the cylinder *E*<sup>1</sup>, which can be placed in connection with the air main. As the front truck of the car passes over the rails it strikes the lever *G*, and depresses it, opens a valve that admits air beneath the plunger *E*, raises it, and causes the air nozzle to push open the flaps *F* and rise above the level of the road. By the time it has reached its full height the nozzle engages in a connection *H* communicating with the reservoirs *D* placed on the car; a valve is opened that admits the compressed air through the nozzle into the reservoirs, which are filled in a few seconds. The

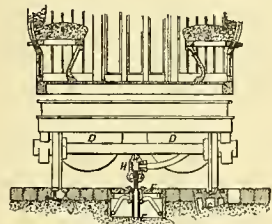


Fig. 4.

valve is then closed, and as the car proceeds the lever *G* is released, the air beneath the plungers in the cylinder *E* escapes and the nozzle falls, the flaps *F* closing over it and restoring the street surface. In the event of mechanism becoming deranged, air standpipes are provided, so that the reservoirs can be charged by coupling up.

The results obtained will be watched with considerable interest, so soon as the system passes out of its experimental stage, which it promises to do

shortly under the care of the Compagnie Generale des Omnibus.

The illustrations are reproduced from London *Engineering*.

**TROLLEY LINES AND STEAM RAILROADS.**

Railroad men have had their attention directed anew to the trolley by the president of the New York & New Haven Railroad, who, in his annual report, refers to the serious nature of electrical

competitions, says the *Chicago Herald*. There is no disguising the fact that the trolley is irremediable. It is a cancer which is gradually sapping the vitality of some of the country's largest railway systems. Its backers do their work systematically. There is no newspaper fuss about it. Thus within a short time there will be a continuous trolley road between such important points in Pennsylvania as Harrisburg and Philadelphia. Most of the towns between these cities are already connected by electrical roads. It is proposed, as said, to make the line continuous between the two cities. The Pennsylvania road feels the trolley, and will feel it more. So do other roads in Pennsylvania, as is shown by the following incident related recently in the corridors of a hotel by a man who lately traveled over the Lehigh Valley road. Said he: "I was on my way to Ashland, Pa. When the train reached Shenandoah, distant eight miles from my destination, nearly everybody got out. Only four or five people remained on the train besides myself. The exodus was so sudden and

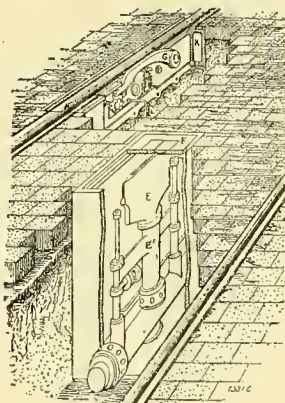


Fig. 3.

complete that I asked the conductor its cause. He told me it was the regular thing. Everybody going to Ashland always got out at Shenandoah and finished the journey by trolley. By the railroad the fare from Shenandoah to Ashland is 24 cents, while by the trolley it is 5 cents, so that the saving is exactly 19 cents per capita." It is predicted that before another year etapes most of the towns on the New York Central road between Buffalo and Albany will be connected by electrical railroads.

**CURIOUS ACCIDENT IN BROOKLYN.**

A curious accident happened to an electric car a few days ago. A gang of men employed by the Municipal Gas Company was employed in repairing a man at the corner of Washington street and Myrtle avenue just under the street car track. When the car passed over the spot a loud explosion occurred, which caused no damage beyond greatly frightening the passengers. A spark from the motor, it is supposed, ignited the gas that had collected in the excavation. The explosion caused

a serious leak in the main, and a flame several feet in height burned for an hour or more, until the damage was repaired.

**QUESTIONS AND ANSWERS.**

**COILS ON COPPER BOBBINS.**

What is the reason that some field magnet coils are wound upon copper bobbins?

A. K. G., Duluth, Minn.

ANSWER.

This device was probably first used by Mr. C. F. Varley, its purpose being to reduce what is sometimes called the *extra current* when the circuit is suddenly broken. The philosophy of its action is that, being a good conductor and a closed circuit, induced currents of considerable magnitude are set up in it at the moment of the breaking of the circuit, and these retard the fall of magnetism in the field cores, thereby greatly lessening the tendency to spark. The application of this principle has been carried still further by Dr. Aron, of Berlin, who, after winding each layer of the coil, interposes a sheath of metal foil so as to kill the induction from layer to layer.

**WELDING CURRENT.**

To settle a dispute will you please tell us if the current used in electric rail-welding or in other electric welding operations is a dangerous one to handle? *A* says that if the two terminals of the welding circuit be grasped by the hands, the current would almost instantly vaporize the body. *B* pooh-poohs the idea and says that it would only give a severe shock. Which is right?

B. L., Boston, Mass.

ANSWER.

Neither is right. If one should close the circuit of a welding machine through his body by catching hold of the terminals with his hands, he would probably feel no sensation whatever. The reason for this is that the electromotive forces used are so very insignificant (not more than four or five volts) that but very little current could pass. This will be clear from Ohm's law. Assuming that the normal resistance of the human body is 1,000 ohms and the E. M. F. of the welding current is five volts, we have  $C = \frac{5}{1000} = \frac{1}{200}$  ampere. This is entirely too small an amount to be dangerous or even sensible. In welding copper a current of about 60,000 amperes per square inch of metal is required. This implies, of course, a very small resistance at the joint; otherwise, with the E. M. F. at hand (say 5 volts), it would be impossible for this current to pass. If, however, a current of 60,000 amperes per square inch were passed through the body, it would consume it, as *A* says; but to force such a current through would require, according to Ohm's law,  $60,000 = \frac{E}{5}$ , or  $E = 5 \times 60,000 = 300,000$  volts.

**RESISTANCE OF THE EARTH.**

Is it true that the earth or ground return offers no resistance or practically no resistance to the flow of an electric current?

INQUIRER.

ANSWER.

By no means. The resistance of the earth would be practically *nil* if the earth plates were each of enormous size, say, for instance, a mile or two square, but with plates of practicable size it is quite appreciable and under usual conditions considerable. The earth is in fact an extremely poor conductor, but as we can decrease the resistance of any conductor by increasing its cross section, so may the resistance of the earth become negligible if our ground plates be large enough so as to sufficiently decrease the resistance of the entrance to and exit from the earth of the current.

**ANSWERING EMPLOYEES' QUESTIONS.**

To the Editor of the STREET RAILWAY GAZETTE:

Referring to a question asked by a motorman in your last issue, relative to flashing at commutator, I may say that it certainly is a mistake on the part of any superintendent to refuse to answer questions put to him by the motormen relative to the trouble with motors; but as is often the case, such officials are unable to answer them. Motormen should know all about their motors as well as an



engineer does his engine, and if they would procure a copy of Perry's book on "Electric Railway Motors" they would, I am confident, in a very short time have all the knowledge necessary relative to the construction, operation and maintenance of street railway motors.

A subscription to the STREET RAILWAY GAZETTE should not be overlooked, as it is a valuable paper to all interested in street railway work. Questions should be asked, and I have no doubt your valuable GAZETTE would be glad to devote a column for this purpose.

Conductors and motormen on this line are held responsible for the proper care of their machinery. They are instructed to examine their motors at intervals during each and every day, and note any trouble that may show up, such as violent sparking at brushes, flashing at commutator or elsewhere, heating of armature and motor frame, etc.; and if the trouble cannot be located, to cut out the motor and report the matter to the Superintendent or Foreman of Carhouse. They are at liberty to ask any questions, which will be cheerfully answered. Considering that only four out of thirty-four motors are water-proof, we have very little or no trouble. Wishing the GAZETTE success, I am very respectfully yours,

CHAS. H. SMITH,

Superintendent Lebanon & Annville Street Railway.

LEBANON, Pa., September 25, 1894.

### THE PERFECTION OF THE ELECTRIC RAILWAY MOTOR.\*

LINCOLN NISSLEY.

A study of the history of the electric railway motor shows us that, from the beginning up to a few years ago, there has been a great tendency toward complicated, fanciful and impracticable designs, including outlandish forms of field magnets, and unnecessary number of field cores and coils. In most cases also the mechanical construction has been very bad; the shaft being too small, the bearings being weakly supported, and the general workmanship poor and not up to standard. It has long been my opinion that the proper way to design a good railway motor is to consider very carefully and systematically each part, first by itself and then with reference to other parts, and thus collect and build up the elements which are best.

Let us now take up the various parts of the electric motor, and consider each as a simple problem in designing. The size of the frame should be such that it can readily be placed upon any standard truck. The machine should be completely shut in so as to make it thoroughly iron clad.

A good, substantial, ironclad frame does more than anything else to give great stability and strength to the whole machine, and is highly desirable in a railway motor. The bearings should be directly and rigidly mounted in this frame, a simple fact that has often been disregarded, and all parts should be interchangeable. The armature and car axle should be in perfect alignment, and consequently perfect meshing of the gears is obtained, which experience has proved to be of vast importance. The gearings should be mounted closely to the frame so as to eliminate buckling and tendency to loosen parts.

The field magnet should be bipolar. The field should also be of the single magnetic circuit, rather than the consequent pole type, because the former is more economical in wire and current required, lessening the cost of renewals and repairs.

A single circuit requires only 70 per cent. of the weight of wire, and 70 per cent. of the energy of magnetization that is required by a double magnetic circuit.

The field cores should, of course, be perfectly insulated; this can be accomplished with certainty by winding them on a solid spool of material which is firm and water-proof and highly insulating.

The armature should be of the ring type, so that the winding does not slip out of place or pile out at the ends when running at high speed, a fact which will be appreciated by those who are operating cross country and suburban lines.

The armature should have teeth or projections upon it in order to secure and protect the wires from mechanical injury, to reduce the reluctance of the magnetic circuit and the weight of wire and energy of current required to magnetize it. The perfect insulation of the armature core is of the most importance. The best material and the most complete covering should be used, and the

greatest possible care should be exercised to avoid short circuits, grounds or broken wires.

The efficiency should, of course, be as high as possible, and is made a maximum by reducing all elements of loss as far as possible. These losses are: current to magnetize field; loss due to armature resistance, friction, resistance of air and eddy currents. It has always seemed to me that if a machine can be run for several hours under full load without any part becoming overheated, the efficiency of that machine must be high. This fact is more absolute than any efficiency test can possibly be.

In looking over the past eight years of practice in the designing and perfection of the electric railway motor we have much to commend and considerable to condemn. The boldness of the achievements, the problems that have been solved, the rapidity of development—seem almost beyond comprehension. That the electric railway motor in less than eight years should reach the high state of perfection, economy and efficiency that it has, as compared with the long years of development of the steam engine, is remarkable.

In the perfect railway motor we have something entirely different from what we have in the steam engine. We have no reciprocating parts, but continuous rotary motion. The strains are all tangential; and this aids greatly in running and maintenance.

The railway motor of yesterday is not what the railway motor of to-day or a few years hence will be. Yesterday we were struggling with difficulties connected with the commutator and brushes which have been the great bugbear of all types of motors. Commutators and brushes require more care outside of gearing connecting motors to axle than anything else we have to deal with. They have always been the weakest spot in the electric railway motor. The question arises, Can these difficulties be overcome? I think they can, and have been to a great extent already overcome by several of our large manufacturers.

In connection with the motor, we are laboring under very serious difficulties in regard to proper control and regulation. In the control of the railway motor we cannot do exactly as we do in the locomotive—adjust our point of cut-off so as to secure the best results with a given load.

We have to govern our motors by varying the resistance in the circuit, which means loss necessarily, because the resistance has to be overcome to some extent by the current passing through it or by reducing the intensity of the field magnet, which also means loss; if this is true, then it seems to me that it is unfortunate, but is it necessary? I do not think so.

The ideal railway motor for the propulsion of our cars would be a motor running at a continuous and uniform speed, and with a variable gearing, giving the motor the advantage of power when the car was first started. You all know that when our motorman wants to change the speed of his motor he moves a switch or controller handle around, which adjusts the current flowing through the motor. Now, as a matter of fact, the motor should adjust the current itself, and not the man, and the speed of the motor should remain absolutely constant, while for regulation between the motor and the gear on the driving wheels you should depend on varying the mechanical advantages entirely.

It should be borne in mind that it is less than three years since the first single reduction motor was commercially introduced. The work was done under the most unfavorable circumstances; compared with similar motors of to-day they were indeed crude and very costly. They answered the purpose, however, and it is generally admitted that they have been a financial success as compared with the use of former construction.

The single reduction motors have since been in continual operation, and those of recent manufacture, embodying the latest improvements, are a great advance in the onward march toward perfection. That there are still annoying circumstances in connection with the mechanism no one who is charged with their practical operation will for a moment deny, but inasmuch as they are universally proving a financial success, it may be taken for granted that electrical and mechanical improvements will be gradually introduced until they become as nearly perfect as anything of the kind can be.

The question is not whether a motor is perfected, but whether it is enough of a success to warrant the improvements which will lead to perfection. Its advantages are not yet thoroughly appreciated, but they will be. Its future is assured; with this outlook will come better construction, better engineering, better mechanics and the solving of the larger problems, which will place the perfected railway motor on a cheaper, better and more successful basis.

### THE ELECTRIC BRAKE IN PRACTICE.\*

BY ELMER A. SPERRY.

#### PART I.

The growing frequency of accidents and the constantly increasing demands of the public for damages are indications that have not been made to impress the mind of the engineer, or I am sure adequate means would have been forthcoming for the correction of so grave a fault inherent in all the present systems of power-operated street cars. Some of our municipal authorities are taking action with reference to the increasing frequency and severity of accidents, and although no thorough scientific investigation of the matter has been published, yet it is a startling fact that with the present hand-brake no electric or other equipment to-day stands provided with anything in the line of an emergency brake. In so grave and urgent a case, what can be done in the line of remedy? The question naturally arises, Will any system of braking worked upon or in connection with the ordinary wheel of a vehicle be sufficient for the stop required? What is the maximum efficiency obtainable by the brake working through the wheels? Is it sufficient to arrest the car before accident in case of emergency? Can it be made in any event a sufficient accident preventer? The popular notion that most accidents are due to brake failure is true, but in a way that is little understood, the failure being one of degree. It may not be known that under proper and standard conditions any car or train may be brought from a speed of 10 miles an hour to absolute rest inside of 10 feet. It is not generally appreciated that the wheel brake has ample capacity to accomplish this. The former investigations of the writer with reference to adhesion under conditions of acceleration and retardation, climbing and descending hills, afford ample proof that the rail adhesion through the wheels gives the wheel brake more than capacity sufficient to accomplish this result. For instance, assuming any weight and load, say 17,000 pounds, the stored up energy, 64,426 foot-pounds, can with ease be dissipated within 20 feet for the ordinary

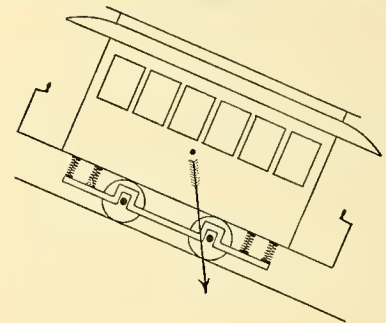


Fig. 1.

equipment, and less than half this distance, or a little over nine feet, under conditions of coupled drivers, or if the wheels are compelled to revolve in unison. This latter consideration will be seen to have quite an unexpected as well as pertinent relation to the problem. It will be seen by a glance at the figures that the center of gravity of the mass is far above the wheel contact with the rail. The retarding effect takes place on the base line in a plane below that of the center of gravity, really the farthest projection downward of the mass as a whole. A sudden stop operating on this base line tends to pitch the upper portion forward, bringing nearly all of the weight, and with it the retarding capacity, upon the front pair of wheels. The brakes on the rear pair in the ordinary equipment will have but little effect; if, however, by any practical method they are coupled to the forward drivers, the brakes on this rear pair still remain active and of full effect. This is true even if the back pair should be lifted clear of the track. With increased weight upon the forward drivers comes ample increased adhesion, thus preserving the full tractive effort of the total weight intact for purposes of stop, which is impossible in the ordinary equipment. These effects are all aggravated in case of short wheel base. The present tendency toward a longer wheel base is a step decidedly in the right direction, and should be encouraged. The effect of shifting the load in reference to the axles will be especially noticed in descending hills, as shown in Fig. 1, where the momentum of the rapidly retarded mass tends to shift the load centers still farther forward, in some cases almost wholly onto the front drivers. It will be seen to have a greater effect than in ascending grades, where in stopping the inertia tends to correct the position of the shifted load, whereas going down, in stopping, the momentum as stated tends to still further aggravate the condition. The

\*Abstract of a paper read before the Pennsylvania Street Railway Convention, Reading, Sept. 5, 1894.

St. Augustine, Fla.—Money has been raised for the construction of the electric railway.

\* An abstract of a paper presented before the American Institute of Electrical Engineers, Sept. 19, 1894.



practical effect of this may be seen whenever an ordinary street car mounted upon springs of fair resilience is quickly stopped. The car will be seen to suddenly right itself, having been pitched forward in the process of stopping (see Fig. 2), the front springs being depressed and the rear springs extended. These considerations all go to show in a new light the advantages to be derived from coupled drivers for general street railway service.

Bearing these facts in mind, let us turn for an instant to the ordinary hand brake. The ratio in the brake levers will be found in the modern trucks to be anywhere from 6 to 11, averaging about 8 1/2 to 1. The lever arm of the brake staff will be found to be anywhere from 6 inches to 13

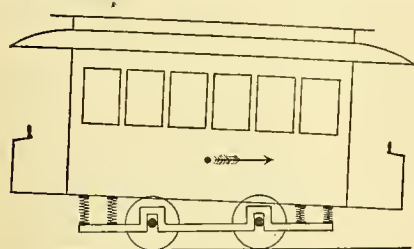


Fig. 2.

inches. Assuming 11 inches as the average, the radius from the center of the brake chain to the center of the brake staff will be 1 1/2 inches, giving thus 6.28 to 1, or a total leverage of 53.4 to 1 from the operating handle to the brakebeam. Two elements now have to be assumed: First, the friction coefficient of the brakeshoes acting upon chilled wheels. Second, the power upon the brake staff. The writer has endeavored to cover both of these unknown quantities by actual experiment, giving the results in the tables. Table I. was taken by a dynamometer being fastened directly to the brake-staff handle in line of the pull of the motorman, a cast-iron brake wheel 16 inches diameter from center to center of a 1 1/2-inch rim bearing the handle. A number of experienced motormen were invited to test their strength upon this handle, and careful readings were taken. It was noticed that the right arm of the more experienced motorman was much more developed than the left, a fact which I think

reach by jerking upon the hand wheel, these pressures cannot be maintained and therefore cannot be depended upon for braking effect. The tests show that the full power that can be maintained upon the brake lever for a sufficient length of time for the purposes in hand does not exceed an average of 180 pounds.

Table II. was obtained in this way: A brake-shoe that had been run in service about three or four days was taken with the axle carrying its co-operating wheel, lifted out of the truck and placed between the centers of a lathe, the load upon the brakeshoe accurately measured, and the shoe held from movement around the wheel by a dynamometer. Every precaution was taken to avoid handling the periphery of the wheel or the face of the brakeshoe, and even the dust was left upon it so as to conform as nearly as possible to the normal conditions of practice.

Tracing our 180 pounds application to the brake-beam with allowance for loss by friction, we have 3,840 pounds applied to each of the two shoes which upon the chilled surfaces are found under ordinary circumstances by Table II. to give a coefficient of about 12 per cent. This would give a retarding effect of 460 pounds, which is less than one-third that easily obtainable were the power needful for its application at hand. The coefficient under these conditions must have been about 37 per cent, to realize anything like the total value of the retarding effect of the wheel. This under condition of chilled and glazed surface is entirely out of the question, showing at once the necessity of power in the application of brakes, if anything like their full value and use are to be obtained. This is also amply borne out in practice, as those who have tested this point well know that under ordi-

bodied in practice, and especially in such a manner as to perform its important function automatically.

For years the writer has believed that electricity was vastly preferable to any other force for the application and control of brakes. Working first on the solution of the continuous-brake problem for railway trains, he built his first electric brake apparatus in '82, and has studied and experimented on the problem in its various phases almost continuously since that date, with more or less encouragement in the line of substantial progress. As to its application to electric cars, the apparatus was successfully applied on some double truck cars in Illinois, one of these cars weighing as much as 12 tons. The first equipment, similar to that shown in Fig. 3, was constructed some five years since. The apparatus has been constantly undergoing alterations and been experimented with, until for the past 18 months a constantly increasing number of electric cars equipped with it have been in regular service, some of these running with change of motormen on each of 13 daily trips, the same motorman having the car once in about three days, making it impossible for the men to become familiar with the operation of the brake. During this time one car has made upward of 70,000 miles, hauling a trailer about 48,000 miles, during some special weeks of test making from 178 to 220 miles daily. It is only under such rigorous conditions of actual operation that rapid progress can be made in reduction to practice. All machinery or apparatus must pass this ordeal successfully before it can be brought into thorough commercial shape.

At the mention of electric brakes the engineer at once admits that they should be entirely feasible, and usually adds that there is plenty of electrical

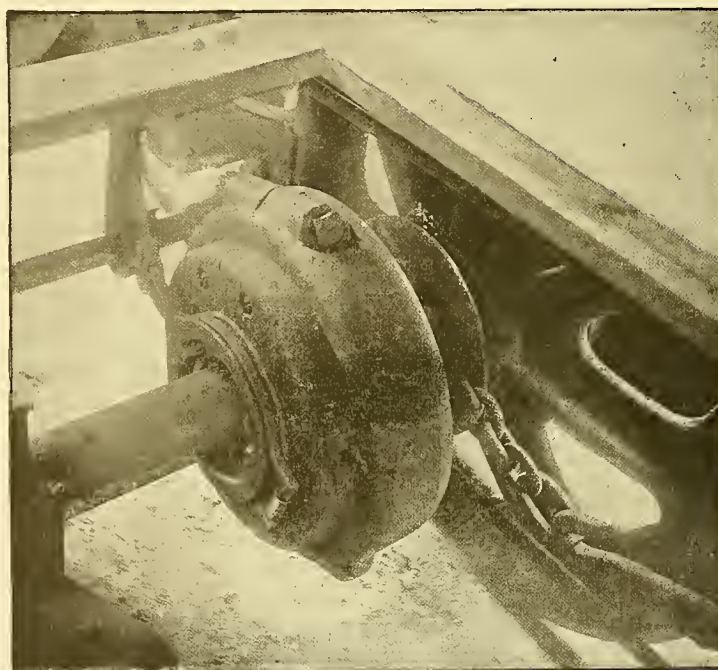


FIG. 3.

TABLE I.

No. of motorman.	Weight of motorman.	Gradual pull with one hand.	Jerk with both hands on hand wheel.	Emergency jerk with both hands on hand wheel.
6	140	110	135	335
18	200	125	275	315
304	207	84	378	315
50	173	125	215	285
173	133	125	245	310
50	159	150	300	300
36	130	150	275	350
66	155	125	215	285
146	135	150	175	325
27	110	125	225	350
56	150	125	250	405
4	160	150	200	400
56	185	175	190	375
		Av. 131.7	224	338.23

\* 3 years in service  
 Right arm, circumference of forearm, 12 1/2 in. " biceps, 14 1/2 " "  
 Left arm, " " forearm, 11 1/2 " " biceps, 13 1/2 "

has been pointed out before. The extent of this development in the forearm is certainly quite marked, showing that the gripping muscles and weight of the body are the elements brought most into play.

Columns 1 and 2 indicate respectively the number of the motorman and his weight,

Column 3 indicates the greatest possible steady pull with the right hand on the handle, bringing into play all possible weight of the body.

Column 4 indicates the same conditions as column 3, the motorman in this case grasping the hand wheel with both hands, some motormen using

TABLE II.

Speed rev. per minute 15 in. wheel.	Brake pressure.	Traction.	Coefficient.
Varying, 150	900 lbs	87.4 lb.	9.7 per cent.
125	900	91.7	10.2
100	900	99	11.0
75	900	116.	12.9
50	900	131.	14.6
25	900	150.	16.6
20	900	158.	17.5
Constant, 105	900	174.6	19.4
	200	70.4	7.8
	300	76.5	8.5
	400	81.	9.0
	500	84.	9.3
	600	87.	9.6
	700	90.	9.9
	800	93.	10.2
	900	96.	10.6
	1000	99.	11.0
	1100	102.	11.4
	1200	105.	11.8
	1300	108.	12.2
	1400	111.	12.6
	1500	114.	13.0
	1600	117.	13.4
	1700	120.	13.8
	1800	123.	14.2
	1900	126.	14.6
	2000	129.	15.0
	2100	132.	15.4
	2200	135.	15.8
	2300	138.	16.2
	2400	141.	16.6
	2500	144.	17.0
	2600	147.	17.4
	2700	150.	17.8
	2800	153.	18.2
	2900	156.	18.6
	3000	159.	19.0
	3100	162.	19.4
	3200	165.	19.8
	3300	168.	20.2
	3400	171.	20.6
	3500	174.	21.0
	3600	177.	21.4
	3700	180.	21.8
	3800	183.	22.2
	3900	186.	22.6
	4000	189.	23.0
	4100	192.	23.4
	4200	195.	23.8
	4300	198.	24.2
	4400	201.	24.6
	4500	204.	25.0
	4600	207.	25.4
	4700	210.	25.8
	4800	213.	26.2
	4900	216.	26.6
	5000	219.	27.0
	5100	222.	27.4
	5200	225.	27.8
	5300	228.	28.2
	5400	231.	28.6
	5500	234.	29.0
	5600	237.	29.4
	5700	240.	29.8
	5800	243.	30.2
	5900	246.	30.6
	6000	249.	31.0
	6100	252.	31.4
	6200	255.	31.8
	6300	258.	32.2
	6400	261.	32.6
	6500	264.	33.0
	6600	267.	33.4
	6700	270.	33.8
	6800	273.	34.2
	6900	276.	34.6
	7000	279.	35.0
	7100	282.	35.4
	7200	285.	35.8
	7300	288.	36.2
	7400	291.	36.6
	7500	294.	37.0
	7600	297.	37.4
	7700	300.	37.8
	7800	303.	38.2
	7900	306.	38.6
	8000	309.	39.0
	8100	312.	39.4
	8200	315.	39.8
	8300	318.	40.2
	8400	321.	40.6
	8500	324.	41.0
	8600	327.	41.4
	8700	330.	41.8
	8800	333.	42.2
	8900	336.	42.6
	9000	339.	43.0
	9100	342.	43.4
	9200	345.	43.8
	9300	348.	44.2
	9400	351.	44.6
	9500	354.	45.0
	9600	357.	45.4
	9700	360.	45.8
	9800	363.	46.2
	9900	366.	46.6
	10000	369.	47.0

gloves to prevent their hands slipping. None of the men could maintain these values for more than one-half second.

In column 5 is indicated an "emergency stop." The motormen were told to "break the machine" if possible. In this test the body was braced, sometimes with the knee against the dasher rail, the needle registering the highest jerk usually given with a sudden lunge of the body.

It will be seen that the power applied by the steady pull of the average motorman is about 131.7. and can be made to run up, in case both hands and the weight of the body are used, to about 224 average, but this value cannot be maintained. The average value of column 5 cannot be used in these calculations, for the reason that although they show the pressure it is possible to

nary conditions it is next to impossible to slip the wheels of a motor car by the hand brake.

In the electric brake, on the other hand, the fact that the truck parts are not bound up and locked into a solid mass by the enormous pressures of the heavy brake levers and shoes is found to prevent racking and straining the truck as well as jumping the track and curves when the brakes are set. The axles and truck parts are perfectly free for easy and normal movement even when the brake is exerting its full power. Great reduction of wear at the pedestal journals is also found, owing to entire absence of all of the usual heavy pressures of the brakeshoes. We can all see that by applying adequate power and control to the wheel brake, this element of the equipment may be raised to the position of an indispensable safeguard, the value of which can only be appreciated as its hitherto undeveloped resources are brought out, demonstrated and rendered simple and easy of application and control. In practice the greatest necessity for maximum brake application exists at the higher speeds. From Table II. it will be noticed that at just this point the failure is greatest, the coefficients being least; increasing as the speeds decrease. This has always constituted the one grave fault of the airbrake in railway service. The intensity of its application should be greatest when the speed is greatest, and decrease as the speed drops off. As will be shown farther on, this point has been fully covered in the electric brake, which is the first time that the varying application has ever been em-

energy at hand from the central station to retard and control as well as to propel the car. This, however, is not the method undertaken by the writer. To employ the central station current for operating the brakes would be to limit very materially their usefulness and certainty of operation. The braking current, although used at comparatively infrequent intervals, and then only for a short period, should for this reason be absolutely certain and unfailling in its action, and not subject to any "heart failure" of the central station, or sudden cessation caused by the opening of the circuit breakers, the interruption of the line, the flying off of the trolley, failure of the fuse, or failure at other more or less vulnerable points. The electric brake under discussion has been operated over a year on equipment upon different roads, from electricity generated independently of the trolley connection, the braking current not being derived from the central station, but produced by the power of the moving car, which power it is desired to get rid of or destroy. The brake thus operates equally well with the trolley off, and, as will be understood from the following description, the trolley current has nothing at all to do with the car while the brake is being operated, except possibly to maintain the light circuit. The electric brake at the same time is entirely independent of the hand brakes, which may or may not be present upon the equipment. The braking action being altogether independent of the ordinary brakeshoes, it is not found



necessary to employ them in connection with the electric brake, although in the earlier forms they were used, and in the case of trail cars, especially in heavy service and on grades, some engineers prefer to use them at the present time, in connection with apparatus such as shown in Fig. 3. The current employed by the writer for operating the brakes is developed by automatically turning the motor or motors into generators. As these are driven forward by the moving car they develop current which is controlled as to intensity by the starting rheostat of the car. The braking current is thus produced at the expense of the mechanical energy stored up in the moving car, which, being consumed, causes a retardation and final stopping of the mass as a whole. The current so generated may be furthermore led through a brake magnet as above seen, to apply the brakes; it may arrest the motion of the car direct by magnetic adhesion, or develop heavy retarding currents in the moving metallic mass by magneto-induction. When an active local circuit is used, the latter method is usually employed, for reasons which will be made more apparent.

(To be continued.)

## RECENT IMPROVEMENTS IN CABLE TRACTION.\*

BY G. W. McNULTY.

### PART II.

(CONCLUDED.)

The superstructure presents some very novel features. Stout cast-iron yokes were used wherever practicable primarily of three standard types, namely, for straight track, surface crossings and curves, the latter weighing nearly twice as much as the others. Some modifications of these had to be made in complicated structures, but the number of special cast yokes were kept as small as possible, special wrought-iron yokes being freely used in all difficult constructions. In fact, throughout the entire work all details were standardized wherever practicable. In the surface crossings, for instance, a typical structure was designed for a square crossing, and crossings of any other style or combination of sizes on double tracks were made by a slight change in the details, for which no special drawing was required. Crossing yokes were made flush on top and kept low enough to permit the use of heavy sole plates under the rails. A number of holes cored in the top flange of the yoke permitted the secure attachment of the sole plates in almost any position. In this, as in other special constructions, the perpendicular web of the slot rail greatly facilitated all attachments thereto.

Cable crossings, which for the sake of distinction were called intersections, were provided for at Twenty-third street and at Sixth avenue, but fortunately their use has not been required. With the possible exception of fenders, perhaps no other subject received so much attention from the noble army of inventors as did the cable crossings. We planned, however, where a cable had to be dropped, to simply "float" over, which our experience at Houston street shows to be always easily practicable at the points mentioned. With an automatic release, to be described later, and an automatic gypsy, as before noted, the whole problem, both of construction and operation, at cable intersections becomes very simple.

Crossovers from one track to another were always made with wrought iron yokes. They presented no other novel features.

Surface turnouts were made with tongue switches in place of run-offs, to secure better support for the wheels, and most of the latter tongues were secured by a locking pin that could be readily withdrawn from the surface, so that the tongue could be easily removed and replaced without disturbing the pavement.

In cable turnouts, of course, the slot switch was the most difficult problem, but it was very satisfactorily solved by making the point of the tongue stationary and throwing the grip shank into the proper slot by movable pieces working under the head of the slot rail, or in special boxes and arranged to support the slot tongue when at rest. Of course the slot and track switches were connected so as to work together, and no case has yet occurred where the grip has taken the wrong slot. They have also stood up very well under the heavy traffic of lower Broadway, which, it may be remarked, is often more destructive to track work than the cable cars themselves.

Before coming to the curves the carriers should be mentioned, since, though possessing no very novel features, they have worked very satisfactorily. To save journal friction and especially to reduce the slip, which occurs when the cable first touches the carrier after having been lifted off by the grip, and which by its multitudinous repetition becomes a serious source of wear, they were made as light as possible. They were cast with solid arms and heavy chills. As with the duplex system, each

carrier had to be to one side of the center of the conduit; the size of the shaft bearings was made proportional to the weight they carried so as to secure uniformity of wear. Both bearings were contained in one bracket so as to insure proper position and alignment, and each bracket secured from slipping by steady pins, rested on an angle-iron frame at three points only so as to prevent chattering.

Curves are the *bete noir* of the cable road; their construction is its most serious problem. It is probable but for the curves there would be a dozen cable roads where there is now only one, but to have to go fast just where you ought to go slow, to be in constant danger of having your cable stranded if a careless or rattled gripman opens his grip ever so little, and to have to put a whole machine shop underground at every change of alignment are such serious and, so far, unsurmountable evils, that it argues much for the inherent merits of the cable road that they have not discredited it altogether. It must be confessed that there are no good curve constructions; some are less bad than others, that is all, and even the least objectionable are vastly complicated by the duplex system. That used on the Broadway road was as simple as any, and, as curve constructions go, has worked very well. Two sheaves, one for each cable, are carried in a frame secured between adjacent yokes so that it can be readily removed for repairs or renewals. Indeed some such arrangement was necessitated by the fact that we had to put the curve construction in the street before the curve mechanism was fairly designed, so that provision for its subsequent addition had to be made. This is a fair illustration of the conditions, probably too painfully familiar to most of you, under which such work is often, if not usually, performed; the drawing room struggling hard to keep up with work already done, instead of having complete and harmonious plans prepared in advance, and the engineer expected to achieve just as satisfactory results as if sufficient time had been allowed him to see the end from the beginning and plan accordingly. In the present case the circumstances more than individuals were responsible for the unfortunate conditions.

But this is a digression to what is neither recent nor an improvement in cable construction.

To return to our curve construction. In order to get the wheels on separate shafts instead of on the same pin, it was necessary to stagger them, as they could not be far apart vertically. In this way either sheave could be removed while the other was running. Lubrication was effected through pipes, the soft grease being forced from the reservoir by a weighted plunger. An angle-iron guide, bolted to the yokes in short lengths, took the side pressure of the grip, while the edge of a flat bar, extending in sections between the sheaves for the whole length of the curve, guided each cable into its proper place. To get the cable started on the right side of this bar at the entrance of each curve, a so called "flipper" was employed. This was a novel feature, and deserves a moment's notice. It really was an extension of the flat bar or cable guide above mentioned, having a partial rotation on an axis parallel to the adjacent tangent. It was projected into the conduit between the cables, being kept out by a spring which permitted it to recede while the grip passed, but held it closely in contact therewith at a point between the cables so that the inner cable was kept above it and the outer one below, thus preventing the live cable from riding on the dead one, which would have done serious mischief. As a moving part kept in place by a spring and struck with some force by the passing grips many hundred times a day, it was adopted with some reluctance, but its action has proved very satisfactory.

6. *Improvements in Cars.*—While the grip is the fundamental feature of the car and, therefore, comes logically under this head, it is also the heart of the cable road as far as its design is concerned, the nucleus around which all the rest of the structure aggregates and the ultimate factor of the whole work. It may be said in planning any machine or structure—and a cable road is both—that part which is most closely controlled by the conditions of the problem to be solved should be first designed. The essential condition of the cable road problem is that there must be some means by which a street car can grasp or release at will a moving cable. The street car and the moving cable are simple problems taken separately. The difficulty lies in their combination; in a cable road it is the grip which effects that combination, and it follows that in planning a cable road the grip should be first selected or designed, and all other parts so arranged as to secure its highest efficiency. Unfortunately, in the Broadway road, through a peculiar combination of circumstances, which need not now be rehearsed, the grip was not fully designed until the road was nearly completed. This necessarily much complicated the design of the conduit and its attachments, as provision had to be made for some possible conditions of the grip which were afterward found to be unnecessary,

while the design of the grip was hampered by the development of unforeseen conditions for which the conduit as built did not adequately provide. Fortunately, by much patient study and some experimenting, it was found possible to devise a very satisfactory grip, whose more important features will be briefly described.

First.—As it had to be able to take a rope on either side and go either end first, the grip was necessarily quadri symmetrical in plan, with, of course, a pair of jaws on each side, both pairs moving together. Contrary to the more common practice, the lower jaws remain stationary. This was done partly to reduce the depth of the conduit, which on Broadway was a most important consideration, but more especially to reduce the slip of the cable on the carriers as it trails from the grip. This, as before noted, is in the aggregate a serious source of wear to both cable and carrier, and its amount in each case is obviously in direct proportion to the length of time that the two are out of contact, which in turn is approximately proportioned to the height that the cable is lifted by the grip. The jaws are lined by steel dies rolled from rail billets, which have given very good results. The shanks were of structural steel, and have also done well. At the end of each cable section, and also in case of long stops, it is necessary that the gripman should be able to drop the cable altogether. Suitable provision is made for this, but it was early foreseen that it was not safe to place entire dependence on the gripman's care, whose attention was liable to be distracted at the critical moment, and whose neglect was certain to wreck the grip if it did not strand or break the cable. An automatic trip was therefore added, actuated by inclined projections in the conduit, which insure the release of the cable at all desired points.

Some of the grips first supplied did not have this device, and its value was abundantly demonstrated by the accidents which occurred through lack of it. As several devices have been proposed whereby the grip can be made to pick up the cable at any point, a feature at first sight of much value, it may be worth while to say, first, that where cars are run on such short headway as on the Broadway road, should it be lost, it will be but a fraction of a minute before the following car will be ready to push the temporarily disabled one to the next gypsy where the cable can be regained. Next, to permit the jaw to get under the cable at all points, would require either a deeper conduit than was practicable in view of the underground obstructions on Broadway, or much more, clearing of the same. Last, but not least, all carriers would have to be carefully protected from damage by the grip, a matter of considerable expense and one which would seriously interfere with keeping the conduit clean. Concentric wheels were used for operating both grip and brake as requiring less room for their operation and permitting greater range of motion and consequently power, and a more delicate manipulation of the grip when "stealing" or running slower than the cable, as is so very often necessary on lower Broadway. They are for these reasons easier for the gripmen, and hence preferred by them. While not quite so prompt as the lever, no trouble from that source has been experienced, and the starting and stopping of the car are less jerky.

The brakes offer no special features. Some air brakes have been tried with satisfactory results, but the advantage has not been sufficiently marked to warrant their general adoption.

The cars have been lighted with compressed gas on the Pintsch system, which has proved very satisfactory, and is believed to have been here used for the first time in street cars.

The heating question has received very careful attention, and several tests of different systems have been made. Some method of hot water storage has promised the best results, but the difficulty of charging on such short headway would be very great, and the experience of one winter would seem to prove that with a road carrying so few long trip passengers heated cars are not necessary.

7. *Improvements in Car Barns, Etc.*—An extensive and elaborate structure for the storage of cars has been very carefully designed, but has not yet been erected. Its dimensions will be about 200 by 600 feet by 100 feet high. Its most noticeable feature will be a combined transfer turntable now partly installed and designed to be operated by electricity, but at present moved by hand gearing. To handle cars in and out of the barn, it is proposed to use two or three small motors driven by storage batteries, compressed air or superheated water. To bring out a car, the motor goes after it and brings it out to the transfer turntable in the front of the building. This not only shifts it to the proper track to run out, but, rotating 100 degrees, puts the motor in position to push the car out onto the line and come back for the next one without switching. Of course, in running cars in, the operations are exactly reversed and the turntable then prevents the motor from being shut in by the car it has handled.

On the upper floors plain transfer tables traverse

\* Read before the New York State Street Railway Association, Sept. 13, 1891.



the center of the building, connecting with a car elevator at each side, while smaller motors or lazy ropes would handle the cars on the floor tracks.

Turntables would not be required here as, if lazy ropes were not used, the motor belonging to the floor could always be placed near the transfer table opposite the track onto which the next car was to be run.

There is necessarily some complications of track work in front of the car barn, and all switches there are operated by one man in an elevated cab overlooking the whole street at that point, which has proved a very satisfactory arrangement. Suitable inspection pits and a well appointed machine shop equipped, not only for the repair, but also for the manufacture of grips when needed, complete the present installations at the car barn.

In conclusion, I may say that if the foregoing looks too much like a descriptive eulogy of the Broadway road, I was limited by the subject assigned to me to the record of improvements only, so that an impartial account of its shortcomings as well as its successes was not to be expected. It is very easy now to see where many things might have been made better, and even where some supposed improvements have not realized all the expectations that were formed for them. The next cable roads should be better than this, whoever builds them, and no one will be quicker than the writer to appreciate the magnitude of the difficulties which future improvements must surmount, or to give hearty credit to the man or men who may accomplish it.

One difficulty, however, ascertained in the construction of the Broadway road can never exist to a like extent elsewhere. I allude to the underground obstructions, subways, gas, water and steam pipes, pneumatic tubes, sewers and other matters too numerous to mention, which had accumulated in three centuries of the growth of a vast metropolis. Their removal alone would have been a formidable task, but as almost all of them had to be kept in use while the removal was going on, and the street traffic had to be continued as well, the writer is inclined to look back on this part of the work with a feeling akin to astonishment at its successful accomplishment in so short a time. To construct and put in running order through such a labyrinth, a complicated machine five miles in length to be jointly operated by an army of engineers and gripmen with reasonable precision and freedom from derangement, is an achievement of which any corporation may well be proud.

#### NEW VERTICAL ENGINE.

In the design of the new vertical engine shown in the illustration, the Ball Engine Company, of Erie, Pa., desired to arrange an engine whose structure should be of such a form that the main pieces should be absolutely rigid, and one easy of access for adjustment or removal of any part subject to wear, and with steam distribution symmetrical on both sides of all the pistons, whether one, two, three or four are used; in other words, an independent valve motion for each and every cylinder employed, and each of these being a perfect engine in itself.

By reference to the cut it will be seen that the main proposition as to strength and indestructibility is fully covered in the symmetrical form of the upright housings which are made to constitute one double housing by having one side of each planed and bolted together in the center of the middle shaft bearing. This substantiality is still further increased by the operation of planing the bottom of both housings to one continuous flat surface, to meet the planed surface of the top of the single base plate to which the bottoms of the housings are substantially bolted.

The introduction of the shaft into this engine is accomplished by arranging the shaft boxes in a large jaw cutting into one side of the housing deep enough to bring the center of the shaft in a plane with the center of the housing, finish spots being provided to meet correspondingly finished surfaces upon the cast iron boxes.

These boxes consist of one lower, two quarter, and one top box for each journal, and these are provided with removable babbitt metal shells upon which the journals bear. These shaft-box jaws are in turn closed by the use of heavy struts or plates having on their inner faces a V-shaped tongue on each end which fits into a corresponding groove planed on each side of the jaw. These struts are fitted so that when bolted in solidly by the four bolts in each, the jaw is closed and

completes the symmetrical strength of the four corners of each housing, each strut being fitted so that there can be neither contraction nor extension of the outer end of the jaw.

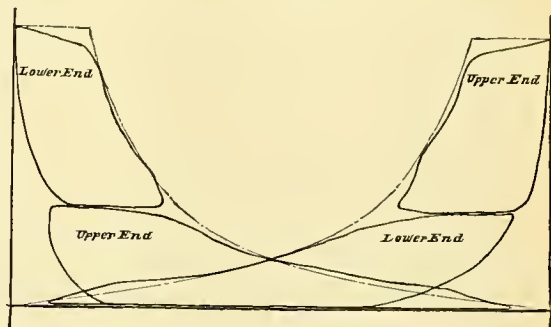
Each housing is also pierced by the large rectangular opening on each side (shown covered by a door bolted on) as wide as the space between the inner edges of the struts and extending both high and low enough to allow the cranks with their counterbalancing discs to pass. Hence, with shaft, boxes and struts in place to close up the engine, it is only necessary to put up and secure large doors, which in turn are provided with a small shutter plate covering an opening large enough for the insertion of one's hand to feel the connecting rod strap when the engine is in motion and the necessary wrenches to key up the crank boxes when so desired,—while the adjustment of the journal boxes is accomplished by turning the three set screws shown in each strut,—the two in the center reaching the quarter boxes, while the third one above operates either in or out a wedge which fills between the upper side of the jaw in housing and the top box; thus giving independent adjustment for three parts of each box while the lower box is perfectly free to move at right angles to the axis of shaft, thereby giving for all positions of adjustment of the quarter boxes a full bearing for the shaft.

Above the openings for the shaft the housing becomes a round taper column, having on two sides of its inner surface the crosshead guide surfaces which are cast in place and bored out coincident with the boring and facing of the upper end for the reception of the cylinders and the lower end for its seat upon the base. The other two sides of each housing are pierced by elliptical openings, making easy access to the crosshead and upper end of connecting rod.

With this form of housing a structure is obtained

and, as are the journals, ground to a perfectly round, smooth running surface. The pins are provided with centrifugal oiling holes in addition to the regular supply through the usual tube reaching from the upper to the lower end of connecting rod.

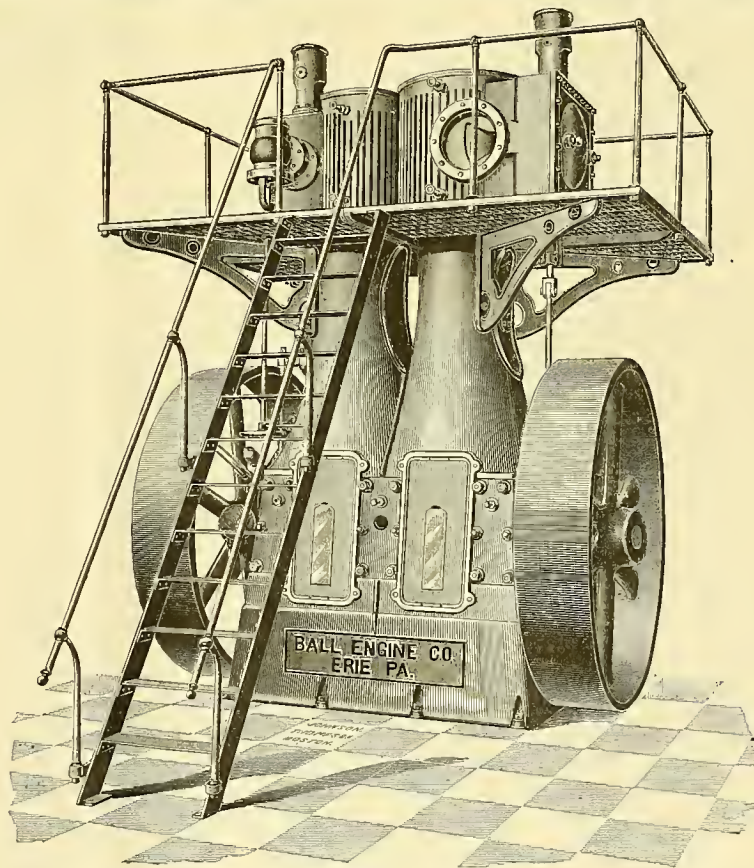
Covering each pair of crank bells is a pair of discs carrying a sufficient amount of counterweight to give a perfect running balance to the cranks and the reciprocating parts, so that there



Indicator Diagram of Ball Vertical Engine.

is practically no vibration to be communicated to the housings, and hence to the upper works of the engine.

The connecting rods are of forged steel, the upper end being solid and cut out for the reception of the brass crosshead box and the removable crosshead pin, the latter being very carefully tapered through the crosshead and held in place by a fine threaded nut; the lower end being provided with an excellent design of strap which, owing to the arrangement of bolts and cross keys, constitutes a solid end rod for the crank as well as the upper end, and both ends are provided with the very best arrangement of wedge adjustment



BALL VERTICAL ENGINE.

that is strong, convenient of access when desired, clean as to any dirt leaving the engine, and entirely closed as to any dirt from the outside entering the engine, along with a natural ventilation past the shaft boxes up the column and out of the elliptical openings therein.

The shaft is of one piece of forged steel from end to end, the crank pin being 180 degrees apart and cut out of the solid down to their round diameter,

that can be conceived of, and which in operation does not alter the length of the rod.

The crossheads are of the double plate pocket type, as used in many makes of Corliss engines, are provided with taper shoes to compensate for any wear that may occur against the guides, the shoes being of cast iron with the running surface entirely covered with babbitt metal, the area of which has been made exceedingly liberal.



The piston rods are of crucible steel, screwed into the crosshead. The stuffing boxes are adapted for the use of fibrous packing unless otherwise ordered.

The pistons are of the double plate type, held up to a solid collar and taper by a well-fitted nut. The piston packing is made up of two self-adjusting parted rings and a broad junk ring for centering and guiding the piston in the cylinder.

The cylinders are made of charcoal iron, mixed in such proportions of hard and soft as to produce a very strong, close-grained iron, which enables the surfaces to take a mirror polish. They are provided with single valves, each of which is practically one piece so far as the motion and wear are concerned.

The high pressure valve is of the double-faced telescopic relief type, with boiler pressure on the inside, and sufficient amount of unbalanced area being left on the faces that the pressure of the steam on the inside forces the two faces apart, causing each to rub against the seat with sufficient force to keep the surfaces polished and steam tight through the entire life of the engine.

The low pressure valve is of the common letter D type with improved proportions and construction, is provided with a round relief area upon its back and operating against the chest cover, thus having a large well-proportioned valve that runs with the greatest ease and yet follows up its wear without attention from the outside. The indicator diagram shown herewith proves that where single valves of proper design are used the steam distribution can be made so perfect that it is simply folly to continue the chase after an ideal perfection that involves a vast amount of complication at an increase of first cost, maintenance and continuous attention, which is not justified by the results obtained.

To state this in another way, the one great governing fact in the use of steam is recognized, namely, that a small leakage will more than destroy the useful effect of very elaborately worked out valves and motions. The makers have, therefore, confined themselves to the work of perfecting and simplifying the simplest and best form of steam valve that is possible.

As an instance in point showing the absolute control which a correctly adjusted governor may have when such a governor has a good valve to handle, a few facts that were developed in a recent test are related.

The engine is employed in electric railroad driving, and is supplied with steam at 125 pounds gauge pressure, and exhausts into a practical uniform vacuum of 24 inches, and was driving (at the time this test for total variation from standard speed was made) 425 to 435 I. H. P. To observe the variation a tachometer was attached to the main shaft. When all was in readiness and the full load was on, the switch controlling the whole current leaving the station was opened, thus dropping the entire load instantly, and the engine made a momentary flutter up to 235 revolutions and back again to 233 revolutions. The circuit was kept open while the attendant counted 10 and was closed as suddenly as it had previously been opened, when the tachometer showed the engine making the same momentary flutter down to 231 revolutions and back again to 233, taking up instantly a load of about 400 I. H. P. This test demonstrated that the governor was in absolutely isochronous adjustment, that the valves were absolutely steam tight.

#### LONG-DISTANCE ELECTRIC RAILWAY.

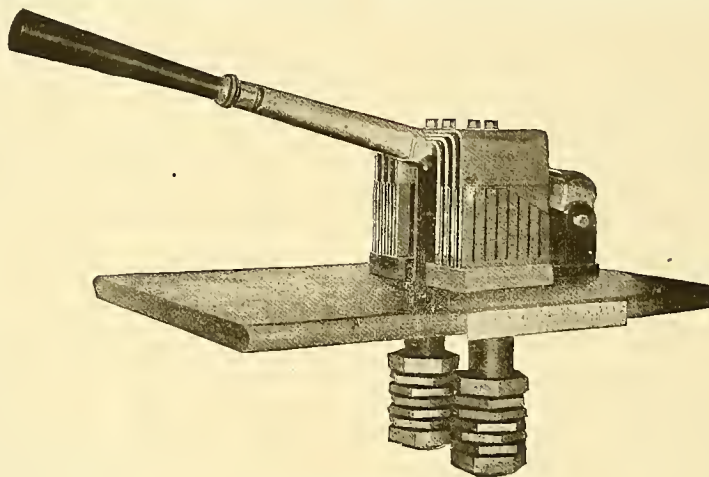
The Central Ohio Electric Railway has been incorporated to connect Pittsburg and Chicago by electric railway with branches to towns and cities along the route. The articles provide for freight, express and passenger traffic and the hauling of the mails. Among other objects are the supplying of light, heat and power for public and private use and the construction of telephone and telegraph lines. The headquarters of the company are Mt.

Vernon, the eastern terminus in Ohio is Brilliant, Jefferson County, and the western Celina, Mercer County. The route proposed is through the counties of Monroe, Jefferson, Harrison, Tascara-was, Guernsey, Coshocton, Knox, Morrow, Crawford, Marion, Wyandotte, Hardin, Logan, Auglaize, Allen, and Mercer. The capital is \$100,000, and the incorporators: G. A. Jones, F. W. Jones, J. A. Caldwell, William M. Koons and M. Spellacy. The cost of construction, it is announced, will be from \$10,000,000 to \$20,000,000.

#### SEVEN-THOUSAND AMPERE AJAX SWITCH.

As late as April, '93, a switch which was guaranteed to successfully rupture a circuit carrying 3,000 amperes of current, at a potential of 500 volts, was considered a giant in breaking capacity. It was then shown that the Ajax switch was able to open a circuit carrying 2,000 H. P. electrical energy at 500 volts potential, without the slightest injury to either the operator or the apparatus. Since that time Ajax switches have been designed for 4,500 amperes (50 per cent. larger than any attempted before), and several such are in actual service on street railway circuits.

The switch in the cut, representing a new plunger type Ajax switch of 7,000 amperes capacity, is claimed to be another advance. This switch is guaranteed to break its full rated capacity at 500



AJAX PLUNGER SWITCH.

volts potential, or nearly 4,700 H. P. It was ordered by the Electric Traction Company of Philadelphia, through the General Electric Company, which is building the switchboard for the former's new Delaware avenue power-house.

Except the carrier and stand, which do not form any part of the circuit, the entire switch is made of commercially pure copper, and provision is made for clamping direct to a laminated bus bar, consisting of six bars, each 5 inches by  $\frac{1}{4}$  inch, or a total of  $7\frac{1}{2}$  inches sectional area; which is also the minimum of sectional area in any part of the switch.

The contact area, finish and action are of the well-known Ajax style. The switch is compact in form, and occupies a space only 14 inches by 13 inches on the switchboard.

A handle of unusual length, which overhangs the switch proper several inches, is required to operate these large and close fitting blades. The total length of the handle from the pivot is  $41\frac{1}{2}$  inches, and terminates in a highly polished piece of mahogany.

As a continuous current circuit breaker, it is believed this switch is the largest yet attempted. It is needless to say that it has not yet been tested to its limit. The Ajax switches are made by C. S. Van Nuis, New York.

**Correction.**—In the last issue appeared an article descriptive of an adjustable advertising gate. The patentee's name is L. R. Godwin, secretary and treasurer of the Citizens' Street Railroad Company of Memphis, Tenn. By an error the name appeared as L. R. Goodwin.

#### NORFOLK & WESTERN SPECIAL ATLANTA CONVENTION TRAIN.

L. J. Ellis, eastern passenger agent of the Norfolk & Western road, the Shenandoah route, has issued the following circular for the information of those intending to attend the Atlanta street railway convention:

The Royal Blue line and Shenandoah Valley route will run a special train to the Atlanta convention of the American Street Railway Association, leaving New York Oct. 15, 1894, at 3 P. M., and reaching Atlanta at 6 P. M. the next day.

The train will carry the representative men in the street railway and supply business. Among those who have declared their intention of going on this special train are the following named gentlemen:

Benj. Norton, president Atlantic Avenue Railroad Company; Jas. H. McGraw, *Street Railway Journal*; E. Peckham, Peckham Motor Truck and Wheel Company; Henry C. Payne, president American Street Railway Association; P. C. Ackerman, American Electrical Works; E. Martin, vice-president Hamilton Street Railway Company; C. O. Baker, Jr., Complete Electric Construction Company; Wm. J. Richardson, secretary American Street Railway Association; E. J. Wessels, Genett Air-Brake Company; Geo. F. Porter, secretary National Electric Light Association; J. B. Griffith, manager Hamilton Street Railway Company; W. J. Clark, General Electric Company; T. E. Crossman, assistant to secretary American Street Railway Association; Wm. W. Cole, superintendent West Side Railroad Company, Elmira, N. Y.; H. C. Evans, The Johnson Company (six in party); J. H. Woodward, Benedict & Burnham Manufacturing

Company, Waterbury, Conn. (three in party), and a number of others.

A special car will be reserved for gentlemen accompanied by ladies. As the time is fast approaching when final arrangements should be made by those going to Atlanta, we would be glad to have your order to reserve accommodations for your party on this train. The railroad fare will be the usual for such occasions, namely, one and one-third fare for the round trip on the certificate plan, one fare going and one-third of regular rate returning. The sleeping car fare will be the regular fare in each direction, or \$6 a berth, New York to Atlanta; \$5.50, Philadelphia to Atlanta; \$4.50 Baltimore to Atlanta; \$4, Washington to Atlanta, and double these figures for sections. Remittance for the going trip from New York, including sleeping car accommodations, one berth, is \$30; from Philadelphia, \$27; from Baltimore, \$23.20; from Washington, \$21.50.

#### COMMENTS AND VIEWS OF CONTEMPORARIES.

**DELAYS FROM FUNERAL PROCESSIONS.**—The attention of street-car conductors and policemen should be called to the action taken on June 25 by the Common Council, which then passed Alderman Kieckhefer's ordinance permitting street cars to pass through funeral processions whenever delay would keep them from making their schedule time. This ordinance repealed the ordinance of October, 1892, which made the act of crossing a funeral procession punishable by fine or imprisonment. Yesterday a procession passing along Milwaukee street at about 11.30 o'clock delayed street car traffic for seven minutes. This is a courtesy to funeral processions which street-car employes have no right to grant and which policemen have no right to require. The delay occasioned when a car crosses a procession is so slight that nobody can object to it, while the delay occasioned to or-



dinary traffic by the unbroken passage of thirty, fifty or a hundred vehicles is often considerable.—*Milwaukee Sentinel*.

**A RAILWAY PROBLEM.**—The problem for the future is to determine to what extent small towns may be connected with cities by electric lines. It is believed that this problem will find its solution in the construction of many short lines of railroad operated by electricity, which will bring suburban towns into close relation to the cities upon which they depend. Following out this idea, it may be practicable to connect Denver with all the towns of the northern part of the State.—*Denver Republican*.

### NEW ENGLAND NOTES.

(From Our Special Correspondent.)

A public hearing took place before the Massachusetts Board of Railroad Commissioners in Boston Sept. 20, on a petition from the promoters of a new railroad that is projected between Lowell and Boston to be built on the Boynton Elevated Bicycle Railroad plan. Several prominent men supported the petition and leading railroad men testified as to the merits of the system. After taking testimony, however, the Commissioners were not satisfied that there was a sufficient demand for such a road through the district surveyed, and requested the petitioners to provide themselves with more testimony as to the necessity for the road and then appear before them again. The hearing was then adjourned.

There will be a large contingent of New England railroad men in attendance at the forthcoming street railway convention at Atlanta, Ga. Several of the local manufacturing firms intend to make exhibits there.

The selectmen of Braintree, Mass., have granted the Weymouth & Braintree Electric Street Railway Company, recently incorporated, authority to begin the construction of its road which will connect the two towns and give quite an impetus to the trade of the district. There is scarcely a town or village to the south of Boston and within 20 miles of that city that is not connected with an electric railway, and the patronage all the existing roads are receiving augurs well for the increased value of these properties in the near future.

The Massachusetts Railroad Commissioners have given a hearing on a petition of the Lynn & Boston Railroad Company for authority to issue \$5,000,000 mortgage bonds, 5%, payable in 30 years. The Board considered the petition as incomplete and irregular and requested the company to prepare another petition.

Work is being pushed on the new factories of the Van Choate Electric Company, at Foxboro, Mass., where it is intended to go into manufacturing on an extensive scale of the Van Choate system of electric lighting and railway apparatus.

### FINANCIAL DEPARTMENT.

Eastern Stock and Bond Market.

(From Our Wall Street Correspondent.)

The tail end of the financial month is accompanied by the usual relaxation in the activity noticeable in spots during the past few weeks' record of the market for street railway securities. The falling off in the volume of business has not, however, been followed by any decline in prices, which are, in fact, firmly held for all classes of bonds and dividend-paying stocks. This strength is, however, particularly marked in the issues of the street railway properties of New York and adjacent cities. Holders of these securities show absolutely no disposition to part with them at current figures, and, as investors and institutions are disinclined to advance their bids just now, the market for street railway issues remains restricted. The feeling, however, favors an early improvement in prices, and the indications are that a most decided increase in values will soon manifest itself.

The most marked feature of the market is, however, the great scarcity of all good issues, both stocks and bonds. Dealers report the greatest difficulty in filling the small buying orders even now on hand, as holders seem disinclined to part with their securities on any basis. This absence of floating stocks and bonds has prompted the offering to the investing public of new issues. Mention has already been made in these columns of the new Long Island Traction and Bridgeport Traction bond issues, and now here comes the Cleveland Electric Railway Company offering, through N. W. Harris & Co., the New York banking house, a goodly number of its 5 per cent. bonds. Rumors are also rife that one or two other big out of town traction companies are about to take advantage of the situation to float new issues of bonds for contemplated improvements. The present is a very propitious moment for such public offerings, and the finance officers of the various street railway companies in proper need of funds for extensions,

improvements, etc., will not neglect their opportunity.

Locally, Ninth and Second avenue shares have been most active in the investment market. Dry Dock still commands increased prices, and Third Avenue holds its own, despite the defeat in the struggle for the St. Nicholas avenue franchise. Metropolitan Traction, for the opposite reason, is disposed to mount higher, though there has developed during the week great opposition on the part of property owners to any railroad on the avenue in question. The stock is still, however, a conspicuous speculative favorite on the Philadelphia Stock Exchange, where alone it is listed.

The local speculative market for street railways has been given over almost altogether to the antics of Long Island Traction. The stock has been depressed for some time by rumors of receivership, inability to float bonds, etc., which culminated in an endeavor to prevent by injunction the proposed issue of \$3,000,000 collateral trust notes by the traction company and by the Brooklyn Heights Railroad. This suit was, however, headed off by quick work, as, while the plaintiffs were preparing their papers, the defendant company secured the money for the notes from a New York Trust Company, the whole amount being subscribed for at a price, it is reported, of 75 and commission. The suit to put the Brooklyn City road, which is leased to the Brooklyn Heights, which is also entirely owned by the Long Island Traction Company, in the hands of a receiver, is still threatening. The effect of all these unfavorable circumstances has been to send Long Island Traction to the lowest price on record, 10½. It has, however, recovered from this low figure and is now selling around 12.

### Financial Notes.

**General Electric Finances.**—The *Boston News Bureau* says: The strength in General Electric is not due in any way to the New York story that the company has paid off its floating debt. It is well known by everybody outside of Wall street that General Electric paid off its floating indebtedness many weeks ago. As a matter of fact General Electric's income has exceeded its outgo for a long time, as its collections on old and new accounts have been in excess of its sales and it has been for some time a problem how profitably to invest the General Electric Company's cash resources. It is now said that \$500,000 has been invested in \$650,000 of the company's own bonds, and still the company has \$550,000 cash on hand, no notes and no indorsements, save about \$170,000 of guarantees. The real strength of the General Electric to-day is in the changed basis of the company's operations. It is no longer seeking to control by patent monopoly or by aggregation of capital, but by manufacturing the largest amount of goods at the minimum of cost. For some years small concerns have been eating into the manufacturing and supply business of the General Electric by working on special articles. The General Electric has now reached forth to retake the field upon the basis of manufacturing each article at a cost based upon the consumption of the whole country, and the result is seen in the failing of electric supply companies, several of the strongest having gone to the wall very recently. General Electric also has a few large projects on hand where outside syndicates will supply the money and the General Electric Company the apparatus.

**Results of Electric Operation.**—The application of the trolley to the Broadway line of the Brooklyn, Queens County & Suburban Railroad has had results which are little short of marvelous. This road has benefited by the change of motive power to an extent greater, perhaps, than any other line in the city. During the 27 days of August in which the road was so operated, the receipts were increased by not less than 53 per cent. On some individual days the increase was 100 per cent. The cost of operation has been kept down to 50 per cent. of the gross earnings. The receipts on this line average more than \$1,100 a day.—*Brooklyn Eagle*.

**Baltimore Traction Earnings.**—During the week ending Sept. 4 the earnings of the Baltimore Traction Company were \$10,979, an increase of \$1,642 over 1893. The operating expenses have been so materially reduced that the net increase will average \$4.35 per day more than last year.

### NEW INCORPORATIONS.

**Long Island City, L. I.**—The Newtown Railway Company has been incorporated to build a road between the town of Newtown and Long Island City and thence to the village of Flushing, a distance of five and one-third miles. The capital is \$150,000. For the first year the directors are: Rudolph T. McCabe, Eugene L. Bushe, Stephen Peabody, John L. Lamson and Walter L. Pease, all of New York City; Cord Meyer, and Christian M. Meyer, of Mas-

peth, L. I.; George Chambers, of Long Island City; Robert C. Pruyn, of Albany.

**San Jose, Cal.**—The San Jose Railroad Company has been granted a charter. The capital stock is \$1,000,000. The company will build and operate street railroads in San Jose and Santa Clara counties and do all business pertaining thereto. The promoters are Wendell Easton, Moses L. Levy, San Francisco, Cal.; Jas. W. Findlay, Eugene M. Rosenthal, San Jose; M. Keeney, San Francisco, Cal.

**The Euclid Heights Company, Cleveland, O.** has been incorporated with a capital stock of \$500,000. The company is to deal in real estate, building roads and bridges, construct and operate electric, steam or other railways, construct and operate water-works, electrical plants, etc. Incorporators: Pat. Calhoun, Roland R. Conklin, Wm. L. Rice, Geo. A. Langhlin and Allison J. Thompson.

**Mt. Vernon, O.**—The Central Ohio Electric Railway Company has been incorporated, with a capital stock of \$100,000. The company will construct and operate an electric system between Pittsburg, Pa., and Chicago, Ill., supply light, heat and power, operate telephone and telegraph line, etc. The promoters are G. A. Jones, F. W. Jones, T. J. Caldwell, Wm. M. Koons, M. Spellacy.

**The Kerlin Brothers Company, Toledo, O.** has been incorporated with a capital stock of \$10,000. The business of the company is to be general contracting and building, construction and operation of gas plants, water-works, electric lighting and electric street railways. The promoters are Richard Kerlin, Edw. M. Kerlin, W. A. Gashé, M. P. Murphy and Patrick Henahan.

**Old Forge, N. Y.**—Old Forge Railroad Company has been incorporated. The capital stock is \$20,000. The company will build and operate a street railroad from Fulton Chain Station to Old Forge. The promoters are S. F. Traffarn, Mary E. Traffarn, Albert James, Gertrude Horton, Forrest Port, N. Y.

**Milwaukee, Wis.**—The Paterson Electric Conduit Railway Construction Company has been organized, with a capital stock of \$500,000. The company is formed to manage and operate a conduit system for street or other railways, mills, etc. The promoters are A. E. Smith, W. Meyst, H. S. Esch.

**Carlisle, Pa.**—The New Castle, Minersville & Tremont Street Railway Company has been incorporated. The capital stock is \$100,000. The promoters are Elias Davis, Lewis S. Sadler, W. F. Sadler, Jr.; last two named of Carlisle, Pa.; first named of Broad Mountain, Pa.

**Chicago, Ill.**—The Chicago Inter-urban Street Railroad Company has been incorporated with a capital stock of \$1,000,000. The promoters are Geo. P. Taylor, E. Harry Plummer, Ellsworth Anson.

### NEWS OF THE WEEK.

**Harrisburg, Pa.**—The East Harrisburg Passenger Railway Company has decided to connect Harrisburg with Hummelstown, a distance of nine miles. Hummelstown's Council has authorized it to run tracks through the borough, provided the company puts down a girder rail, allows the borough to use its poles, pays \$250 annually into the borough treasury, limit the speed of cars within the borough to ten miles an hour, have the line in operation within fifteen months and relieve the borough from all damage suits that may be incurred through the operations of the line.

**Lancaster, Pa.**—A deal has just been completed between the Pennsylvania Traction Company and the New Holland Turnpike Company by which the former leases the latter's turnpike between Lancaster and New Holland for 999 years. The traction company will build within 90 days a line of electric railway along the turnpike, paying a percentage of the receipts as rental for the turnpike, and as soon as the line is in successful operation it will be extended to Terre Hill. The new line will pass its entire length through a thickly populated territory.

**San Bernardino, Cal.**—It is proposed to extend the city street car line (three miles in length) from its north terminus six miles to the famous Arrowhead hot springs, seven miles from the city. The project also contemplates the absorption of the Highlands motor railway and the extension for a distance of six miles in a circular manner so as to intersect the Arrowhead extension. If the plan is executed the 21 miles will be converted into an electric system.

**Washington, D. C.**—A permit has been issued to the Columbia Railway Company for the erection of the power-house for its cable road. The building, which is to be one story high, measuring 42 feet from the ground up, with a frontage of 80 feet by a depth of 200, will be located at Fifteenth street and Benning Road. The contract for the power-house was awarded to Richardson & Burgess, of Washington, whose bid was \$22,000.



**Philadelphia, Pa.**—William Reimer, aged 30 years, was killed this week while stringing trolley wires for the Electric Traction Company, at Sixth street and Lehigh avenue. Reimer was standing upon the top of a tower wagon with his hand upon the iron railing. As the wagon moved along it came into contact with a live electric light wire, which touched the iron railing, and Reimer was instantly killed.

**Fremont, O.**—J. J. Cessna is at the head of a scheme to build an electric railway from Fremont to Bowling Green. The line Mr. Cessna proposes, if possible, to build will pass through Gibsonburg, Rollersville, Bradner, Woodside, New Rochester and other thriving villages in the gas and oil field.

**New York, N. Y.**—The new Board of Rapid Transit Commissioners held its second meeting Tuesday, and adopted a resolution providing that the question of municipal construction be submitted to the people at the coming election, and requesting the board to prepare the necessary ballots.

**Benton Harbor, Mich.**—The street car barns belonging to the St. Joseph & Benton Harbor Street Railway were damaged to the extent of \$2,000 or more last week by fire.

**Collinsville, Ill.**—Dwight Tredway has offered to build an electric road to East St. Louis if the residents will subscribe \$10,000 and take a number of the bonds.

**Newburgh, N. Y.**—A project for building an electric railway from Orange Lake to Walden is under consideration.

**Carthage, Mo.**—The residents of Carthage have subscribed \$15,000 toward the construction of an electric railway.

## PERSONALS.

**H. N. Ransom**, of the Consolidated Car Heating Company, of Albany, was in New York this week.

**Charles E. Newton**, of the Jewell Belting Company, Hartford, Conn., was in New York last week.

**Joseph H. Hoadley**, of the California Engineering Company, Chicago, has been in New York this week.

**W. H. Dodge**, president of the Dodge Manufacturing Company, of Mishawaka, Ind., died on Sept. 10.

## TRADE NOTES.

**Brake Shoes.**—The necessity of securing more effective brake mechanism on street railways is frequently urged, and in this connection the brake shoe made by the Composite Brake Shoe Company, of Boston, has been warmly indorsed. It not only grips quickly, but the universal testimony seems to be that it retards the car promptly without the usual bucking and jerking, a fact that the traveling public will not be slow to appreciate. There is something about the combination of the wood and metal that together produces this effect, and without sliding or skidding of the wheels. The reason given is that the shoe grips all the wheels more nearly alike, so that one or two are not sliding while the others are turning. It is presumed all four wheels on a truck are never flattened at one and the same time. Another claim that is made for this shoe is that the motorman or driver need not set his brakes so rigidly as with a plain shoe. This would appear to be for his advantage and relief, as well as less strain on the trucks and wear on the wheels. If a shoe is very hard, the wheel being chilled, it stands to reason that a great pressure must be brought to bear on the brakeshoe, especially if it has become smooth from use; and this is the reason why most railroad men use a soft iron rather than a chilled iron shoe.

**Pennsylvania Steel Company.**—The sharp advance in the stock of the Pennsylvania company during the last few days is ascribed to the more favorable view taken of the iron and steel trades, sentimentally induced here by the maintenance of the regular dividend on the stock of the Cambria Iron Company, says the *Philadelphia Stockholder*. A better appreciation of the value of the great plant of the Pennsylvania Steel Company—probably there is none better in the world—has also had very much to do with the demand for the stock, which a year or so ago sold around 150. It is believed by people whose opinions are entitled to weight that, as a result of the successful reorganization of the company—and there seems to be no question that the present plan will become operative—the stock will, on its merits, in a reasonable time, go to a parity with the price then ruling. The business of the company since it passed into the hands of a receiver has been very good, and lately has increased materially. It has now on its books a great many orders for steel rails for street railways, so many

of which are changing motive power all over the country.

**The Chas. Scott Spring Company**, of Philadelphia, has recently purchased the property adjacent to its works and is now erecting a brick addition having a frontage on Canal street of 120 feet, Germantown avenue 130 feet, and New Market street 43 ft. This addition was made necessary by the growth of the company's elliptic spring business. The present shop has a capacity of 1,200 tons of elliptic springs annually. The additional space secured will be devoted entirely to the manufacture of elliptic springs, and will increase the capacity of the shop by about 1,500 tons, making a total capacity of over 2,500 tons elliptic springs annually. A siding from the Philadelphia & Reading Railroad will run into the works from Germantown avenue and the shipping facilities will be greatly increased. The reputation this company has acquired for furnishing strictly first-class goods at reasonable prices is a sufficient guaranty of its success in the future.

**New Westinghouse Factory.**—The new works of the Westinghouse Electric Company, at Brinton, near Pittsburgh, are making rapid progress. The main machine shop and warehouse will be finished and turned over to the electric company next week. The power-house is under roof, and the boilers are being put in, so that power can be furnished by the middle of October, when the company will begin to move its machinery from Pittsburgh. It will probably take six months to do the moving without interfering with the filling of orders, of which the company has now a large number on hand.—*Boston News Bureau*.

**The Berlin Iron Bridge Company**, of East Berlin, Conn., will furnish the iron roof trusses for the new city armory, at Pawtucket, R. I. The new power-house for the Bridgeport Traction Company, at Bridgeport, Conn., consisting of a dynamo room and boiler room, which will be of iron and brick-composite construction—will be designed and built by the same company. The dynamo room will be equipped by a traveling crane, furnished by the same company.

**Mr. Frank R. Chinnoek**, of 143 Liberty street, New York, has secured the contract for the complete equipment of an electric railroad between Hackensack, N. J., and Union Hill, N. J., for the Bergen Turnpike Company. The road will be 11.7 miles long, single track with nine turn-outs. A 70-pound girder rail will be used through Hackensack and a 60-pound T rail for the balance of the road. At first 12 closed cars will be operated with double equipments.

**Contract Awarded.**—The contract for building and equipping the Manchester & Northern Railway has been given to L. J. Highland, Chicago. The road will be 25 miles in length and will be built on the county turnpike, connecting the towns of Manchester, West Union and Winchester in Adams County, Ohio. The road will do both a passenger and freight business. It will be equipped with the Highland motor, having a maximum speed of 20 miles per hour.

**The Berlin Iron Bridge Company**, of East Berlin, Conn., has erected for the Mather Electric Company a new building 300 feet by 50 feet, equipped with improved electrical machinery, and a 40-ton electric traveling crane, especially adapted for building large direct connected generators for railway work. The unfinished castings are brought in at one end of the shop, and are loaded on the cars at the other end as finished generators.

**Field & Hinchman** have formed a partnership, and will do general engineering work, with offices at 39 Clifford street, Detroit, Mich. The firm has already on hand electrical work of considerable importance. Mr. Field was formerly electrical inspector for the insurance companies in Detroit. Mr. Hinchman has been connected with Jesse M. Smith in the capacity of mechanical engineer.

**The New Haven Car Register Company**, of New Haven, Conn., has received an order from the Philadelphia Traction Company for 100 of the New Haven car registers, also a good order from the Consolidated Railway Company, of Atlanta, Ga. The order from the Philadelphia Traction Company is the third that the New Haven company has received from that company.

**The Robinson Patent Trolley Wheel**, placed on the market by the Wallace Electric Company, of Chicago, is meeting with splendid success. This wheel has been in use now for some time, and tests which have been made go to show that on account of the independent contact ring the life of the wheel is prolonged and the results obtained are very satisfactory.

**The International Register Company**, of Chicago has just issued a little pamphlet containing testimonials from those who have used its portable fare register. The opinions are those of men well known in the street-railway field, and their unqualified praise of the International register is the highest possible indorsement.

**The H. N. Bates Machine Company**, of 240-246 Congress street, Boston, has just issued its new catalogue descriptive of its machinery for the transmission of power. The book is a volume of over 150 pages and is profusely illustrated. Those interested in machinery of this kind should secure copies.

**The Mather Electric Company**, of Manchester, Conn., reports the sale of one of its 180 k. w. improved new type multipolar railway generators, with complete station equipment, to the Hartford & West Hartford Horse Railway Company for the Hartford, Conn., power-house.

**Manager Adams**, of the Crescent Electric Company, Chicago, says that the business of the company is good and constantly increasing. This company makes a specialty of repairing electrical work for street railways and lighting companies.

**Electric Car Heaters.**—The Union Railway Company, of Providence, has just ordered 75 additional sets of electric heaters of the Consolidated Car Heating Company, of Albany. The original order was for heaters to equip 160 cars.

**The Abendroth & Root Manufacturing Company**, of New York, although next to the highest bidders, got the contract for 600 H. P. boilers for the new station of the Chicago General Street Railway Company.

**Mr. F. C. Boyd**, vice-president and general manager of the New Haven Car Register Company, was in New York this week and says that business in his line is improving.

**The Bridgeport Car Equipment Company** has received an order for 15 fenders to be attached to the new cars of the Bridgeport Traction Company.

## Record of Street Railway Patents.

U. S. Patents Issued Sept. 18, 1894.

**526,083. Electric Motor;** Alexander W. Weston, St. Louis, Mo., Assignor to the Emerson Electric Manufacturing Company, same place. Filed Aug. 1, 1892. One or more coils are wound on the armature in a plane parallel to the plane of the magnetic lines of force, and means are actuated by the rotation of the armature, for throwing the said coils into the motor circuit.

**526,111. Station Indicator;** Edward Miller, Jr., Evansville, Ind. Filed June 1, 1891. The second claim reads as follows: "The combination of the casing having the sight opening, the parallel shafts mounted in the casing and carrying the drums or spools, the band having the ends connected to the drums and adapted to wind first upon one and then the other drum, the fast wheels connected to the end of the shafts, the loose wheels adjacent to the fast wheels, the pivoted pin or

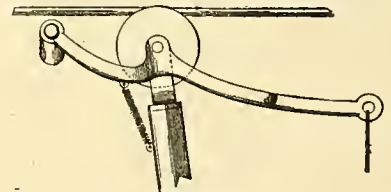


No. 526,112.

stud carried by the loose wheels and carrying the pawls which engage the fast wheels and also the tripping pawl, means for turning the fast and loose wheels and a stop for engaging the tripping pawl to allow the return of the loose wheel."

**526,142. Bond for Electric Railways;** Dwight D. Book, Brooklyn, N. Y. Filed July 14, 1891. The bond plate is electrically connected with the rail, which is provided with upwardly extending holes to facilitate connection with the bond conductor. (See illustration.)

**526,152. Street Railway Switch;** John C. Jacobs, Alexander Keil and John H. Roemer, Buffalo, N. Y. This is the combination of an L-shaped box and covering plate for holding the switch-operating mechanism of two disks pivoted centrally on cross bar in said box, connecting rods pivoted and connected with opposite sides of the disks connecting them with each other, friction rollers upon which the disks turn, a connecting rod extending laterally and connecting one disk with the pivoted switch bar, a pivoted operating bar located outside of the covering plate and connected by a pin



No. 526,153.

pivoted thereto and extending down and connecting with the opposite disk, and means located on the car for operating the switch.

**526,170. Dynamo Electric Machine;** David H. Wilson, Chicago, Ill. Filed Aug. 17, 1893. A motor and generator, the armatures of which are fastened to the same shaft, are combined in one machine. The field magnets of the motor and generator are magnetically connected but electrically entirely separated from each other.

**526,183. Trolley Wire Finder;** Edward Gale, Peoria, Ill. Original application filed Nov. 21, 1892. Divided and this application filed Jan. 15, 1894. The trolley pole and wheel are combined with a guard or finder having revoluble sleeves on each end to prevent friction with the line wire. The guard or finder is supported by the pole near the wheel, and extends laterally beyond the vertical planes of the sides of the wheels to catch the line wire in case it should become disconnected from the contact wheels. (See illustration.)



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**The Atlanta Convention.** An extract from an Atlanta paper, published elsewhere in the issue, indicates that the residents of the Gate City of the South are preparing a royal welcome for those who attend the Street Railway Convention, October 17.

**Victory for the Detroit Company.** During the last few years the city of Detroit has contended that the local street railway company was at its mercy, but the tables are suddenly returned, as a consequence of the decision of the United States Circuit Court of Appeals. It is to be hoped that this settles matters and that the city will soon be favored with rapid transit.

**Obstruction of Cars by Teams.** We have always taken a strong interest in all efforts that are directed toward the improvement of the service on rapid transit lines by preventing the obstruction of street cars by obstinate teamsters. Philadelphia seems to be doing something along that line, and a Quaker City writer whose communication appears elsewhere in this number recommends the passage of ordinances containing several admirable suggestions for overcoming these annoying delays. If the ordinances were adopted and fairly well enforced, no doubt the nuisance could be abated to a very great extent, but it is questionable if the police could be depended upon to make the regulations effective, unless their superiors were stimulated in some way. The *Public Ledger*, of Philadelphia, in referring to the subject makes this timely comment: "The delays from obstructing teams appreciably lengthen the time in passing over a long route. Philadelphia is a city of magnificent distances. The round trip on one or more of our street railway lines covers nearly 25 miles. To give the best and most satisfactory service, all ordinances governing street traffic must be firmly executed. . . . Surface cars cannot move at very high rates of speed in congested streets, but there are delays that are unavoidable."

**Grade Crossing Application Denied.** The Railroad Commissioners of the State of Connecticut have just denied the application of an electric railway company for leave to cross at grade the tracks of the New York and New England railroads. The decision of the petition, which was that of the Bristol & Plainville Tramway Company, has been awaited with not a little interest, as it was assumed it would establish a precedent. One can hardly fail to sympathize with the decision if, as we believe, it will absolutely prevent the reckless multiplication of grade crossings. Unless every safeguard is adopted, and that is not always practicable, the grade crossing must needs be a danger point. The commissioners object to the particular crossing in question for reasons that it would seem will be fatal to all applications of a similar nature. The interesting part of the finding is as follows: "In our judgment the danger incident to the grade crossing more than counterbalances the other advantages of the route, unless such crossing be protected by derailing switches and interlocking signals on both the steam and electric roads. We, however, have no power to require this protection or any other condition or restriction of our approval. We must, therefore, withhold the same until such time as the properly authorized representatives of both companies shall

make and file with us an agreement to provide the protection above suggested."

**Competition with Steam Railroads.** The officials of steam railroad companies cannot get rid of the competition of the trolley lines by whining or sneering at the service. Just at present they are doing considerable of both, for they are commencing to realize that in certain quarters the electric railways are making sad inroads on their receipts from local traffic. They seem to feel that their case is one of injured innocence, and that something should be done very speedily to kill off this unrighteous competition. Of one thing these officials may be extremely positive, and that is that the electric roads will be favored with no patronage that they do not deserve. The electric lines not only furnish cheap transportation, but the service is frequent, and the accommodations are comfortable. A contemporary in its comment on this subject, published elsewhere in this issue, hits very wide of the mark when it describes the electric cars as means of "cheap and inadequate" carriage. It is as far from the truth when it insinuates that the suburban passenger is provided in all cases by steam roads with spacious cars and with pleasant surroundings. In a great many instances the electric cars are far more attractive than the steam cars running between the same local points. For example, a great many of the ordinary cars used for suburban service on the New York, New Haven & Hartford, the New York Central, the Reading, Rock Island, the Illinois Central, and a great many other roads that could be mentioned, including all the elevated railways in the country, are very far from being attractive coaches. They are very frequently dirty, dingy, badly ventilated, ill smelling and, in winter time, poorly heated, and at night miserably lighted. There is a very strong suspicion that a great many railroad companies care extremely little about the comfort and convenience of passengers in ordinary coaches, but assume, if desirable traveling quarters are wished, that passengers should pay an extra fee and patronize the parlor cars. So the ordinary car equipment seems sometimes to be badly neglected, and as a natural sequence the passengers are dissatisfied. Who would not, especially in the summer months, prefer a ride in a trolley car to a journey in the familiar stuffy steam car if the trip was to be one of 10 or 12 miles and the matter of the few minutes extra time did not happen to be of pressing importance? The electric car in many cases is cleaner, far more comfortable, as well as cheaper, and it is not surprising that it is so largely patronized, to the injury of the steam railroads. As we believe, the only way the railroad companies can keep the short-haul patronage that is straying away from them is to improve their service. They will not accomplish this by securing the enactment of laws unfavorable to electric railway construction, for the people want trolley lines in the country and propose to have them at any cost, though railroad attorneys talk of vested rights till they are black in the face. The railroads must organize a service that will be so much better than that afforded by the trolley lines that they will attract the best class of patronage that is always ready to pay a fair price for a good thing, but cannot be hoodwinked into buying inferior groceries or transportation simply to prevent the grocer or the railroad company from losing money.



### MAILS ON NEW YORK CABLE CARS.

A correspondent in Washington states that Second Assistant Postmaster-General Neilson, who has charge of the mail transportation service of the country, has under consideration a plan for utilizing the cable railway system of New York City in the distribution of the mails to districts convenient to those systems. The plan is not yet fully matured, but Mr. Neilson, who has just returned from his vacation, is actively engaged upon it, and it is considered not unlikely that it will soon be perfected and put into operation.

So far as can be learned, it is designed to have the mail for the different districts along the lines made up in pouches at the post-office, just as mail is arranged by the employes of the railway post-offices. At stated hours postal cars would leave the post-office with pouches, and, at stations to be designated later, carriers would be in waiting to receive the packages made up for their distribution. The design is to give each carrier sufficient time to cover his route, so that he may experience no difficulty in reaching his station at the hours when his pouches are due. The city postal cars would be used in making collections.

It is believed by Mr. Neilson that such a system would result in a more efficient and rapid mail delivery, and there does not appear to be any doubt that it would be welcomed by the officials of the New York Post-office, who are only too willing to accept any arrangement which looks to the betterment of the postal delivery branch of the service.

### STEAM RAILROADS AND THE COMPETITION OF TROLLEY LINES.

The following extract from the *Railway Age* indicates the position which railroad companies assume in reference to the competition of trolley lines:

The competition of electric railways for local travel and even for journeys of considerable length, not to speak of its probable extension to freight service, is rapidly constituting an important condition affecting the management of steam railways. The suburbs of every large city are already served by electric lines running into the business center which have taken much travel from the railways by offering rates one-half or one-quarter of those previously charged by the latter, and many such lines 25, 50 and even 100 miles and more in length are under construction or projected in various parts of the country, east and west. An electric line from Philadelphia to New York by branches making a total of 150 miles is proposed by a newly organized company; an enthusiastic prospectus with map shows another from Philadelphia to Harrisburg, a distance of 105 miles, running most of the way alongside of the Pennsylvania Railroad, with proposed branches making up a system of 364 miles, of which 50 miles are already in operation; the ambitious scheme of an electric railway system between Pittsburgh and Chicago, with numerous branches, is on foot, the articles of incorporation providing for "freight, express and passenger traffic and the carrying of the mails"; lines to connect several widely separated cities in Ohio and Indiana are being seriously advocated, and in short electricity is "in the air" and liable to strike in the shape of a trolley line in the immediate neighborhood of almost every station of a steam railway in the country. Thus far competition by means of these cheap and inadequate methods of carriage has been made extremely easy by the remarkable generosity of the communities traversed in giving up their wagon roads, without any consideration, to the tracks and horse-terrifying motors of the electric roads. But the dangers and the injustice of surrendering the public highways to the possession of the "broomstick trains" are beginning to be felt and it is not likely that the movement will be allowed to go on much longer as strangely unrestricted as it has been.

Naturally if local travel on the steam railways is greatly diminished by the operation of the electric roads the train service on the former will be reduced, and thus the portion of the public to whom the far greater speed and comfort of traveling in spacious cars on solid roadways are more of a consideration than the saving of a few cents will suffer disadvantage. A still more important consideration, however, is that pertaining to the multiplication of grade crossings. It is strange inconsistency which while interdicting the crossing of highways at grade by steam railways allows electric roads not only to occupy and intersect high-

ways on the surface, but to cross the tracks of steam railways at grade.

Altogether the rapid increase of trolley roads is a problem for legislation of very grave importance to the public as well as to the existing lines of transportation that have built up the business upon which, for the most part, these new roads expect to live.

### FIVE THOUSAND DOLLARS FOR A DOG'S LIFE.

A curious suit has just been begun against the Brooklyn City Railroad Company by Mrs. Annie Curley. The plaintiff seeks to obtain \$5,000 to compensate her for the death of her dog, which was killed by a trolley car last February. The dog took care of the plaintiff's child, and his services in this respect were so exceptionally valuable that Mrs. Curley feels warranted in demanding an extraordinary sum for the loss of the animal. The complaint in this suit is as follows:

That, at all the time hereinafter mentioned, the plaintiff was the owner and enjoyed the possession of a certain dog, which the plaintiff had kept, among other purposes, to watch over, as well as to lead and take care of, her daughter Mary, who was then, and now is, an innocent child, simple in mind and not able to take care of herself; that the said dog was, and had been for five years, the guardian of the said simpleton, the daughter of this plaintiff, and had guarded and watched over her, and led and taken care of her, and had performed his services as such in an efficient and praiseworthy manner, and had thereby spared this plaintiff much worry and anxiety, as well as considerable trouble and expense; that the said dog was an intelligent and faithful animal, and by reason thereof, and of the services which he rendered, the said dog became, and was at the time of his decease, invaluable to this plaintiff. That on or about Feb. 2, 1894, while the said dog was lawfully upon the said Richards street, which is a public thoroughfare in the city of Brooklyn, as aforesaid, the defendant, by and through its agents, servants and employes, not regarding their duty in that respect, so negligently, recklessly and carelessly conducted itself, and its agents, servants and employes in charge of one of the cars belonging to the defendant so negligently, recklessly and carelessly conducted the same while driving through said Richards street, in the course of their employment for the defendant, that the said car, so owned by the defendant and managed and controlled by its agents, servants and employes, ran into said dog, knocking it down, throwing it a considerable distance, and running over and killing and destroying the said dog, by reason and in consequence of which the plaintiff has been deprived of a faithful, intelligent, useful and affectionate animal, which the said dog always was, and her daughter, Mary, of a faithful and loving companion, all of which has caused the plaintiff great mental pain and anguish and has put her to considerable trouble and expense, necessitating her giving her personal care and attention to and watching and caring for her child, Mary, and she has otherwise suffered and sustained damage thereby, which she fixes and claims at a sum of \$5,000.

### DETROIT CITIZENS' COMPANY'S LEGAL VICTORY.

The famous case of the city of Detroit against the Detroit Citizens' Railway Company has been decided in favor of the defendant by United States Circuit Court of Appeals. The decision reverses the decree of Judge Taft, of the United States Circuit Court, and its effect is to declare that the rights of the Citizens' Street Railway Company are good for 14 years to come. The relief sought in the litigation, to quote the language of the extremely long decision, "was the removal from the streets of Detroit of the tracks and cars of the Detroit Citizens' Street Railway Company, on the ground that the term for which the city consented to the use of the streets occupied by that company has expired by limitation, and that the company is therefore an unlawful trespasser on the streets, and its tracks and cars a public nuisance." The fight has now been going on for three years, two of which have been spent in proceedings in the United States courts. The Circuit Court upheld the city's claim that no company could acquire rights for a length of time longer than its legal life—30 years—but the Court of Appeals' decision reverses this finding.

### OHIO STATE TRAMWAY CONVENTION.

The meeting of the Ohio State Tramway Association, of which a brief report was published in the last issue, opened at the Boody House, Toledo, O., on Wednesday, Sept. 26, at 11 A. M., with A. E. Lang, president, in the chair. Those present and the railroads they represented were as follows:

Cleveland City Railway Company, Cleveland, M. A. Hanna, president; J. B. Hanna, secretary and treasurer; Cleveland Electric Railway Company, Cleveland, C. W. Wason, electrical engineer and purchasing agent; Toledo Consolidated Street Railway Company, A. E. Lang, president; C. L. Wight, secretary and W. S. Jewell, general manager; Toledo Electric Railway Company, David Robison, president, James J. Robison superintendent, F. B. Perkins and Wm. Robison; Toledo & Maumee Valley Railway Company, B. P. Foster, superintendent; Columbus Street Railway Company, W. F. Kelly, superintendent; Delaware Electric Railway Company, J. K. Newcomer, president; Mansfield Electric Railway Company, Reed Carpenter, president.

Letters and telegrams of regret were received from the following, who were unable to be present: The Youngstown Street Railway Company, by A. A. Anderson, general manager; Cincinnati Inclined Plane Railway Company, Cincinnati, by H. Bradford, general manager; Cincinnati Street Railway Company, Cincinnati, by John Kilgour, president; Canton Street Railway Company, by Wm. A. Lynch, president; Akron Street Railway Company, by F. A. Seiberling, secretary and treasurer. The following gentlemen were also present:

C. N. Fulton, of the Davis Car Shade Company, Portland, Me.; E. P. Sharpe, of the Webster & Beecher Electric Company, Boston; J. A. Hanna, of the McGuire Truck Company, Chicago; E. A. Smith, of the Consolidated Car Hearing Company, Chicago; H. H. Foster, of the Dreher Manufacturing Company, New York; J. B. Bennett, Chicago; John Dale, of the Dale Manufacturing Company, New York; W. E. C. Coxe, of the Cambria Iron Works, Philadelphia; John I. White, of the Fort Wayne Car Wheel Company.

After the meeting had been called to order the following companies presented their credentials for membership in the association: Toledo & Maumee Valley Railway Company, of Toledo; the Toledo Electric Street Railway Company, Toledo; Delaware Electric Street Railway Company, Delaware. After being referred to the proper committee the credentials of these companies were approved, and they were duly elected members of the association. President A. E. Lang read his annual address to the association, in which he referred to what had been accomplished by street railroads in Ohio during the last year. Following the president's address the report of the treasurer, J. B. Hanna, showing a small balance to the credit of the association, was read and approved.

The committee appointed to nominate officers for the ensuing year, and to select a place for holding the next meeting, reported as follows: For president, Wm. F. Kelly, superintendent Columbus Street Railway Company; for vice-president, Reed Carpenter, president Mansfield Electric Railway Company; for secretary and treasurer, J. B. Hanna, secretary and treasurer the Cleveland City Railway Company; Wm. A. Lynch, president Canton Street Railway Company, for chairman of the Executive Committee. Sandusky was selected as the place of holding the next meeting. The report was unanimously adopted.

The meeting then went into executive session and the following subjects were thoroughly discussed informally: "The Best Means of Detecting Dishonest Conductors;" "A Desirable and Satisfactory Fender or Life Guard, for Protecting the Lives of People who may Meet with Accidents in Front of the Cars;" "What are the Best Qualifications for Conductors and Motormen?" "The Treatment of Low Joints in the Rails, and how Best to Prevent Them;" "The Best Method of Controlling Employees and the Collection of Our Fares." A great deal of useful information of



enefit to all those present, whether interested as small or large roads, was obtained from this discussion.

At five o'clock those present accepted the invitation of B. P. Foster, superintendent of the Toledo & Maumee Valley Railway Company, to take a ride in one of its cars up the river for a distance of some 10 miles. The ride was enjoyed by all present. The visitors passed through a very pleasant portion of the country on the bank of the Maumee River. At seven o'clock those attending the convention proceeded to the Toledo Club, where, as the guests of A. E. Lang, president of the Toledo Consolidated Railway Company, and James J. Robison, superintendent of the Toledo Electric Railway Company, they enjoyed an elegant banquet. During the progress of the banquet a band was stationed in the adjoining room, which made a very pleasant feature of the evening's entertainment.

A. E. Lang presided, and proved himself to be a very capable toastmaster. Among the citizens of Toledo present who assisted in entertaining the company were Robison Locke, editor of the Toledo Blade, and Negley Cockran, editor of the Toledo Commercial. The latter made a very entertaining speech, detailing some of his experiences in obtaining the right of way for the numerous suburban lines projected several years since in the vicinity of Toledo by Mr. Tillotson. His experiences in obtaining rights of way in the country and the questions asked him by the people of small towns and villages about electric cars and their bad influences were very laughable. Barton Smith, attorney for the Toledo Consolidated Railway Company, also made an entertaining speech.

M. A. Hanna, of Cleveland, gave a very entertaining account of the progress made by street railroads in the last ten years. He spoke of the value of suburban roads, and the great benefits they conferred on cities and people of outlying districts. He noted that rapid transit was making available better homes for the workingmen and the poorer classes in the districts outside of the crowded portions of the city. He said that he did not believe that there was any industry in which the united energies of as many bright people had been employed as advantageously or in which as great progress and development had been shown as in the street railway field. He thought that there was a great future in the development of the country adjacent to large cities by suburban lines, and gave as a reason that the progress that street railroads had already made in so short a time was due to the fact that those engaged in looking after these properties were trying to advance more and more, and were always willing to take up new and meritorious ideas of inventors. They were always ready to spend their money in seeking to better the service rendered the public, and also to increase, if possible, the dividends to their stockholders.

Mr. Lang gave his experience of rates of fare on tramways in London and Paris, and contrasted the slow progress in rapid transit with that afforded by modern vehicles and modern management on American railroads. He stated that while their rates of fare were two cents per mile for first class passage, the lines were all very short, so that really a much higher rate of fare for a ride of some miles was charged to passengers than is charged in this country. At the conclusion all present united in a vote thanking Mr. Lang and Mr. Robison for the royal manner in which they had been entertained during their stay in Toledo.

#### GREAT BRITAIN TRAMWAY STATISTICS.

The latest English Board of Trade returns sufficiently indicate that mechanical traction has made but slow progress during the past 20 years. Out of about 760 miles of tramway open for traffic in England and Wales, only 240 miles are worked by mechanical systems of traction, the remaining 520 miles being worked entirely by horse or animal traction. In Scotland, out of a total of rather less than 90 miles of tramway, only about 14 miles are provided with mechanical tractive power, while

in Ireland, with about 114 miles of line open for traffic, about 44 miles are worked either partially or entirely by mechanical systems. In this summary electric tramways are included under mechanical systems. The number of horses employed by the companies of England and Wales is about 24,000, in Scotland nearly 5,000 and in Ireland 2,500, giving a total of 31,500 animals. The total number of locomotive engines employed in the whole of the United Kingdom for tramway service would not reach 600.

#### HOW THE CARBON BRUSH CAME INTO USE.\*

BY ELIHU THOMSON.

It is, I think, true that no single thing has had a greater or more direct influence upon the technical success of electric railway machinery than the introduction of the carbon brush as a substitute for the various forms of metal brush, many forms of which had been tried previously on railway motor commutators, but without even the beginning of success. Simple as this substitution was, the results are of the greatest importance. The pioneers in electric railway work had been struggling with the many problems presented, not the least of which was to get a motor commutator to run under varying loads without spark, to run in either direction without trouble, and without need of changing the lead, and above all to endure for a reasonable time.

All forms of metal brush had been tried and become acknowledged failures. They were only calculated, under the harsh conditions, to be ground and to grind the commutator into dust at a rapid rate (such dust being scattered by the pound along the line of way) with the production at the same time of a flickering greenish illumination under the car, an illumination all the more ghastly on account of the havoc known to be going on and of which it was an unfailing index. It is not too much to say that before the carbon brush was substituted there was in prospect inevitable failure; disaster not unforeseen, but all too evident.

But after the advent of carbon all this was changed, and a great load was at once lifted from the shoulders of those on whom rested the responsibility for the success of the apparatus then being applied to street railway work. Failure from technical difficulties was not to be thought of more. The great bugbear and most annoying obstacle had been overcome, and overcome, as it were, in a day. But how did it come about? I do not know that the circumstances have ever been detailed in print, and it shall be my present purpose to fill this gap in the history of electric railways and at the same time to pay a tribute to the memory of Mr. Chas. J. Van Depoele, truly a pioneer in this art, and to whom was due the suggestion of the use of carbon as a brush for railway motors.

It came about in this way. We had been trying to use, on the first roads installed by the Thomson-Houston Company in 1888, various forms of copper and other metal brushes, all of which, however, had soon been condemned as either quite worthless for the purpose or so nearly worthless as practically to be so. A discussion of the matter between Mr. Van Depoele and myself, attended as it was by many expressions of misgiving as to the fate of electric railway work unless a radical change for the better could soon be made in the commutators, led him to remark in substance: "I have used a plate of carbon as a brush, on a stationary motor, which carbon brush worked well, and I think it might answer the purpose here." To this I replied in effect that if such was the case we should by all means make the trial at once, as, if it should fail, that would be an event to which we had become somewhat accustomed in our experiments with metal brushes.

The trial was made and was at once so eminently successful that scarcely any time elapsed before the metal brush became a thing of the past, not only on the Thomson-Houston railway motor apparatus, but on others also, as soon as the news got abroad. We called the new brushes "carbon brushes," though of course they have very little of the brush proper about them. In some other systems they were dubbed "graphite brushes," and their merits were set out in a sort of "I told you so" spirit; for the carbon brush was copied in substance, if not in name. They are all "carbon" to-day.

It was some little time after the introduction of the carbon brush on the motors that the same substitution was made on the generators. This was, I think, first done on the Thomson-Houston D 62 type generator. It had been soon found that with the great variations of load occurring, very serious effects of sparking and cutting of the commutators of the power generators were brought about. The rapidly changing lead made it impossible to make suitable adjustments of the brushes.

\* From the *Electrical Engineer*.

Carbon, however, as with the motor, solved the difficulty and their use on the power dynamos was a natural consequence of their application to the motors.

I remember inspecting one of the first carbon brushes applied in railway work to a motor commutator after it had had a reputed run of 5,000 miles. It had only worn down to a moderate extent and the commutator retained its smooth black polish. Then it was that we knew that the difficulty, at one time so serious and exasperating, had been removed and our reputations as skillful electrical engineers saved for the time.

The first proposal to use carbon as a current collecting brush for dynamos was made by Prof. George Forbes, in a British patent of 1883. Blocks of graphite were to be applied in his unipolar machine to collect the currents developed in the revolving iron armature, and the patent further suggested the use of such blocks on ordinary multiple segment commutators. For unipolar work their resistance would make them of doubtful utility in view of the low potential generated and the large currents, and even for low pressure lighting dynamos they are scarcely suitable; but for power work at 500 volts, whether for generators, stationary motors or railway motors, their introduction was a great step in advance.

The whole matter seems now so simple that it is hard to realize the state of things which existed immediately before the happy suggestion of Mr. Van Depoele was put into practice. And the state of things thereafter is indicated by the rapid growth which followed and which has continued to the present. Technical success must be assured before business success can be based thereon, and I feel sure that in the above brief account I have not overestimated the effect or value of one of the small yet great things that have contributed to that success.

#### QUESTIONS AND ANSWERS.

##### DIFFERENCE BETWEEN DYNAMO AND MOTOR.

Will you kindly tell me the essential difference between a dynamo and an electric motor—viz., how does the winding of one differ from that of the other? J. H. C.

NASHVILLE, Tenn.

##### ANSWER.

There is no difference. Any dynamo, if fed through its brushes with a current of electricity, will work as a motor. The converse of this is equally true, viz., that any electric motor whose armature is driven by mechanical means will act as a dynamo and generate an electromotive force. Some very small motors, however, will not generate E. M. F. under these conditions, but this is because of their faulty construction—the resistance or reluctance of the magnetic circuit due to a proportionately large air gap between armature and field poles being so great as to prevent the necessary mutual reactions between armature and fields, but such a machine makes also a very poor motor. Generally speaking, the qualities which go to make a good dynamo also go to make a good motor, and, conversely, a machine that will not make a good dynamo will also make a poor motor. When a machine is designed as a motor for some special purpose, it is not unusual that some of its details are more or less modified to adapt it to that purpose, but, in many cases where one has two machines of equal capacity and voltage, it is a matter of indifference which shall be used as the motor and which as the dynamo.

##### LINES OF FORCE.

What is meant by the expressions "lines of force" and "density of lines of force" so much used in textbooks treating of magnetism and electricity? A. L. D., New York City.

##### ANSWER.

The expression "lines of force" is due to Faraday, who conceived the idea that the force exerted by a magnet could be represented by lines representing the direction of the force, which thread themselves through the magnet, emerging from the north pole and returning upon themselves through the air and re-entering the magnet at the south pole. He thought that he had proved that the so-called lines of force were strictly analogous to the lines of electric flow in an electric circuit. The direction or paths of these lines of force may be made visible by sprinkling fine iron filings on a piece of glass, placing the latter over a magnet and then tapping the glass gently so as to enable



the particles to arrange themselves. If this experiment be carefully performed the filings will take up positions in beautiful curved lines.

The line of force has been taken as the unit of magnetic strength, just as the ampere is the unit of rate of flow of current or current strength. If one line of force will attract an armature with a given strength, two lines will attract it with double the strength and so on. In the flow of currents we often speak of the current density in a section of conductor, meaning the number of amperes per unit of area of cross section; so we speak of the density of lines of force. If but one line of force exists per square centimeter of section of the magnet the latter will be said to have a density of one line per square centimeter. If in a very much stronger magnet there are found to be, say, 100 lines per each sq. cm. cross section, it will be said to have a density of 100 lines per sq. cm.

**STREET REGULATIONS.\***

BY ALBERT B. WEIMER.

The contemporaneous introduction of electric cars and bicycles into the streets has brought about such a change of conditions in street traffic as to require legislation to define the duties of the various classes of persons who use the streets.

The use or custom which directs that the persons and vehicles shall keep to the right should now be established as a compulsory rule of law enforced by penalty. If it were well understood by everybody that all vehicles must be driven upon the right hand side of the streets, both pedestrians and drivers could rely upon certainty in the action of others, and accidents would be avoided. If this rule should be extended so as to forbid any driving upon the railway tracks, it would result in a great advantage to the public, in securing the best result from the new system of electric railways. Where drivers are permitted to keep in the tracks the cars are constantly impeded, and the rapid transit which the public is reasonably entitled to is interfered with and obstructed.

The efficiency of the electric railways as a means of rapid transit has been materially lessened by the rule of some of the companies, which require cars to come to a full stop on the near side of streets to be crossed. This rule not only involves an unnecessary waste of time, but it is so irregularly carried out that it leads to great uncertainty and confusion in the minds of drivers and pedestrians, and many resulting accidents. Some observations were recently made by a friend of the writer, showing the irregular manner in which the rule is carried out. A complete circuit was made on the Tenth and Eleventh street line, and it was found that the car made 35 full stops on the near side of the streets crossed, while it crossed 152 streets without making any stop at all. On the Twelfth and Sixteenth street line two full circuits were made. On the first the car made 88 full stops on the near side of the streets, and passed 112 streets without stopping at all. On the second circuit the car made 93 full stops and passed 107 streets without stopping. In these observations only streets were noted which were of a width to allow at least two wagons to pass each other. It will seem by the above figures that there must be a great uncertainty in the public mind as to what are the streets at which stops are made, and what streets are passed without stopping at all. This confusion is further increased by the fact that some of the companies do not require any stop at all, except when passengers are taken up or let off. Another serious objection to the "near side" rule is that during the winter, when the streets are obstructed with snow and ice, passengers will have great difficulty in getting on or alighting from the cars.

It seems to the present writer that, if the limit of speed of electric cars was somewhat reduced, and all cars required to slow down when approaching streets which are much traveled or upon which street railways are operated, our new system

\* Philadelphia Public Ledger.

of railways would be much more efficient in securing us rapid transit, and that many elements of danger would be eliminated.

The writer suggests that the following ordinances should be passed:

**AN ORDINANCE**

Relating to the driving of vehicles and riding of bicycles on streets upon which street passenger railways are operated.

Section 1. The Select and Common Councils of the city of Philadelphia do ordain:

1. That no person shall drive any vehicle or ride a bicycle on or within the tracks of a street passenger railway except in cases where it is absolutely necessary to turn into the tracks to avoid an obstruction.
2. That all persons driving vehicles or riding upon bicycles on streets upon which passenger railways are operated shall keep in the cartway upon the right hand side of the railway, unless such portion of the cartway is obstructed.
3. Any person or persons violating any of the provisions of this ordinance shall pay a penalty of ten (10) dollars, to be recovered before any magistrate of the city of Philadelphia. And the mayor of the city be and he is hereby authorized to carry this ordinance into effect.

**AN ORDINANCE**

Relating to the operation of cars upon passenger railways in the city of Philadelphia.

Section 1. The Select and Common Councils of the City of Philadelphia do ordain:

1. That all street passenger railway companies shall require passengers to alight from the right

**THE ELECTRIC BRAKE IN PRACTICE.\***

BY ELMER A. SPERRY.

**PART II.**

In developing this system, the point which seemed fraught with the most difficulty, and which has finally received the simplest solution of any in connection with the problem, was that of obtaining always and with absolute certainty sufficient current at the lowest speeds without the aid of the trolley current. Teaser coils were at intervals resort to, maintaining connection with the trolley circuit. "Artificial teasers" were also used, being a device by means of which the trolley circuit was entirely done away with, and which worked well. Observations made from time to time in connection with these experiments led to an exhaustive investigation of residual magnetism, in consequence of which structural means were adopted to utilize to the full the residual magnetism of the motor. This supply is constantly being renewed with every energizing of the car. This method was found to be the simplest as well as the most effective. The connections, and in fact the whole arrangement of the electric brake upon the car, are extremely simple. This is shown by the fact that only one small extra wire needs to be run to the controller in addition to the ordinary wiring of the standard equipment without the electric brake. The certainty of operation is evinced by the fact that at present writing over 150 of the equipments have been placed, which are making upward of 10,000 miles daily in regular service. Early in the experimentation a phenomenon was observed in reference to the

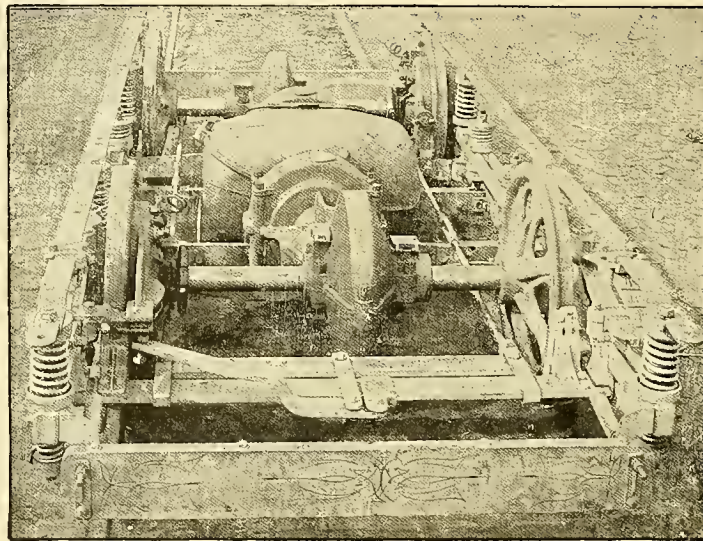


FIG. 7.

hand side of their cars, and shall maintain a gate upon the left hand side of the rear platform of the car, and, in the case of open or summer cars with transverse seats, a bar along the whole of the left-hand side of the car.

2. All street cars shall stop upon the far side of cross streets when it is necessary to take up and leave off passengers, and shall not come to a full stop on the near side except in cases of necessity, or where the street to be crossed has upon it a steam railroad. Where the street to be crossed is much traveled, or has upon it a street railway, all cars shall slow down upon approaching it. No electric or cable car shall be run at a greater speed than 12 miles an hour.

3. Any company, person or persons violating any of the provisions of this ordinance shall pay a penalty of ten (10) dollars, to be recovered before any magistrate of the city of Philadelphia. And the mayor of the city be and he is hereby authorized to carry this ordinance into effect.

**AN ORDINANCE**

Relating to the size of coal wagons or carts.

Section 1. The Select and Common Councils of the city of Philadelphia do ordain:

1. The use of coal wagons or carts of such a length as to obstruct, while unloading, the operation of street cars is hereby declared a nuisance.
2. Any person or persons violating this ordinance shall pay a penalty of ten (10) dollars, to be recovered before any magistrate of the city of Philadelphia. And the mayor of the city be and he is hereby authorized to carry this ordinance into effect.

Chicago, Ill.—The Chicago Passenger Traction Company has been organized by P. H. Hoynes, Wm. Riley and J. W. C. Jones. The capital stock is \$100,000.

persistence of the current even after the motor had stopped. This is due to the slow action of the decreasing magnetization, taken together with the reaction or self-induction effect of the fields and any brake coil or coils that may be in the circuit. The movement of the magnetic lines, which persist after, and in fact long after, the motion of the motor has ceased, generates potential. In many instances it is possible to draw an arc from the rupture of the brake circuit one second after the motion has ceased, showing the presence of current in the local circuit. The current flowing after motion ceases, though small, is found exceedingly useful in holding the car from starting itself, even on quite a heavy grade, as only a small quantity of energy added to the already great friction of quiescence will prevent the car from starting. This persistency of current is also found useful to kill or destroy the magnetism of the brake magnet, in case it is desired to suddenly move the car forward again. The tendency on the part of the windings at the moment of rupture to generate an opposing E. M. F. tends to suddenly free the magnet from its face, a purely accidental feature, which is of great value and utility in this connection. The wonderful energy of the withdrawal of the lines of force, being in its manifestations a phenomenon of magnetic viscosity, is illustrated by the following fact: With a perfectly dry track a great force is required to shear the adhesion and start the wheels slipping. A car going down a grade under these conditions where no brake magnets are present will, with a sudden application of the electric brake, generate sufficient current to not only arrest the motion of the wheels, but start them going in the opposite direction, the reverse motion being maintained

\*Read before the American Institute of Electrical Engineers, Sept. 19, 1894.



through an interval truly remarkable, in some instances running as high as one and one-half seconds. It will be borne in mind that all the above phenomena are entirely independent of the central station current, the trolley connection having been severed before the brake is applied.

The current required to be developed to stop a car when no other braking apparatus is used, is found to be only a fraction of that required to accelerate the car in the same interval.

As to the effect of the electric brake on the total temperature of the motor the following experiments were made. A car and trailer were operated over the line in regular service 41.1 miles without the brake. The temperature of the atmosphere was noted every half-hour during the test, and the temperature carefully taken of all parts of the motor at the end of the run. The suc-

short duration at the time of each application. The following wattmeter readings have also been taken:

	First Trip.	Second Trip Trailer.
Reading of wattmeter, leaving Lake View .....	392,538.9	392,542.25
Reading of wattmeter, end of round trip .....	392,542.25	392,547.1
Number of full stops .....	35	53
Number of slow-ups .....	42	37
Time .....	1:40	1:35
Difference in reading .....	3.35	4.85
Constant of wattmeter equals "22"; total watts both trips, 180.4.		

With this style of brake, the life of the wheels is increased from two to three fold, thus affording a saving in the item next in cost to the electric maintenance itself, to say nothing of the entire saving in brakeshoes. This is emphasized in the

rotate more or less, and constantly present new surfaces for the sliding contact.

The braking action is twofold and is especially efficient. The rotating armature of the motor, instead of tugging ahead by its momentum, is itself pulling back, and more or less powerfully braking the car through the gears by the retarding effort of the magnetism of its field while generating the braking current. The power required, therefore, to perform this work is taken from energy of the moving car which it is desired to destroy; not only is the car thus retarded, but the electric brakes arrest the motion of the wheels direct, with a force that is remarkably powerful and under perfect control of the motorman.

Two forms of braking magnets are used, one for winding up a brake chain usually employed in connection with the trailer, shown in Fig. 3 [see

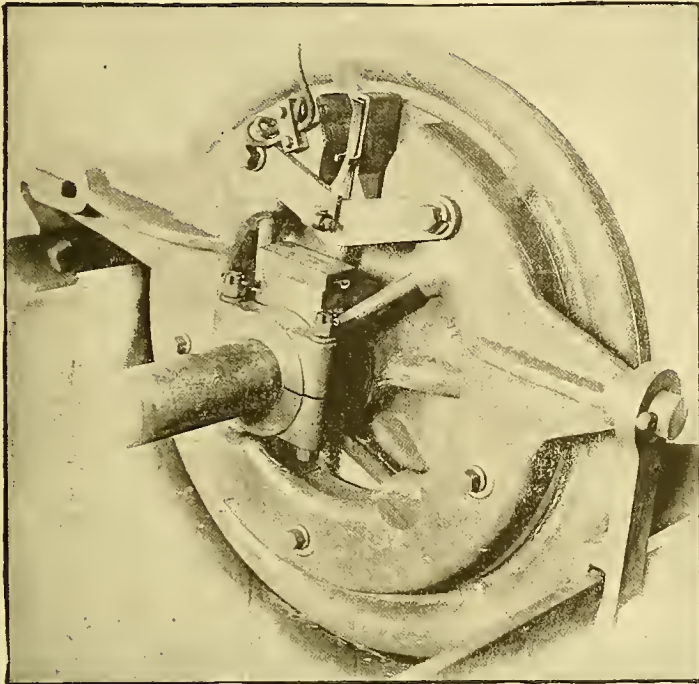


FIG. 4.

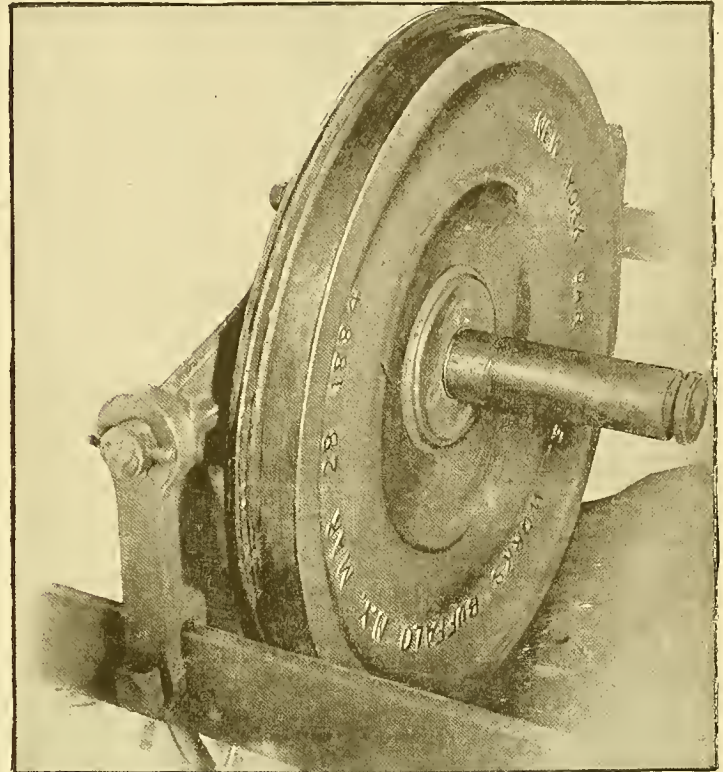


FIG. 6.

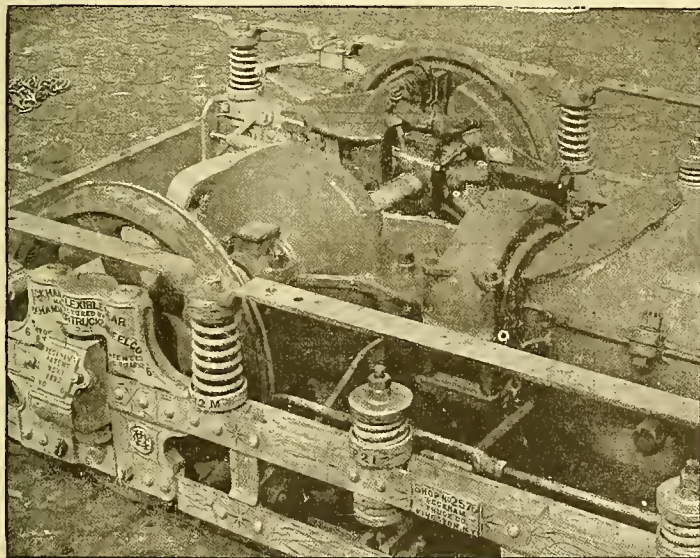


FIG. 8.

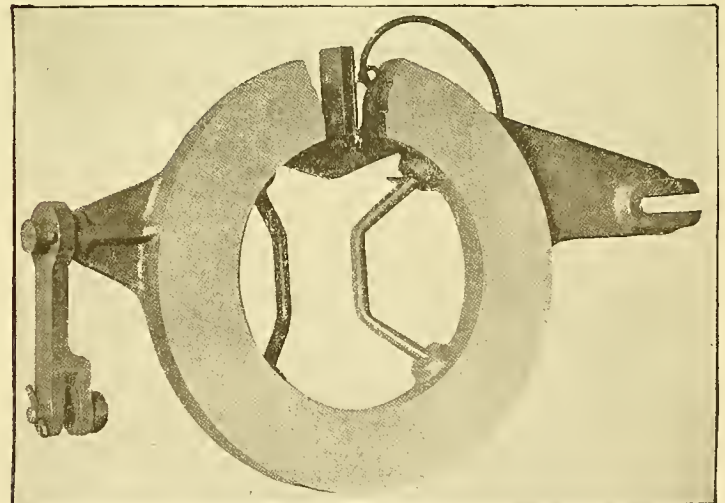


FIG. 5.

ceeding day a similar run was made with the same trailer over the same track and in the same length of time, but with the electric brake in use, braking direct on the simple local circuit without brake magnets. The difference in the average atmospheric temperatures during the two days was six and one-half degrees, and the difference in the average temperature of the motor parts was seven degrees, making only a difference of one-half of one degree Centigrade as the total increase of temperature from the use of the brake. Observations in reference to the heat in the rheostat were made, although no temperatures were taken, and no difference could be observed in reference to the heating of this portion of the equipment. The explanation will be found in the comparatively small amount of current as seen above, and the relative infrequency of its application, and

fact that the brakeshoes are being constantly besmeared with sand and grit thrown from the wheels, and when in this condition they are brought against the wheels with the tremendous pressures noted above. A better method could hardly be devised for reducing both wheel and shoe. We little realize the great number of brake applications necessary in a day's run. Careful record has been kept of this point, giving in three days an average of 1,377 brake applications per day for a run of about 164 miles.

Another interesting feature in this connection is that a flat wheel from skidding is an impossibility. It will readily be seen that, should the wheels stop, the generator connected with the axles ceases to produce current, and none therefore exists to further apply the brake, and though they may be sliding forward on the rail, yet the wheels continue to

last issue], and another for directly arresting the motion of the axles, one magnet only being used in connection with each axle, as shown in Figs. 4, 5 and 6. These magnets are truck-mounted, not an ounce of their weight being directly on the axle, and are so supported that their gravity acts to automatically retract them from the brake face; see Figs. 6 and 7, the latter showing the link standing out of the vertical. The brake face is automatically lubricated to a slight degree, receives a high polish and does not cut or rapidly wear. The brake is noiseless in its operation. It will be seen from the cuts that inasmuch as it does not revolve, no commutating or contact device is necessary. Its crescent form accomplishes important technical functions and also eliminates the necessity of pulling off a wheel for its attachment, removal or inspection. The brake is shown in position on



truck in Fig. 8. Its face is solid unbroken metal with no grooves or interstices for catching grit or sand, which in part explains the absence of wear above referred to. The brake magnet is practically indestructible, a few turns of stout wire constituting its one coil entirely inclosed and sealed in metal. No harm nor moisture can reach it. As to moisture, it is immaterial, as the E. M. F. at which it works is extremely small, seldom reaching six volts. The lubricator for the brake surface is dry, not sticky or adhesive, and does not gather sand or dirt and retain it upon the braking face. No mechanical pressures whatever are employed to arrest the car, and hence no strain or shoulder wear comes upon the journals. In constructing the brake magnets their proportions and the arrangement of the magnetic circuits received considerable study. It was during some preliminary experiments that an unexpected phenomenon was noticed; namely, that the retarding effect when speed is an element, is very much more than would have been expected from the coefficient of friction due to magnetic attraction or adhesion, this latter being a known and definite quantity. Further experiment, made to ascertain the cause, showed it to be due to Foucault or eddy currents set up in the masses. The conditions and structure of the brake magnet were therefore varied in a number of particulars, especially such as would be expected to give the greatest result in Foucault currents produced. The result was immediately successful. It was found that the retarding effect of the brake magnet is due very much more to the generation of these currents than to the direct effect of the coefficient of friction resulting from direct magnetic adhesion, the amount of which I find can be relied on accurately when employed by itself. Some of the forms of brake magnets experimented with were provided with numerous poles of opposite polarity, which were worked upon three different kinds of armature, two of which had radial teeth of different number relative to those in the magnet, and one being a plain disk armature. The toothed armature, while it causes a series of sudden jerks and is also unsatisfactory in the total retardation resulting from a given input, is found also upon rupture of the magnetic circuit to impart to the magnet coil certain counter E. M. F.'s which materially cut

tarding effect which should be expected from a friction coefficient of 10 per cent. between the lubricated surfaces due to magnetic attraction of the lines actually circulating; and column B indicating the values of retardation actually obtained on the dynamometer.

(To be continued.)

PROBABLE EVOLUTION OF THE ELECTRIC RAILWAY.\*

BY IRVING HALE.

One of the first and most natural outgrowths of the electric street railway will be the application of electricity to elevated roads. In many respects this is an easier problem than the operation of surface roads, for the elevated structure affords an opportunity to conduct the current by a third rail, which cannot be satisfactorily insulated on a street track, and the motors are not exposed to their worst enemies, sand, mud and water. In fact, some of the earliest experiments in electric railroading were made on the New York elevated roads, and the lack of complete success in these trials was due, not to any inherent weakness in electric traction itself, but to the fact that they were made when no really successful system, even for street roads, was in existence. Now that the success of the intramural electric road at the Columbian Exposition has demonstrated both the practicability and the advantages of electricity for elevated roads, there is no reason why the electrical equipment of such roads should not make rapid progress.

On underground railroads the advantages of electricity over steam are much greater than on surface roads. Steam power, with its attendant smoke and noxious gases, is manifestly unfit for such service, and electricity is practically the only suitable power now available. The success of the London underground electric road leaves no question as to the practicability of this system, and its extensive adoption in the great cities of the civilized world may be confidently predicted.

Another natural extension of the electric street railway is the suburban and inter-urban road. The former is an established institution. The latter is already in operation in several places and will gradually extend its field of usefulness. The advantages of electricity over steam on roads joining neighboring cities are evident: avoidance of smoke and cinders, more frequent though smaller trains, and the ability to make the street tracks of each city and the road between them a continuous system, avoiding the transfers and delays at the steam railway stations. Beyond comparatively short distances, however, the ordinary 500 volt system becomes alarmingly expensive and the need of some longer range method is apparent.

This brings us to the long-distance electric road, which, because it is a thing of the future and is fraught with such alluring possibilities, constitutes the most attractive branch of the subject.

At the outset of the discussion, the inquiry is naturally suggested as to what can be gained by substituting for the locomotive, in which steam power is produced on the spot and applied directly to its work, a costly and complicated system consisting of a stationary steam plant costing more than the locomotive, electric generators costing about as much as the steam plant and wasting eight to ten per cent. of the power in the process of conversion, expensive line-work or storage batteries (according to the system used) wasting another fraction of the power, electric motors on the cars exceeding the locomotive in cost and causing the loss of another 10 per cent.—all this for the doubtful privilege of running our trains by electricity. There must certainly be some strong compensating advantages to justify such a proposition.

In the first place, power can be produced much more cheaply in a stationary plant consisting of compound condensing engines supplied by boilers of the most efficient type equipped with automatic stokers and grates for burning cheap slack coal, than in a locomotive where economy of fuel and labor must be sacrificed to economy of space.

Another advantage is the probable saving in repairs. The repair account for a locomotive, with its many rapidly moving parts and its overworked, poorly protected boiler, is a serious item. The electric motor with its single moving part, "iron-clad" method of construction, and thorough insulation of armature and field coils, is a very satisfactory machine from the repair standpoint, even when subjected to the trying conditions of street railway service; and in regular railway work, where it can be much better protected and cared for, there is little question of its superiority in this respect over the steam locomotive.

From an engineering standpoint, one of the most important advantages of electricity is the facility with which the weight of the car itself and its load of passengers can be placed upon the

wheels to which the power is applied, thus utilizing this weight to give the necessary traction. The problem of applying steam direct to the wheels of the passenger car is a very difficult one and has never been attempted on a large scale. A separate locomotive must be used, and this locomotive must have sufficient weight upon its drivers to give the necessary adhesion to enable it to exert the required tractive force upon the train which it is pulling. The safe weight on each wheel being limited, the total maximum weight on the drivers is determined by the number of wheels to which the steam power can be applied without too much complication and rigidity of truck. The power of the locomotive is also limited by the size of boiler which can be mounted on its wheels, by the amount of water and coal that can be carried and by the capacity of the fireman to feed the furnace. Boiler, tender, fuel and water, while necessary for the operation of a steam locomotive and utilized in part for giving the required adhesion of the driving-wheels, are, in one sense, so much dead weight to be carried. All these difficulties and objections can be avoided if motors can be used requiring neither fuel nor water, applied direct to the axles of the car, and utilizing for traction the weight of the car and its paying load.

The electric motor, supplied from a wire with current generated in a distant power-station, exactly meets these requirements. It is not a difficult problem to mount a 200 H. P. motor on each of the six axles of two six-wheel trucks, carrying a car of large dimensions accommodating 100 passengers or more, the load being distributed equally on the 12 wheels with every pound of motors, car and passengers utilized for traction, enabling this 1,200 H. P. locomotive, which is a passenger car in itself, to haul as heavy a train of additional cars as could be pulled by a steam locomotive of the same weight and power. It has even been suggested that motors might be attached to each truck of every car in the train. While this would be possible, it would involve undesirable complication in the connections between the cars, and more especially in the device for controlling the motors. The tendency in electric railroading will probably be toward more frequent and shorter trains, consisting of either a passenger-car-locomotive hauling one or two cars, or preferably of a single car of mammoth dimensions, equipped with its own motive power and avoiding all the objections of long loosely connected trains. For such service electricity is peculiarly adapted and is, in fact, the only known power suitable for the purpose.

It is needless to dwell in detail on the increased comfort of passengers given by a car of this description, with its freedom from smoke and cinders, perfect ventilation and unrestricted view. Anything which increases the comfort and luxury of travel will command a higher price, and higher prices will help pay dividends on the greater investment required for electric equipment. It should not be concluded that the introduction of electricity will necessarily be accompanied by increased cost of travel. The tendency is toward a reduction of railway rates, and there is no doubt that travel, whether by steam or electricity, will be cheaper 20 years hence than now. But at any given time and under the same general conditions the more perfect and comfortable service will command the higher price.

After all, whatever the method of propulsion, expense is the principal consideration. The question is not "What speed would the people like?" but "How much speed are they willing to pay for?" Electricity, by decreasing the engineering difficulties which now make high speed impracticable, or obtainable only at enormous expense, will certainly pull up the stake heretofore supposed to mark the approximate boundary in this direction, and set it considerably farther on.

The chief limitation is that of distance. Long distance transmission is rendered possible by the law that if the voltage is increased in proportion to the distance, the cost of copper remains the same. The beauty of this compensation is marred, however, by the fact that, whatever the system employed, there is a limit to the voltage which can be satisfactorily controlled in apparatus and line. In the direct current system, this limit for railway service is not far above 1,000 volts, and at this voltage the power stations would have to be located at such short intervals as to bar it from consideration for long distance railways. The multiphase alternating system, which is so rapidly becoming the cynosure of all electricians, permits the use of low voltage currents in generators and motors and (by means of transformers) very high voltage currents on the line. While there are some technical difficulties in the application of this system to railroad work, there is no reason to think that they are insuperable or to doubt that it will greatly extend the distance over which roads can be satisfactorily and economically operated by electricity.

The storage battery is another "young hopeful" of which the public entertains great expectations.

TABLE III

Amperes.	Volts.	"A" Pull due to magnetic adhesion or traction. Friction coefficient 10 per cent.	"B" Pull on brake chain obtained. Graphite lubrication.
5	1	7.6 lbs.	225 lbs.
9	1.8	18.3	395
0.5	1.9	36.4	608
15	3	121.	1975
16	3.5	149.	2475
30	4	156.4	2584
35	4.6	165	2750
55	5	185	3040
11	6.2	307.	3385
15	7	315	3690
35.5	7.3	314	3500
41	8.5	373	3650

The assumed values are based on a traction of 28.26 lbs. per square inch for 45,000 lines per square inch, being the assumed value at the knee of the curve easily recognized as occurring between 25 and 30 amperes in the table.

down the current supply and thus the capacity of the device. A magnet formed of a continuous disk, with an annular groove sunk in its face, is found to give very satisfactory results, but is much heavier and requires an armature twice as heavy for a given number of lines as the double circuit magnet shown in the figures. Furthermore, the relative rotation between such a magnet and its armature affords no point in the masses where the lines are interrupted or changed, and the Foucault currents, or reactionary effect set up, is very much inferior to those in a magnet where a gap or cessation of magnetic stress is continuously produced. As a result of these investigations the crescent form shown in the figures has been adopted, the opening in the crescent giving the effect referred to, as well as affording an excellent method of attachment and removal of the brake magnet, and at the same time supplying a gap for easily reaching the face for inspection and lubrication. A lubricator (see Figs. 4 and 5) is shown as occupying this space. The belief that the extra retarding phenomenon is that of Foucault or other eddy currents is borne out by the fact that a conducting lubricant such as graphite is found to considerably increase the effect, also metal filling between the polar faces is almost indispensable for the best result, while at the same time effectually protecting the coil from all damage. These observations would seem to indicate that the eddy currents, however produced, circulate in both masses near the surface, and traverse back and forth across the air gap whenever ample provision is made to allow them so to do. The practical value of the combined action of all these forces in increasing the retarding effect results in necessitating but a small magnet, and a smaller current expenditure considering the work performed.

By reference to Table III., the result in retardation gained through the eddy or other currents may be plainly seen, column A indicating the re-

\* Abstract of an article in the *Engineering Magazine*.



Its growth has been somewhat slow and disappointing, but this is partly due to the atmosphere of legal uncertainty by which it has been surrounded, and there is good reason to believe that before many years the storage battery will be a practical success for many kinds of work. For street car service its advantages over the trolley system, *provided it can be made equally practical and economical*, are generally recognized. For long distance railways it has several attractive features as compared with the trolley system. It would avoid the difficulties and complications of enormously high voltage and the technical difficulties previously referred to in the application of the multiphase system to railway work. It would enable electric trains to be run on any existing track without the construction of linework. It would save the cost of "step-up" transformers at each station, primary linework, "step-down" transformers (which must be placed at intervals of a few miles, and each set of which must have capacity to supply the train while on that section), and secondary linework from the step-down transformers, all of which, on account of the long distances between stations and large power transmitted, will be very expensive. It would enable the generating capacity of each station to be reduced to just enough, when worked continuously, to charge the batteries during the intervals between trains, while with the trolley system each station must be large enough to operate the train or trains that may be on its section at any one time, although idle during the remainder of the day.

The natural conclusion from this comparison is that the trolley system will find its most favorable application on roads with heavy traffic, where the stations can be placed at moderate intervals and given steady work, while for lines with less frequent trains the storage battery offers the most hopeful and in fact the only economical solution.

When the storage battery can be made at half the present price, with twice its present life and capacity per pound of battery, and with a safe and fairly efficient discharge rate twice as high as the present limit, conditions by no means hopeless, it will become a very formidable rival of the trolley.

#### TEARING UP TRACKS AT BARREN HILL, PA.

A stretch of track of the Manayunk & Roxborough Incline Passenger Railway at Barren Hill was torn up Oct. 1, at the instigation of St. Peter's Evangelical Lutheran Church. The line of the company extends up the Ridge turnpike from Barren Hill, and in order to connect it with that of the Chestnut Hill & Norristown Railway, also in course of construction, tracks were laid on a short piece of road connecting the Ridge and the Germantown turnpikes. This road is but 30 feet wide. The church fronts on the narrow thoroughfare, as also does a school building. The ground in front of the school building is owned by the church, and adjoins land of a Mr. Huston. The church, it is alleged, agreed to yield up 10 feet of ground in front of the schoolhouse for the trolley, with the understanding that Mr. Huston would grant a similar strip. The company proceeded to occupy the land given by the church, but when the tracks reached Mr. Huston's ground they were diverted from a straight line so as to occupy a part of the road. As this was alleged to be in violation of the agreement said to exist, the church council, after due deliberation, employed a force of men to remove the tracks. A dispatch states that litigation is threatened, but that as the court has become impatient over these monotonous trolley fights, the company may proceed to reconstruct its road without encroaching on the 30-foot thoroughfare and interfering with free ingress to and egress from the church.

#### NEW GRAHAM TRUCK.

The accompanying engraving shows the new Graham truck made of steel and malleable iron complete with fender boards. The strong points

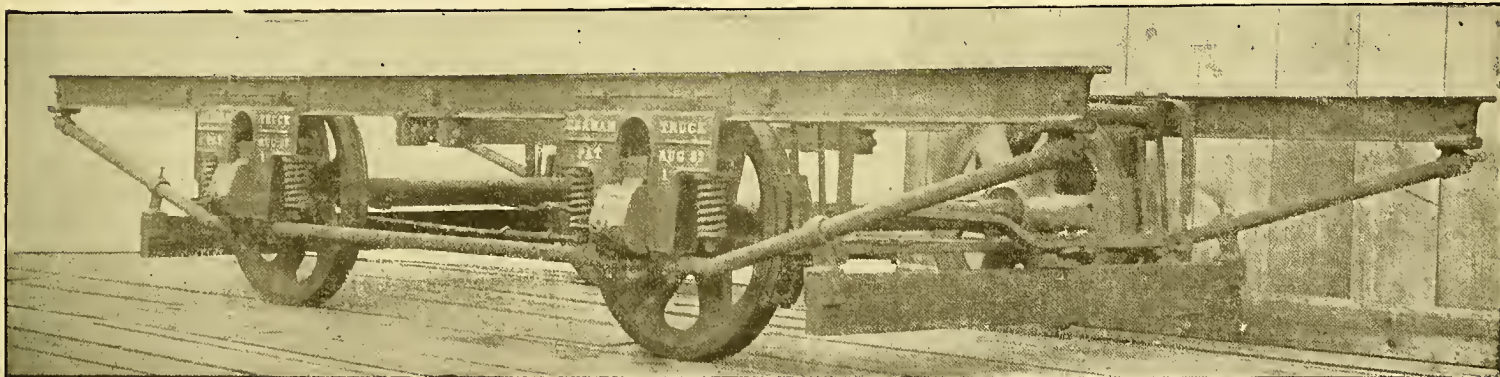
#### RAPID TRANSIT IN ENGLAND.

Thomas J. Gargam, of the Boston Subway Commission, has recently returned from a trip to Europe, and has submitted to an interview in which he spoke of the rapid transit information he had obtained. After saying that the tendency in England was toward municipal control and that astonishment was expressed by officials that such liberal franchises were granted to American street railway companies, he spoke of the Liverpool electric elevated road in this way:

"This railway is six miles long and runs along the great Liverpool dock system—not in the middle of the street, but at one side, on land owned by the owners of the docks. It is an overhead system, running above the surface freight railway that is used by the dock company to transport merchandise from one wharf to another. Its construction is much the same as that of the New York elevated—iron columns with transverse beams. Trains are run in pairs, or trains of two cars each. First and second-class passengers are taken, the fare of the former being six cents and that of the latter four cents. Trains are run every five minutes, and there are 14 stations along the line. The cars are operated by electricity, but the underneath feed-wire is used instead of the trolley system.

"One day I took the trouble to ride the whole length of the line, with the object of seeing for myself just what the running time of a train would be. The journey was made in 25 minutes. Allowing half a minute's stop at each of the 14 stations, the average rate of speed attained was a mile in three minutes. This railway carried 6,000,000 passengers during the last year, notwithstanding the fact that it begins nowhere and ends nowhere. The company proposes next year to extend it to Seaforth, a suburb a mile to the south, and the advantage thus gained of possessing something more than a merely arbitrary terminus, they think, will result in doubling their traffic.

"A great deal has been said here in Boston about people not wanting to ride underground, and many persons have said that underground travel



NEW GRAHAM TRUCK.

As the electric road is only six years old and scarcely anything has been done as yet toward the operation of long distance railways by electricity, it may be considered a little early to venture any well defined predictions on the subject. The indications are, however, that within five years electricity will be the generally accepted power for elevated and underground roads as well as for surface street car service; that in ten years numerous inter-urban roads from ten to thirty miles in length will be electricity equipped; that in twenty years some of the large railway systems enjoying the heaviest traffic will consider electric passenger service essential to their welfare; that, both for the convenience of the public and economy of operation, the tendency will be toward more frequent and smaller trains; that a maximum speed of 150 miles, and a schedule rate of 75 miles per hour, will not be considered remarkable; and that within the life of the present generation we will see the present long train of loosely coupled cars with their restricted space, poor ventilation and light, imperfect facilities for viewing the scenery, and annoyances from smoke and cinders, give way to a single car of liberal dimensions, shaped on scientific lines to cleave the air at high speeds with minimum resistance, equipped with noiseless electric motors, free from the disagreeable products of the steam-locomotive furnace, designed to afford the passengers an unrestricted view in all directions, perfectly ventilated, lighted by electricity, and capable of a speed that will cover the distance from New York to Chicago between sunset and business hours next morning.

claimed for this truck are simplicity, strength, lightness, smooth riding, freedom from oscillation, durability, adaptation to short curves and to stopping and starting, so that less power is required and the wear and tear to track and car body are greatly reduced. Perhaps the most interesting feature of the truck is found in the spring suspension, which comprises a half elliptical spring with spiral springs of a lesser capacity hooked on each end. This provides for the inequalities in the track and at the same time prevents undue hammering and jarring to the motors and the car bodies. The truck has but 24 bolts, and weighs but 2,600 pounds embodying in itself points of great excellence. The "I" beam is made to suit the length of the car body, and adds an additional support to the car sill, being specially trussed from pedestal to end thus preventing any hogging, which is so detrimental to the upper part of the car body. This truck is in service on the Atlanta Traction Company with gratifying results. The Graham Equipment Company is also manufacturing a steel snowplow for single and double track that requires no motors or extra crew, obtaining its motive power from any motor car that happens to be in the shed when the service of the plow is required. One of these plows will be on exhibition at the convention at Atlanta.

was detrimental to the health. Now, I learned something in Liverpool which bore very directly upon that point. The Liverpool people have constructed a tunnel under the river Mersey. It is three-quarters of a mile long and 30 or 35 feet under the bed of the river, and the water, of course, is above that. Moreover, it is lighted by gas, which does a great deal toward vitiating the air. The directors of the company that owns the tunnel have determined, I understand, to substitute electricity in the near future. As far as I could find out, the people of Liverpool, with here and there an exception, have no objection to riding underground in this tunnel. What is more, the few who do object do not object on the ground that it is unhealthy.

"The tunnel is kept clear by means of two large fans. It will be remembered that that was the scheme for purifying the air in the Boston subway. If only electricity were used instead of gas there could not be slightest objection to the ventilation of this Mersey subway. Even as it is, I found that the men employed constantly in the tunnel for the last eight years were unanimous in saying that they suffered no inconvenience, much less any loss of health, on account of having been obliged to work in underground atmosphere."

Wichita, Kan.—Lightning struck the Fifteenth street depot and car stable of the electric railway Oct. 2, and fire completely consumed it with all its contents. The Fairmount electric street railway wires were completely destroyed.



### THE ATLANTA CONVENTION.

The *Atlanta Constitution* gives the following information regarding the Convention of the American Street Railway Association to be held October 17-19:

The committee have gone to work in earnest for the reception they intend to give the visitors to Atlanta. They have arranged many delightful features for the coming convention and by the time the street railway men are ready to leave the Gate City of the South they will be in full spirit to accord Atlanta a vote unanimously crowning it the most hospitable city of the universe.

The sessions of the association are to be held out at Piedmont Park, in the old Machinery Hall of the Exposition. The local Committee on Entertainment has already put a large number of hands at work in the building putting down seats for the members of the convention. The hall will have a seating capacity of about 1,000. In addition to this there will be all the space wanted by exhibitors right in the building.

Mr. Kingston, Southern representative of the Johnson Manufacturing Company, with headquarters in this city, who is a member of the Committee on Exhibits, said that there has already been 20,000 feet of floor space taken by exhibitors who will be here with their respective patents and appliances for show.

Every room at the Aragon hotel, which is to be the headquarters for the convention, has been engaged by the Committee on Entertainment at the request of visitors who are to come to Atlanta.

The Kimball House, in addition, is booked for 200 names.

On the night of the 17th there is to be a reception at the Capital City Club. On the night of the 18th there will be a grand banquet given by the association at the Kimball House. This is known as the regular annual banquet of the association.

On the 19th the guests of the city will be driven out in carriages and will be taken to the Piedmont Driving Club for a spread and a reception.

It is the opinion of Mr. Kingston, who is on several of the important committees, that the street railway men will be given the most cordial and the most splendid reception Atlanta has yet given a company of visitors in convention assembled here, and surely this is saying a great deal.

### BURYING STREET RAILWAY WIRES IN BOSTON.

The law compelling the West End Street Railway Company, of Boston, to place all its feed wires north of Dover and Berkeley streets under ground in six years requires that before Jan. 1, 1895, 200,000 feet of conduit (about 38 miles) and 21 miles of feed wire, or more properly cable, shall have been placed under ground in the district bounded by Dover street, Shawmut avenue, Tremont, Boylston and Essex streets and Fort Point Channel, and this work is now in progress.

The total cost of taking down the present overhead wires and placing them in conduits, including cost of conduit, etc., will average about \$6,000 per mile per wire. The number of wires to be buried varies from 34 wires at the Albany street powerhouse down to two or one. There are eight now being laid in Boylston street.

It will require about 40 miles of conduit to accommodate the 60 miles of feed cables north of Dover and Berkeley streets and will call for an expenditure of about \$360,000. Ultimately the conduit will be extended to the East Cambridge powerhouse.

### SOUTHERN RAILWAY (PIEDMONT AIR LINE) TO THE STREET RAILWAY CONVENTION, ATLANTA, GA.

The annual meeting of the American Street Railway Convention, at Atlanta, Ga., will be largely attended from the East. Arrangements have been perfected for a most elegant Pullman vestibuled train, composed of dining and sleeping cars, to leave New York 4:30 p. m. on Monday, October 15th, via the Pennsylvania Railroad and Southern Railway (Piedmont Air Line), arriving in Atlanta at 3:55 p. m. the following day, making the trip within 26 hours and a half.

The Southern Railway owns and operates the entire direct line from Washington to Atlanta, also the line via Asheville, Knoxville and Chattanooga, and is prepared to handle passengers with absolute comfort and dispatch via either route.

Already five Pullman sleeping cars are filled, and

the attendance from the East will be quite larger than at any other meeting heretofore held.

Most of the New England and Eastern representatives are going via the Southern Railway (Piedmont Air Line) as it is 12 hours quicker than via Chattanooga to Atlanta.

Among the number who go via this line are representatives of the Lewis & Fowler Company, H. W. Johns Company, Portland Shade Manufacturing Company, Okonite Company, STREET RAILWAY GAZETTE Company, Mr. C. W. Price, of the *Electrical Review*, and a large number of other representatives of leading supply-houses.

From Boston two special sleepers carrying a large delegation. Also Mr. J. H. Cunningham, of Massachusetts Street Railway Association. If you are going please send your name to 271 Broadway, New York, for sleeping-car reservations. \* \* \*

### COMMENTS AND VIEWS OF CONTEMPORARIES.

**ACCIDENTS IN PHILADELPHIA.**—There have been numerous trolley car accidents in this city within the last few weeks, but we fail to recall one in which the new method of street car propulsion was solely or wholly at fault. Most of the accidents thus far recorded have resulted from the carelessness of the injured parties. New dangers have been created in the streets and we must learn to avoid them. The railway companies should continue the search for an efficient fender.—*Philadelphia Public Ledger*.

**THE UNDERGROUND ROAD.**—New York has the most comfortable and the most healthful system of rapid transit in the world. Every traveler who has tried the underground road of London knows by experience how far superior are our elevated railways. The London method of transportation is only tolerable because no better can be had. If a man is compelled to live too far away from his business to be able to walk to an 'fro, he must use the means of transportation provided, whatever they are. He has no choice. He must travel through a hole in the ground if he can get home to his supper in no other way. But when practical, if it is left for him to say what the method of transit shall be, is he not bound to declare his preference for journeying above ground? The inhabitants of New York are not troglodytes.—*New York Sun*.

**OBSTRUCTING CARS.**—A trolley car, containing scores of passengers, is frequently noticed delayed or at absolute rest awaiting the convenience of the driver of a dray to move off the track. It is a rare thing for teamsters to give heed to the first warning received from the motor-man's gong. As a rule, drivers keep to the tracks until the approaching trolley car is almost in contact with the team. Rows of wagons are here and there suffered to remain in the path of the cars, each teamster apparently waiting for the others to move out of the way first. An ordinance has been on the city statute-book for many years prohibiting drays, carts and wagons from following each other in a continuous line. There is a general disregard of the well-known and salutary rule requiring such teams to allow a space of ten feet between each of them, which, if observed, would permit teams to turn aside more readily and allow the trolley cars to proceed. There is less occasion now than heretofore for teams to use the street railway tracks and roadway between the tracks, inasmuch as the streets of the city occupied by the trolley lines have been relaid and vastly improved by the substitution of a smooth roadway on both sides of the track. In cobble-stone days the iron roadway furnished by the car tracks was gladly used because there was no other surface between the sidewalks fit to travel over. This condition of things no longer exists on many streets, and the old reason for the universal use of the rails has lost much of its force. There is a good roadway now on the entire width of the "trolley" streets. If drivers would use these excellent roadways, and observe the ancient "law of the road" by always keeping to the right when in motion, their own movements would be unimpeded and they would rarely be obliged to cross the trolley tracks to evade teams coming in the opposite or wrong direction.—*Philadelphia Public Ledger*.

**PASSES.**—An Allegheny street car line reduces its fare and announces the abolition of all passes, except to Councilmen and city officials. It strikes us these are the identical passes that should be abolished.—*Pittsburg Post*.

**BOOM PREDICTED.**—The next year will witness the building of a larger number of electric railways in this State than have already been constructed, and a boom in the industries one way or another connected with this class of work may be confidently looked for. These industries include steel-rail makers, car builders and manufacturers of electrical supplies. The outlook in this direction is, therefore, very encouraging.—*Philadelphia Stockholder*.

**CONDUCTORS' TRAINING-SCHOOL.**—Might it not be a benefit to the citizens of Chicago and a blessing to the strangers in our midst if the conductors of our street cars and elevated trains were required to graduate from a conductors' training-school before they may take charge of a car? That there is a need of a special discipline for these public functionaries is evident to every one who has occasion to make use of our surface and elevated lines. It is observed, for example, that almost all conductors are afflicted with what may be termed a vocal ellipsis, but whether it is the result of defective mentality, a disorder of the nervous forces, simple ignorance, or a habit of perversity is not easy to determine. The presumption, however, that the evil is remedial suggests the advisability of applying the correction that a training-school might supply. The marked peculiarity of conductors is to elide vowels and eliminate consonants wherever it is possible in calling out the names of streets, or in the inability to reduce a name to simple phonetics to substitute a new batch of sounds for the ones to which the intelligent public is accustomed. This produces a more or less unpleasant confusion of ideas in the mind of the passenger, who is in greatest doubt "where he is at" just after the conductor has made believe to inform him.—*Chicago Inter-Ocean*.

### FINANCIAL DEPARTMENT.

Eastern Stock and Bond Market.  
(From Our Wall Street Correspondent.)

The large supply of money and the difficulty experienced by institutions as well as by individual capitalists in finding full employment for their funds, even at current low rates of movement, has led to a continuation of the investment buying of street railway securities that formed so prominent a feature of the September financial situation. As for some time past, offerings are very moderate and totally inadequate to the demand. In the absence of new issues, buyers are obliged to rely on the old floating supply, and, as this has become very much reduced through the absorption process following upon the prolonged ease in the money market, the scarcity being aggravated by the indisposition of present holders to let go their ownings, buyers' orders are very difficult to fill. Consequently business is for the moment very much restricted, but trades are easily made on concessions from either holder or buyer.

Third Avenue continues the most prominent of all local stocks. The dividend period is again approaching, and this is leading to renewed speculation as to the amount to be declared. So far this year the company has paid 8 per cent. on the capital stock. It was the intention of the directors to continue quarterly payments of 4 per cent., but at the last quarter distribution of profits was postponed, for the reason that the company's management desired to create a good surplus in anticipation of soon beginning work on the contemplated extensions to the city limits. Having, however, been defeated in this project, the company can apply these reserve funds to dividend purposes, and it is likely that a good deal of it will be distributed in the channels from which it was originally diverted. Rumors, well founded, have it that 6 per cent. will be paid. What is more, it is reported that more than this amount has been earned on the stock during the current quarter alone. Third Avenue shares at 186 are, in view of these circumstances, a bargain.

Second Avenue shares have had a most suggestive rise to 137½; this is ex-dividend, making current quotations equal to about 140. It is almost sure that the old deal has been rejuvenated. As already outlined in these columns, this deal provides for a change in control. People allied with the big Metropolitan Traction syndicate are known to be bidding for the stock, which is, however, very scarce. It has been herein related how the deal hung fire through the refusal of a large holder living abroad to part with his holdings at a reasonable figure. The sudden boom of the stock following close on the return from Europe of Mr. W. C. Whitney lends color to the report that the traction magnate succeeded in persuading the recalcitrant stockholder to come to terms, and important developments may now be looked for almost any day.

The Metropolitan Traction Company is meeting with a deal of opposition in its endeavor to build a surface road up St. Nicholas avenue and the Kingsbridge road from 125th street to Kingsbridge. The Railroad Committee of the Board of Aldermen has, however, closed further hearings upon the matter and will now prepare a report to submit soon to the Board of Aldermen. That it will be favorable to the Traction Company, with its Tammany Hall affiliations, is undoubted.

There is a very good market for street railway bonds. Quite a goodly number of Broadway 5s and Cross Town and Bleeker Street issues were disposed of this week by one investment house alone, and quick sales are found for any issue of value.



## Financial Notes.

**Philadelphia-Hestonville Road Not To Be Leased.**—There was a rumor in circulation this week that one of the three traction companies of Philadelphia had made overtures to secure control of the Hestonville, Mantua & Fairmount Passenger Railway Company of that city, which operates the Arch and Race and Vine street lines. It was said that an offer had been made to lease the company's property on a certain rental, but the terms were not named. A director of the Hestonville company, when spoken to in regard to the matter, said there was nothing in the report. The men who control the property, he said, had no idea of leasing it. They took charge of it two years ago with the intention of rejuvenating it, and had done so. Before the end of the year electric cars will be in operation, and the present management was confident that, with new equipment and electricity, it would prove a valuable property. There was no intention, the official declared, of parting with the control which the present management held securely.

**Columbia Railway Bonds.**—The Columbia Street Railway, of Washington, has secured its issue of \$500,000 worth of 6 per cent. bonds, sold for the purpose of changing the motive power to a cable, by a deed of trust on all the property of the company. The trustees are the American Security and Trust Company. The bonds are 300 of the denomination of \$1,000, and 400 of the denomination of \$500, and will be issued from the Bank of the Republic to those who hold certificates of subscription. They are payable in 20 years, with interest semi-annually, April 1 and Oct. 1 of each year. The property of the company named in the deed of trust includes the line and its stable property, as well as several lots of land at Long Meadows.

**Report of the Glens Falls Road.**—The annual report of the Glens Falls, Sandy Hill and Fort Edward Street Railroad Company for the year ended June 30 shows the following figures: Gross earnings, \$43,205; operating expenses, \$33,414; net earnings, \$9,791; fixed charges, \$9,538; net income, \$253; deficit June 30, 1893, \$1,032; deficit June 30, 1894, \$779; assets \$278,231; cost of road, \$67,336; cost of equipment, \$92,645; cash on hand, \$4,543; capital stock, \$136,000; funded debt, \$136,000; length of road, seven and one-half miles; passengers carried, 856,892; number of cars, 14; number of motors, 10; expended for betterments, \$8,840.

**Foreclosure Proceedings.**—The Trustees of the Syracuse Consolidated Street Railway Company have begun for closure proceedings because the company defaulted on the coupons of its 5 per cent. first mortgage bonds, due Jan. 1 and July 1, 1894, and Simon Worosser, Casimir Tag, Clarence H. Wildes and Isaac N. Schigman have been appointed a committee for the protection of the bondholders. The Central Trust Company, of New York, will receive bonds and exchange certificates for them.

**Consolidation Rumored in Toledo.**—The report has been current that prominent New York bankers and President Robison, of the Consolidated Street Railway, are engineering a deal for the consolidation of the Consolidated Street Railway Company, the Electric Street Railway Company, the Toledo Electric Company and the Western Electric Lighting Company, the resulting concern to have a cash capital of \$6,000,000.

**Assignment of Taylor, Dee & Mack.**—Taylor, Dee & Mack, of Chicago, dealers in electrical supplies, have made an assignment to F. S. Terry. It is reported that the principal cause for the assignment at this time is the fact that internal dissatisfaction existed among the members of the firm, and that if the creditors so desire a reorganization may be effected and the business continued.

**Street Railway Securities.**—Stocks of electric railway companies, it seems to us, are likely to continue to grow in public favor, for reasons often stated in the *Stockholder*, but one of which is of sufficient importance to warrant repetition—the small number of contingencies, compared with those confronting steam railroads, by which their earnings will be affected.—*Philadelphia Stockholder*.

**Middletown (Conn.) Road Sold.**—Israel A. Kelsey, of New Haven, and A. C. Pond, of Boston, have purchased the Middletown Street Railway, and will at once equip the property with the trolley system. The company will issue bonds in \$150,000, half of which will be placed on the market.

**Large Judgment Against the Manhattan.**—A judgment for \$15,684 in favor of Gen. John Watt De Peyster and against the Manhattan Elevated road of New York was entered this week. The judgment was obtained as damages to plaintiff's 100 feet of land on Sixth avenue.

**Central Street Railway of Rock Island, Ill.**—The annual report of this company shows a falling off in gross earnings of over \$6,000 and a net decrease of about \$4,300.

## NEW INCORPORATIONS.

**Chillicothe, O.**—The Chillicothe Electric Railway, Light and Power Company has been organized. Business to be prosecuted to build or acquire and operate electric, horse or other motive power street railroads and to furnish electric light and power, etc. The capital stock is \$100,000, and those interested in the enterprise are: Jos. P. Myers, Jno. A. Poland, Willard A. Story, Richard Enderlin, Jos. M. Klingensmith.

**Wadsworth, O.**—The Wadsworth General Electric Company has been incorporated with a capital stock of \$10,000. The company will build and operate electric railways, electric light, electric telephones and telegraph; furnishing electric power, etc. The promoters are: W. B. Hunsberger, Eli Overholt, John A. Clark, A. M. Beck, F. G. McCanley, O. V. Doble, J. P. Baldwin, I. G. Grismer.

**Gloucester, Mass.**—The Cape Ann Granite Railroad Company has been incorporated. The capital stock is \$50,000. The company is to construct and operate a street railway from Gloucester to Rockport. The promoters are: Jonas H. French, Gloucester, Mass.; Geo. E. Craig, Walpole; Chas. H. Cleaves, Rockport, Mass.

**Philadelphia, Pa.**—The Philadelphia, Bala & Narberth Railway Company has been incorporated, with a capital stock of \$24,000. The promoters are: A. L. Fretz, Cynwyd, Pa.; G. Morris Dorrance, Bristol, Pa.; J. L. Stadelman, Bala, Pa.

**Clinton, Ia.**—The Electric Railway and Park Company has been incorporated. The capital stock is \$50,000. The promoters are: A. L. Schuyler, C. Coan, F. C. Walsh, A. L. Stone, M. A. Walsh, J. W. Walsh, Clinton, Ia.

## NEWS OF THE WEEK.

**Philadelphia, Pa.**—Work is progressing rapidly on the Maoyunk and Roxborough Inclined Plane Railway's trolley line, which is run on Ridge avenue from Sumac street, Wissahickon, to Barren Hill, Montgomery County, a distance of nearly six miles. Double tracks have been laid as far as Jefferson street, Roxborough, to which point the avenue is paved with granite blocks. From Jefferson street to the county line at Manatawna the roadway is macadamized. The single track with the turnouts is placed along the west side of the avenue close to the curb line. The trolley wires have been stretched from the company's depot, a short distance south from the county line, to the Wissahickon terminus, and men are at work stretching the feed wires between the same points. The power house, which fronts on the Schuylkill River, at the foot of Shawmont avenue, has been completed for several weeks, and the boilers, engines and generators are being placed in position as rapidly as possible. It is expected that before the end of October the entire line will be in operation and trolley cars running at intervals of 10 or 15 minutes, covering the entire distance in about 50 minutes.

**Philadelphia, Pa.**—The work on the reconstruction of the Hestonville road is progressing favorably. The new track on the Arch street line is about completed. The Reading Railroad crossing at Spring Garden street, about the last of the track work, will be laid in a few days. Much of the overhead work is also completed. New rails have been laid on Race and Vine streets, east of Broad. The company has been unable to do any work west of Broad street for some time, because of the inability to get rails. Work will be resumed, however, in a few days. The power station, at Twenty-fifth and Callowhill streets, is about under roof, and the installation of machinery will soon begin. The station will have three General Electric generators, of about 500 H. P. each, directly coupled to 500 H. P. tandem-compound Green engines, built by the Providence Steam Engine Company.

**Brooklyn, N. Y.**—W. A. H. Bogardus, general manager of the Brooklyn Heights Railway, which controls the principal trolley lines in Brooklyn, including all the branches of the Brooklyn City Railway Company, has resigned, declaring that failing health was the reason. Cyrus P. Smith, the secretary and treasurer, also resigned. Mr. Bogardus takes Mr. Smith's place. One of the directors of the road said that there had been a reduction in the salaries of all the employees, with the exception of the motormen and conductors, from the president down. The reductions, with other retrenchments recently made, would effect an annual saving of about \$200,000. The directors announce that they have agreed to cut down the fee for attendance on meetings one-half.

**Boston, Mass.**—The Railroad Commissioners have approved the issue of additional capital stock to the amount of \$261,000 by the Brockton Street Railway Company. This company originally petitioned for license to issue stock to the amount of \$289,000 for the purpose of providing means for the payment of its debts and for the purchase of the property, rights and franchises of the Brockton &

Holbrook, the East Side and Whitman Street Railway companies, which were absorbed by the petitioner. It afterward appeared that the company had included a debt not incurred by construction. The commissioners deemed the \$261,000 additional stock reasonably requisite, and approved an issue to that amount.

**Philadelphia, Pa.**—The Philadelphia Traction Company is preparing to equip the Seventh and Ninth streets and Columbia avenue cable roads with the trolley system, and conduits are now being laid for the feed cables. All of the overhead work will be constructed and the feed cables put in before the cable cars are taken off, but the track and cable conduits will not be touched, except to temporarily bond the rails. When all this is ready the trolley cars will commence running on the present tracks, and then the cable conduits will be torn up, the excavation filled in and new rails laid. This can be done while the trolley cars are running, but not while the cable cars are running.

**Philadelphia, Pa.**—The trolley cars are now in operation on Girard avenue. The first car traversed the line Sept. 26. The residents of the business section of Girard avenue went wild with enthusiasm over the advent of the trolleys, and the people of the residential portions of the thoroughfare welcomed them with quite as much pleasure, if less noise. Redfire and fireworks, waving flags, and Chinese lanterns followed the course of the first car, while the crowd cheered loudly in its great glee. The first car, one of the summer pattern, carried a party of officials and guests. It was followed by two cars containing members of the Girard Avenue Business Men's Association.

**White Plains, N. Y.**—The Port Chester, Rye & Mamaroneck Railroad has been incorporated to build an electric road from the Connecticut State line, a couple of miles from Port Chester, through that village and to Rye and Mamaroneck. The company is capitalized at \$150,000, and the directors are as follows: Congressman William Ryan, John W. Lonsbury, William L. Ward, Hanford M. Henderson, John F. Mills, Josiah Wilcox, all of Port Chester; Justice Bernhard Baruch, of Rye; Congressman Charles D. Haives, John A. Tremper, and S. Floyd Woodworth, of Kinderhook; and Wilson Miller, of Valatie.

**Philadelphia, Pa.**—The Lancaster Avenue Improvement Company has filed a bill in equity against the Hestonville, Mantua & Fairmount Passenger Railway Company, asking the Court to restrain the defendants from laying tracks on Lancaster avenue, beginning at the intersection of Fifty-second street, and running westward to the county line. The plaintiff company claims the sole ownership and right of franchise to the avenue by right of purchase from the original owners.

**Poughkeepsie, N. Y.**—The new Poughkeepsie trolley system, covering 30 miles of line, built by Major J. W. Hunkley, Chairman of the Democratic State Committee, was formally opened last Monday afternoon. A car was run over it containing Mr. Hunkley, Mayor Ketcham, the members of the Common Council and others. There was a big demonstration all along the route, although no previous notice of the event had been given.

**Camden, N. J.**—It is announced that the New York & Philadelphia Electric Railway Company, supposed to be a branch corporation of the Consolidated Traction Company, is securing right of way down through Boroentown, Florence, Burlington, Beverly, Delanco, Riverton, Palmyra and on to Camden. It is stated that enough consents of property owners have been secured to assure the building of the road.

**Allentown.**—A few weeks ago the Lehigh Valley Traction Company doubled its rates of fare. On Oct. 1, without any previous notice of its intention, the company reduced the fare to the old price. The officials admit that it was more profitable to run the lines at the low rate. The president, it is stated, opposed the increase at the time, but several of the directors insisted on it.

**Indianapolis, Ind.**—The Citizens' Street Railroad Company has filed in the United States Court a bill of complaint against the city of Indianapolis, asking that the city be perpetually enjoined from interfering with the plaintiff in its use of the streets. Ex-President Harrison is one of the counsel for the company. The city denies the perpetual franchise of the company.

**Chicago, Ill.**—The West Chicago Street Railroad Company has just closed contracts with Fraser & Chalmers for Corliss engines of 7,000 H. P. for the new trolley lines. Three of these machines are of 2,000 H. P. each, and one of 1,000 H. P. They will be installed in the West Madison street power-house.

**Chicago, Ill.**—The Chicago General Electric Company has stolen another march on its opponents. Last Sunday it unexpectedly laid half a mile of track on Rockwell street between Twenty-second and Twenty-sixth streets, and a car traversed the completed track.



PERSONALS.

John English, treasurer of the Bridgeport Electric Light Company, and an officer in the National Electric Light Association, died at his home in New Haven last Sunday. Mr. English had been very ill for a month or more. He was 34 years of age, and leaves a widow and three children. Mr. English was a nephew of the late ex Governor English, of Connecticut.

W. H. Gordon, whose serious illness was recently noted in these columns, died on Oct. 1. The funeral services were held Tuesday night in the Episcopal church of Bergen Point, N. J., which was Mr. Gordon's home. The remains were taken to Cincinnati for interment. Mr. Gordon leaves a wife and four children.

TRADE NOTES.

Pope Light.—In order to meet the demand for the Pope light, which is interchangeable with the "Pintsch" now in wide use, the Consolidated Car Heating Company, of Albany, has added considerably to its plant, and is about to manufacture lamps for compressed oil gas and fittings on a large scale. The compressed gas plant of the latest pattern recently erected shows most excellent results. 17,600 cubic feet of gas of 50 candle power having been obtained from 160 gallons of oil, that is, 110 feet per gallon, whereas the usual make is somewhat under 90 feet. The Consolidated company is preparing to notify railway men from all over the country to witness an exhibit of Pope

lighting apparatus at Albany, carrying out a similar plan to that it established in 1892 with reference to steam heating apparatus, when special trains were run hourly to Troy and return during two days, and many prominent railway officials from all parts of the country and Canada were present to observe the operation of the Sewall Coupler and Commingler Storage systems.

Electric Heaters.—Electric heaters seem to be greatly favored by railway managers this year, and a large number of contracts for the installation of heaters has recently been secured by the Consolidated Car Heating Company, of Albany. A few days ago the company, through its sales agent H. N. Ransom, obtained the contract for equipping the cars of the Stenway Electric Railway Company, of Long Island City, with electric heaters. The Consolidated company's type of heater was adopted only after a series of tests had proved its merits. The contract for the equipment of electric heaters for the Fair Haven and Westville roads of New Haven, has been awarded to the Consolidated Car Heating Company.

The Mather Electric Company, of Manchester, Conn., reports on hand a large number of contracts for its new multipolar railway generators for railway work. The company last week closed the following contracts: The Danbury & Bethel Horse Railway Company, of Danbury, Conn., two 100 k. w. multipolar railway generators, with very elaborate and complete switchboard, which will be fitted entirely with new Mather station instruments; and the Chicago City Railway Company, Chicago, Ill., one 125-h. p. direct connected generator.

Test of the Modemann Fender.—A test of the Modemann street-car fender, which is made by the United States Street-Car Fender Company, of 300 Bennett Building, New York, took place on the tracks of the Atlantic Avenue Railroad Company, at Ninth avenue and Twentieth street, Brooklyn, last Thursday. The operation of the fender was illustrated and a practical demonstration was given of its ability to pick up the unwary pedestrian who ventures in front of a car.

E. W. Bliss & Co., of Brooklyn, have lately moved their Chicago office and warerooms from 14 Canal street into more commodious quarters, at 100, 102 and 104 West Washington street, near Desplaines street, where the firm will continue to keep a representative line of presses, drop-hammers, shears and sheet metal machinery. The Chicago office is still in charge of Mr. C. W. Ellsworth, late superintendent of the Chicago Stamping Company.

The Seaboard Air Line has issued a neat circular giving information for the use of those intending to visit Atlanta to attend the American Street Railway Convention. Copies will be sent to those sending a request to 287 Broadway, New York.

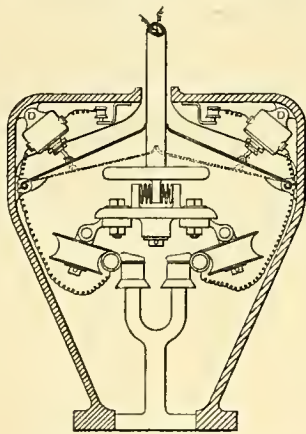
The Consolidated Car Heating Company, of Albany, has been awarded the contract for equipping 60 cars of the Nassau Street Railway Company, of Brooklyn, with sets of electric heaters.

The Sterling Supply and Manufacturing Company has received an order from the Metropolitan Traction Company for 75 sets of sandboxes for the Broadway line, N. Y.

RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Sept. 25, 1894.

526,392. Conduit for Electric Railways; David F. Graham, Springfield, O., and William P. Allen, Chicago, Ill. Assignors of one-third to Oliver S. Kelly, Springfield, O. Filed Oct. 25, 1893. The conductors are supported in a conduit and the hinged plates are arranged above said conductors. Feeding wires are in proximity to the conductors, and switching devices are



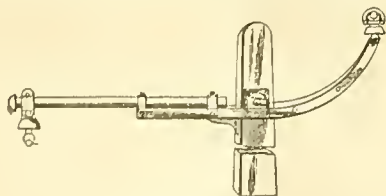
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connected with the plates, the latter being adapted as the plates are operated, to form an electrical connection between the feeding wires and the conductors. (See illustration.)

526,408. Bracket for Trolley-wires; Leroy S. Pfouts, Canton, O. Filed Dec 30, 1893. The pole is provided with a fixed right angle arm, which has a yoke, and with a pivoted trolley wire supporting arm.

526,409. Trolley and Feed-wire Bracket; Leroy S. Pfouts, Canton, O. Filed Jan. 11, 1894. The pole is provided with a pivoted feed-wire arm, having attached thereto a trolley-wire supporting arm. Both of the arms are located at right angles to the trolley and feed wires. (See illustration.)

526,422. Trolley Wire Hanger; Irvin B. Walker, Sioux City, Iowa. Filed Feb. 26, 1894. The hanger is constructed of a single piece, and has a central lip grooved upon its upper surface for the reception of the



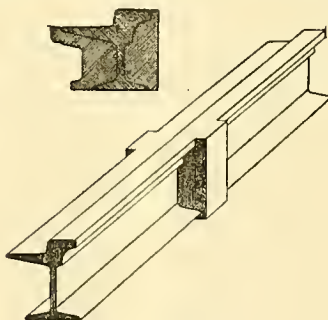
No. 526,422.

wire, the ends of the hanger extending longitudinally beyond the lip and over the wire and being grooved upon their under edges. The distance between the bottom of the groove in the ends and a line extending from the bottom of the groove at the extreme corners of the lip is the diameter of the wire. The hanger is concave at the point of contact with the wire and convex on the side opposite thereto; the entire lower portion of said hanger is of the width of the diameter of the wire.

526,434. Joint for and Method of Joining Metal Bars; William M. Brown, Johnstown, Pa., Assignor to the Johnson Company, same place. Filed Mar. 23, 1894. A welding chock is adapted to engage the web and base flange of the rail and weld thereto, and has a portion adapted to underlap said flange. (See illustration.)

526,453. Cable-car Grip Slot-brake; James T. Marlin, Kansas City, Mo., Assignor of one-third to Alfred Blaker, Kansas City, Kans. Filed Jan. 22, 1894. The frame depends through the slot, and comprises a stationary section and a movable section. Levers are carried by the frame and are provided with brakeshoes and friction plates above and below the slot respectively. A block is carried by the movable section and means are provided to partially rotate the block and cause the brakeshoes and friction plates to approach the slot-rails.

526,455. Railway-Cross; Arthur J. Moxham, Johnstown, Pa. Filed May 2, 1893. The cross has one through rail and two abutting rails; two clamping members, one on each side extending below the rail and bent at such angle as to fit the through and one butting rail. There is a supporting plate or plates beneath the rail, the edge of said plate or plates entering with the flange of the rail a recess in the clamping member.



No. 526,455.

526,468. Closed Conduit for Electric Railways; Charles D. Tisdale, Boston, Mass., Assignor to himself and John D. Gould, New York, N. Y. Filed Sept. 4, 1893. The conduit is formed of the flexible tube. The main conductor is arranged at the bottom of the tube, the auxiliary sectional conductor being placed on the top of the tube and provided with contact pins extending downward into the tube and provided with collars within the tube.

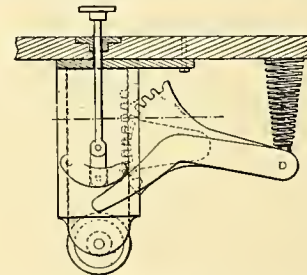
526,481. Switching Device for Street Railway Cars; Joseph Brautagan, Brooklyn, N. Y. Filed Oct. 19, 1893. A guide projects downward from the car floor, a bar guided to said guide is provided with a rack with a roller on the lower end. There is a lever pivoted on an arm of the guide, and is provided at one end with a toothed segment engaging the rack. A spring acts on the opposite end of said lever, and an additional lever is connected with the lever having the toothed segment. A cam-lever is pivoted to the guide, and a rod is pivoted to the cam-lever and extending up to the car floor. (See illustration.)

526,502. Electrical Safety Fuse; Otto M. Ran; Milwaukee, Wis. Filed Oct. 31, 1893. The fuse is constructed with a series of turns or coils lying in close proximity to each other.

526,513. Car Brake; Samuel G. Wilber, Lake Hill, N. Y. Filed May 20, 1893. Renewed Aug. 22, 1894. The second claim reads as follows: "The combination with a

truck, an axle, the wheels, and the brake devices, of a friction wheel arranged upon the axle, a rotatable and oscillatory winding shaft journaled adjacent to the axle, a cable or chain connected therewith, and device between the cable or chain and the brakes, a loose friction wheel mounted on the winding shaft, a stationary collar at one side of the wheel, a threaded portion arranged at the opposite side of the wheel, a nut upon the threaded portion, and a coiled spring upon the shaft between the nut and the wheel."

526,567. Register for Street Cars; William D. Forbes, Hoboken, Assignor, by mesne assignments, to Horace B. Miller, trustee, Montclair, N. J. Filed Nov.

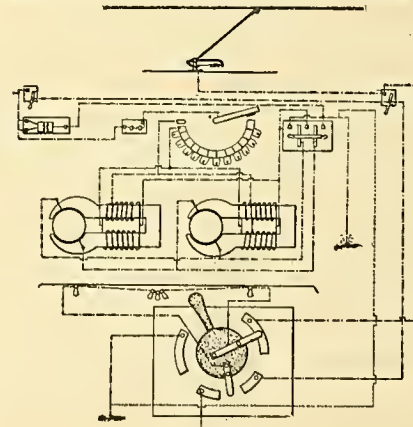


No. 526,481.

4, 1893. The register has a stationary but removable flanged rim graduated to form an annular dial in combination with a rotary disk inclosing the front of the case and carrying a pointer to co-operate with the annular dial.

526,605. Rheostat; Burton E. Baker, New Britain, Conn. Filed June 4, 1894. This consists of cores having resistance wires wound around them and blocks of plastic material in which the cores are embedded, and suitable clamping devices by which the blocks are retained in operative position.

526,644. Testing Indicator for Electric Railway Cars; Theodore Stebbins, Boston, Mass. Filed Aug. 21, 1894. The indicator comprises, in combination,



No. 526,644.

an electric apparatus or circuits to be tested, an indicating instrument, and an electric switch or contact making appliance having connections to the ground. (See illustration.)



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Street Railway Convention Report. The next issue of the STREET RAILWAY GAZETTE will contain a report of the convention of the American Street Railway Association to be held in Atlanta next Wednesday, Thursday and Friday.

Special Cars for Trolley Parties. In a recent number of the STREET RAILWAY GAZETTE it was predicted that street railway companies might soon find it desirable and profitable to provide specially appointed cars for the use of trolley parties. The West End Company, of Boston, has already done so, and illustrations of its special cars are shown elsewhere in this issue. The cars in their arrangement resemble the parlor coaches of the steam roads. The trolley party, we believe, has come to stay, and we are confident it will pay to provide for its demands.

A Year Ago And Now. The American Street Railway Association meets in Atlanta next Wednesday under conditions that are happily very different from those that obtained when the organization held its convention in Milwaukee a year ago. At that time the financial depression presented itself in its ugliest aspect. Every one was discouraged, and the calamity-howlers had it all their own way. No one had the heart to attempt denials of their wretchedly gloomy predictions. Street railway companies reported alarming decreases in their receipts and all were planning schemes by which their expenses might be materially lessened. Economy was the word in the mouth of every manager. The supply men, whose cheerfulness is proverbial, were even more dismal than the members of the association. They could find no orders in the field, and they were afraid to look for them, as they did not know whom they could trust. They swapped the most harrowing stories about the shifts that companies made to escape the necessity of buying goods and paying for them. The unfortunate condition of affairs was referred to even in the convention hall. In his annual address President Longstreet said: "Financial panics such as the one through which we are now passing are of irregular occurrence, yet they are sure to reappear, affecting receipts and making economies of management a subject of deep study." If he saw any signs of improvement in the immediate future, he failed to make the slightest allusion to them. Another cause had its effect on the meeting. The World's Fair was in full blast in Chicago, and its attractions were so great that the importance of the street railway meeting perhaps seemed less because of the comparison, but the fair probably did not affect the attendance, although it was feared that such might be the case. It probably did detract from the completeness of the exhibit of street railway apparatus, but it may safely be said that the display in the Milwaukee Exposition Building did not suffer any from comparison with that shown in the gaudy Transportation Building in Jackson Park. The latter was woefully meager and incomplete, as representing an interest in which hundreds of millions of dollars are invested, but that is another story. The exhibitors in Milwaukee were not given a fair show. The convention adjourned before they were led to expect that it would be concluded,

with the result that, during the very afternoon when exhibitors expected the most attention from delegates, the latter were packing up their trunks and starting homeward. Though the association, of course, had no thought of interfering with the success of the exhibit when it unexpectedly adjourned, the sudden departure of the members was none the less hard on the companies that had expended liberal sums of money to show samples of their manufactures in Milwaukee. And money came hard a year ago. This, however, is a digression from the topic we are treating—the differences between 1893 and 1894.

That a better condition of affairs exists to-day than a year ago no one dreams of denying. Every caller at the STREET RAILWAY GAZETTE office during the last few weeks has admitted that fact. The only question has been the extent of the improvement. Some are fairly jubilant over the return of prosperity; others can see that the situation is just beginning to improve, and is steadily, though not rapidly, bettering. And even the third class, which includes all the croakers and misanthropes, concedes, although sometimes almost grudgingly, apparently, that matters are on the mend. Certainly we are all glad to welcome every hopeful symptom. It has been a tempestuous year for a great many of the supply men and manufacturers, and quite a number of them have gone down under the stress of the financial storm. Those who have weathered the trouble are certainly warranted in taking heart and in looking with some confidence to the future.

The street railway men are even more encouraged and hopeful than the supply men. During the last year they have been obliged to practice a vast number of economies that have greatly reduced the expenses of their roads, and as a natural result this cutting off of all possible outgoes, the significant fact has appeared in a great many financial statements: While incomes have been reduced, operating expenses have been more than correspondingly lowered, so that net earnings have been greater than during equal periods in seasons of prosperity. We have not the slightest doubt that the necessity which dictated changes calculated to reduce expenses has been the means of causing managers to add materially to their store of knowledge on the subject of the economical operation of street railways. It ought to bring with it higher rates of dividend as times improve. It is gratifying to note that on a great many lines the receipts are now as great as they were before the panic caused such a disastrous reduction in the traffic.

The street railway men and the supply men, under all the circumstances, therefore, should thoroughly enjoy the meeting in Atlanta next week and the attendance should be unusually large. The change for the better in business prospects is a matter for congratulation all around. The people of Atlanta are anxious to extend the warmest kind of a Southern welcome to the visitors. The programme is an excellent one and varied enough to suit every one. The topics to be discussed are timely and should be discussed with more life than ordinarily characterizes the speeches in the business sessions. The electrical and street railway exhibit will be well worth seeing if promises are fulfilled; in short the Atlanta Convention will be a noteworthy meeting unless all signs fail.



### ATLANTA CONVENTION OF AMERICAN STREET RAILWAY ASSOCIATION.

The annual convention of the American Street Railway Association will be held next Wednesday, Thursday and Friday, in Atlanta, Ga. The association meets for the first time in the South, and it is to be hoped that the attendance will be unusually large. The sessions of the convention will be held at the Machinery Hall, Piedmont Park, and the exhibit of street railway apparatus and supplies will be located in the same building. The location is at some little distance from the hotels, but the park is easily reached by the electric cars.

The programme of the meeting in condensed form is as follows :

#### SPECIAL REPORTS OF COMMITTEES.

"Can the T Rail be Satisfactorily Used in Paved Streets?" Joel Hurt, President Atlanta Consolidated Street Railway Company; S. Hendrie, Manager Wyandotte & Detroit River Railway Company, Detroit; H. J. Crowley, Engineer Atlanta Consolidated Street Railway Company.

"City and Suburban Electric Railways." Elwin C. Foster, Superintendent Lynn & Boston Railroad Company, Boston, Mass.

"Mail, Express and Freight Service on Street Railway Cars." Richard McEnloch, Electrical Engineer Citizens' Railway Company, St. Louis, Mo.

"The Best Method of Treating Accidents and Complaints." John B. Parsons, General Manager West Chicago Street Railroad, Chicago, Ill.

"Street Car Wheels and Axles." D. S. Cook, Electric Engineer, Trenton Passenger Railway Company, Trenton, N. J.

"Transfers and Communication." Rodney Curtis, President Denver Tramway Company, Denver, Colo.

"The T Rail Construction of the Terre Haute Street Railway Company." M. F. Burke, Superintendent Terre Haute Street Railway Company.

"A Standard Form of Street Railway Accounts." H. I. Bettis, Constructing Engineer, Atlanta Consolidated Street Railway Company, Atlanta, Ga.

#### SPECIAL PAPERS.

A Practical System of Long Distance Electric Railway Work.

Brake Shoes.

Power Brakes vs. Hand Brakes.

Taxation.

Destructive Arcing of 500-Volt Fuses.

The officers of the association are:

President, Henry C. Payne, Milwaukee, Wis.

First Vice-President, William J. Stephenson,\* Washington, D. C.

Second Vice-President, James R. Chapman, Chicago, Ill.

Third Vice-President, Lewis Ferrine, Jr., Trenton, N. J.

Secretary and Treasurer, William J. Richardson, Brooklyn, N. Y.

Executive Committee: The President, Vice-Presidents, and D. F. Longstreet, Denver, Col.; Thomas H. McLean, Indianapolis, Ind.; Edwards Whitaker, St. Louis, Mo; W. Y. Soper, Ottawa, Can.; E. S. Goodrich, Hartford, Conn.

#### CONVENTION NOTES.

The headquarters of the association will be at the Hotel Aragon.

On Wednesday evening a reception will take place at the Capital City Club, of Atlanta. All members and visitors are invited. Ladies are especially invited.

On Thursday afternoon the ladies who are attending the convention will enjoy a carriage drive about the city. The banquet will take place Thursday evening at nine o'clock.

The "genuine Georgia barbecue" will be the attraction Friday. The feast will take place at Stone Mountain, 20 miles east of the city.

If you propose to attend the banquet which takes place Thursday evening, Oct. 18, please notify the secretary of the association, W. J. Richardson, as soon as possible. Each company that is a member is entitled to two tickets. Visitors will be furnished tickets upon the payment of \$10. Ladies' tickets are \$5 each.

The American Street Railway Association has 181 members according to the list of the secretary. The membership is distributed throughout 34 States and Territories, and the Dominion of Canada. The banner State is Pennsylvania, in which there are 27 companies which hold membership. The city

\*Deceased.

which appears most frequently on the membership roll is Pittsburg, where 10 members are located. The association has 25 members in the New England States, 20 in the South, 15 west of the Mississippi River and 6 in the Dominion of Canada.

The following list of the principal hotels in Atlanta and their rates may be of value to those who have not been wise enough to secure rooms in advance: Hotel Aragon, American plan, \$3 to \$5 per day; European plan, \$1.50 to \$3 per day. Kimball House, \$2.50 to \$5 per day. Markham House, \$2 to \$4 per day. Hotel Marion, \$2 to \$4 per day. National Hotel, \$2 to \$3 per day.

Certificates for return tickets at the one-third rate must be countersigned by the clerk of the convention before they will be honored. Mr. N. W. L. Brown, of the Atlanta Consolidated Street Railway Company, has consented to act as the clerk for the purpose.

#### TESTS OF THE MODEMANN FENDER.

It is generally conceded that an efficient fender should form an essential part of the equipment of every rapidly moving surface car in cities. One of the most recent appliances of this kind is the Modemann fender, which, the United States Street Car Fender Company, of New York, claims is adapted to all the conditions to be encountered in actual service. A test of the device was made a few days ago on the tracks of the Atlantic Avenue Railroad Company, in Brooklyn, and the results were of the most interesting character. The purpose of the company was to demonstrate the practicability of the fender under conditions approaching those to be met in service. A large gathering, including a number of interested street railway men, watched the progress of the test and noted the ability of the device to pick up unwary persons and remove them out of harm's way. The tests were all made with persons not dummies, and those who submitted to be operated upon went through their experience without the slightest injury.

Before referring in detail to the operation of the feeder a description of the device will be of interest. Its general appearance and its construction can be seen from the accompanying illustrations. The material of which it is made, except the framework, is the same as that used in spring mattresses

cess of adjusting it is so simple and perfect that one man can make the change alone in two minutes. The attachments are inconspicuous and neat and do not interfere with the passengers' or motorman's convenience in the least.

The fender is automatically collapsible, and will collapse on receiving a body or impact equal to 40

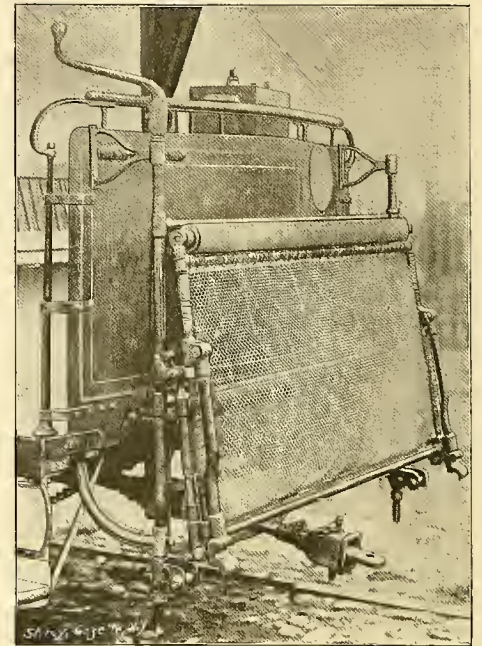


Fig. 3.—The Fender Folded Up.

pounds weight. It runs, normally, within 2½ inches of the ground, and the height from the ground necessary for a body to strike the fender so as to cause it to collapse is about 8 inches; a child of two years of age, or even a dog, would on coming in contact with the fender cause it to act. Ample experiment, it is claimed, has shown the fender perfectly reliable in its action under all circumstances.

Another feature of its action is that by a positive acting supporting bar, operating automatically, the body falling upon the fender is raised above



FIG. 1.—THE FENDER IN POSITION READY FOR USE.

and it yields readily when it is subjected to pressure.

It is attached to the car by a light, but exceedingly strong steel frame, and it is so constructed that by having a frame at each end of the car the fender can be shifted at a moment's notice. One fender, therefore, is enough for each car. The pro-

cess of adjusting it is so simple and perfect that one man can make the change alone in two minutes. The attachments are inconspicuous and neat and do not interfere with the passengers' or motorman's convenience in the least.

The collapsing of the fender at 40 pounds resistance breaks the force of the fall, and avoids the



shock which inevitably occurs if the person falls on a rigid fender or the ground. In actual tests made under the most dangerous conditions it has been proved that even slight injuries and bruises are the exception rather than the rule.

A very important feature of the fender is that of



FIG. 5.—ONE WAY IN WHICH A VICTIM WAS PICKED UP.

the extensible wings which when collapsed project nearly two feet on each side of the platform of the car, preventing the person in collision from being struck by the steps of the car or from falling off. When in ordinary position these extensible wings hang down on either side of the fender and are entirely out of the way.

The oscillatory movement possessed by the fen-

der makes it free from one of the most serious defects of many other fenders. The fender is attached by sleeves to the permanent frame and moves up and down easily and freely. The rubber roller which is attached to the front edge of the fender is ordinarily about 2½ inches from the

ground, but should the car tilt forward it acts as a wheel and offers no resistance. The fender rising on the frame and oscillating easily no damage can ever result from touching the ground or any hard substance of moderate size.

The fender has several positions of adjustability when not in use. It can be folded up and made to take little or no room (Fig. 3) on the end of the car, or lifted off and set on the car platform.

The illustrations tell the whole story of the tests of the fender in the most graphic way. Two persons, a man and woman, volunteered to take turns in standing in front of the car as it moved along, in order that the action of the appliance might be illustrated. When the woman was struck she was standing between the tracks, with her side to the car. She was promptly picked up as the fender collapsed. She thrust out her arm and steadied herself by resting her hands on the wing of the fender (Fig. 4).

The most remarkable pick-up was that in which the man struck the fender head first (Fig. 5). A snap shot taken at the instant appears among the illustrations. As a result of his tumble into the fender in this fashion he was not injured in the slightest. It should be stated that neither of the volunteers was in any way connected with the company. The young woman was a reporter for a New York daily, and the man had simply become interested in the fender by his examination of it.

**VICTORY FOR THE MILWAUKEE STREET RAILWAY COMPANY.**

The Milwaukee (Wis.) Street Railway Company has been successful in its suit to set aside the city assessment of



FIG. 4.—HOW THE FENDER COLLAPSES AND PICKS UP THE PEDESTRIAN.

\$2,800,000 on its property, including the roadbed and the franchises. In the Circuit Court a decision has just been rendered which reduces the assessment by about \$2,000,000, so that the assessment is now less than a third of its original size.

**GENERAL ELECTRIC EXHIBIT AT ATLANTA.**

The exhibit of the General Electric Company at the Atlanta Convention will be of an elaborate description. It will comprise motors, controller and other car equipment parts, station switchboard panels, line material, wattmeters, etc. The G. E. 800 motors will be shown not only in the exhibit proper, but, mounted on cars, will be operated on the lines of the Atlanta Street Railway Company. Ample opportunity will be afforded for a close and critical examination of these motors and of the component parts which enter into their construction. The motors will be operated in conjunction with the "K" controller, and those

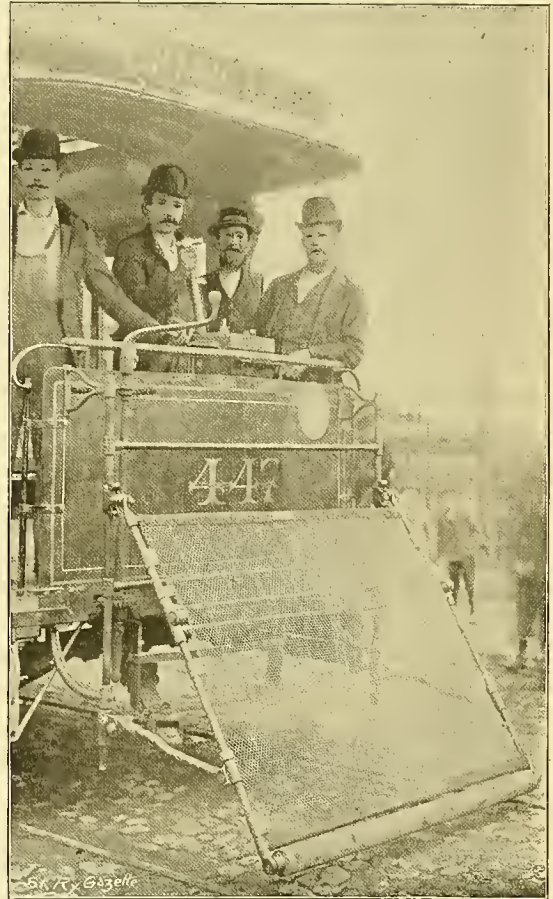


FIG. 2.—THE MODEMANN FENDER WITHOUT WINGS.

interested will be enabled to investigate the merits of the combination. The principle of the magnetic blow-out device will also be shown and explained and its action demonstrated. This principle is embodied in all other devices in which electric arcs may occur, such as switches, fuses, lightning arresters, etc.

Several sizes of generator and feeder panels for station switchboards, all of black marbleized slate, with the necessary instruments mounted thereon, will also be shown. These panel boards are made in various capacities to suit the requirements of a plant, and have been devised so that the switchboards may be increased in size, as the station grows, merely by the addition of other panels.

The line material exhibited will embody several improvements of an important character, made necessary by the increased demands of railroad service.

The Thomson recording wattmeter in its portable form for testing on moving cars will also form an important part of the exhibit. The exhibit will be illuminated by means of Thomson's '93 arc lamps for railway circuits, connected in series and operating on the railway lines. They have been especially designed for use in power-houses, car-barns and elsewhere where light is desired from 500 volt circuit.

The exhibit will also comprise samples of underground feeder tubing with models of junction boxes and taps, and among the literature which will be distributed will be found a special pamphlet



dealing with the application of the three-wire system to street railway work. The interests of the General Electric Company will be in charge of Mr. W. J. Clark, general manager of the railway department. He will be assisted by Messrs. W. H. Knight, chief engineer of the railway department, Theo. P. Bailey, H. H. Corson, H. J. Crowley, W. B. Potter, H. C. Wirt and A. K. Baylor.

**THE CLARET AND WUILLEMIER ELECTRIC RAILWAY SYSTEM.**

For several months an electric railway, operated on the Claret and Wuillemier system, has been working in the city of Lyons, France. This system

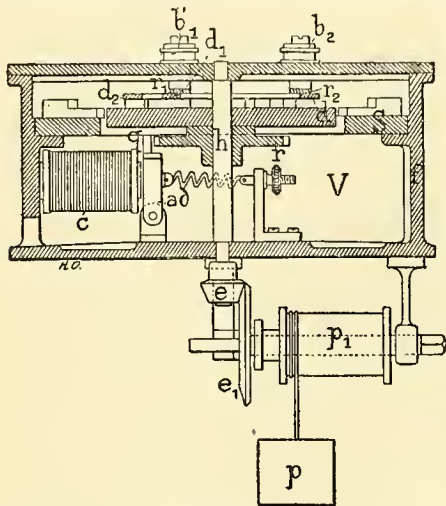
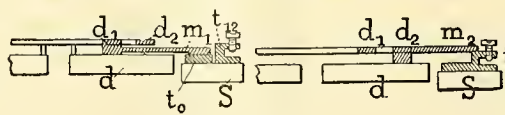


Fig. 1.

appears to be extraordinarily complicated; it seems even more complex than many plans that have been put forward on paper in America for the electrical operation of street cars without overhead wires. The line cannot be considered wholly experimental. A. Moutier, an electrical engineer,

overhead system could not be introduced on a large scale in France because of the great objection, especially in cities, to aerial wires. M. Moutier, in the article to which reference has already been made, speaks of this prejudice in this strain: "The French people, especially with their innate sense of



Figs. 3 and 4.

beauty, are not sufficiently Americanized to adapt themselves easily to a system of locomotion that will destroy the architectural beauties of a city by the introduction of obstructing and ill-looking poles, and metallic wires crossed horizontally at intervals, so that they present the appearance of a huge net with meshes of greater or less size."

This seems to be an extreme view of the case for an electrical engineer to exploit who is anxious for progress along all electrical lines, even though poles and aerial wires are required. This view of the case caused M. Claret to devote himself to the invention of an electric railway system that would not need wires above ground, and the road at Lyons is the result. M. Wuillemier, a distinguished engineer, became his collaborator.

The railway is double-tracked about two miles in length and extends from the heart of the city to the gates of the exhibition. The way is narrow gage, one meter in width. The generating plant is inside the exhibition grounds, and comprises a 100-h. p. gas engine, belted to a six-pole 500-volt Thury dynamo. The rolling stock comprises 12 motor cars, each weighing, with its complement of 42 passengers, and its 20 h. p. double reduction Thury motor, something like nine tons. The speed is regulated by switching resistances into and out of circuit. Carbon brushes are used, the wear of which, it is said, amounts to 0.06 mm. per run of 100 km. During the month of August

perhaps, its most practical exposition in the Lineff device. (See description of Lineff system in Lieut. F. Jarvis Patten's article on "Electric Railway Conduit Systems," STREET RAILWAY GAZETTE, July 7, 1894.) Compared with the simplicity of Mr. Lineff's plan, that of MM. Claret and Wuillemier appears extraordinarily complicated; but it has managed to withstand the test of actual running.

The sectional conductor consists of reversed rails 2.8 meters long and 3 meters apart; so that the cars, which are 7.6 meters long, almost cover two sections and an intervening gap. The sections are insulated by wood-paving blocks run in bitumen. The main cable, which has a section area of 0.135 square inch, and is armored and lead-cov-

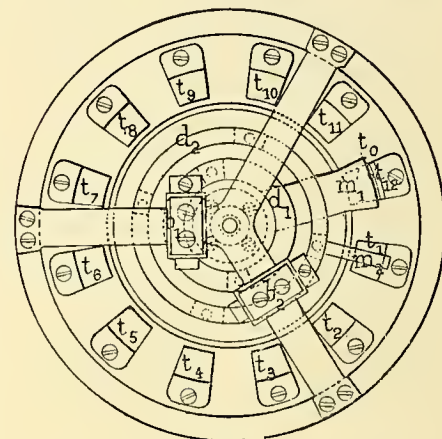


Fig. 2.

ered, is run under the pavement, the feeding wires from the distributors being led to the sectional conductor inside a wooden trough impregnated with a preservative and tarred. The return is by the rails.

The distributors, which are laid in pits 100 meters apart, are as follows: In each distributor there is a spindle 'h' (see Fig. 1) carrying a ratchet wheel, 'r', upon which rests an insulating base, 'd', which supports two copper rings, 'd1' and 'd2', insulated from each other. Ring 'd1' carries the horizontal arm 'm1' (Fig. 2), and ring 'd2' the arm 'm2'; so that as 'h' revolves these two arms come in contact with the contact pieces 't1', 't2', etc. The arm 'm1' is somewhat wider than the interval between two contact pieces, 'm2' being narrower than this interval. In Figs. 3 and 4 we see that the arm 'm2' presses on the upper edge of the contact pieces, while 'm1' presses only on the lower part. Each contact piece is,

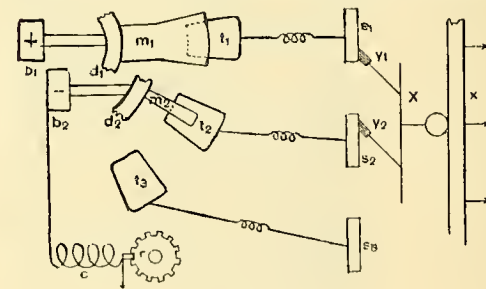
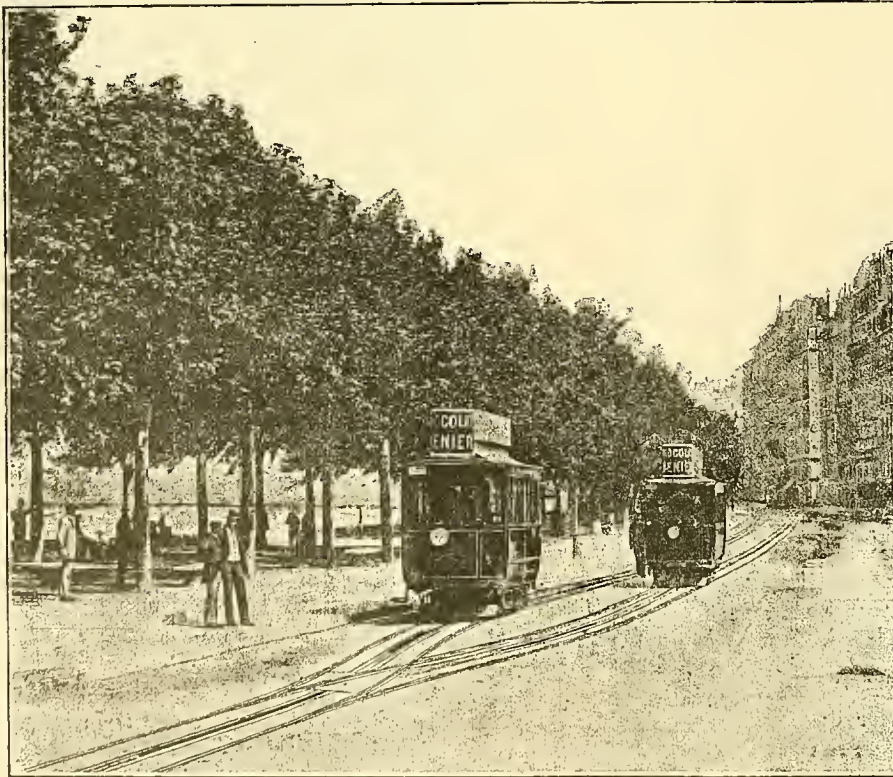


Fig. 5.

however, all in one part, except in one instance, where the two portions are insulated from each other, as shown in Fig. 4. From each of the contact pieces wires run to the corresponding sectional conductor. The rings 'd1' and 'd2' are placed in connection with the terminals 'b1' and 'b2' respectively (Fig. 1) by means of brushes, 'b1' being in connection with the main conductor, and 'b2' with one end of the coil of the electromagnet 'c' (Fig. 1), the other end of which is to earth. The rotation of the arms 'm1' and 'm2' is effected by means of a weight (or electric motor) 'p', which communicates motion by the bevel wheels 'e' and 'e1' (Fig. 1) to the spindle 'h', the ratchet wheel 'r' of which cannot rotate, however, until a stud, 'q', on the armature of the electromagnet 'c' releases it.

By aid of the diagrammatic sketch (Fig. 5) we



CLARET AND WUILLEMIER ELECTRIC RAILWAY IN LYONS, FRANCE.

who describes the road in *L'Electricien*, of Paris, writes that, if one judge from the excellent appearance of the cars, from the popularity of the road, from the regularity of the service and its "elasticity," the railway is a veritable success.

Claret, one of the inventors, installed the overhead trolley line from Clermont to Royat, which was, we believe, the first electric road in France. He soon came to the conclusion, however, that the

line was used by 124,000 passengers; 15,000 being the largest number carried as yet in one day.

The Claret-Wuillemier system is simply a special application of the principle of bringing successively into contact with the "live" conductor sections of an insulated conductor laid between the rails on a level with the roadway, a principle which was first thought out by Professors Ayrtton and Perry, and which met with what was, per-



CARS FOR TROLLEY PARTIES.

The West End Street Railway Company, of Boston, has just constructed two elegantly appointed special cars which are to be placed at the disposal of private parties. The cars were intro-

duced as the result of the growing popularity of trolley parties last summer, when special cars were chartered for their exclusive use. The two parlor cars are 20 feet long by 7 feet 4 inches in width, and the bodies were made by J. M. Jones' Sons, of West Troy, N. Y. They are equipped at each end with sliding doors similar to those used in the elevated railway coaches. When one of each pair of doors is open, the other door is opened also. The car bodies are mounted on West End trucks,

may now possibly be able to see what happens as a given car, X, passes along. As shown, the rear collector  $y_1$  of the car is just leaving the sectional conductor  $s_1$ , and the front brush  $y_2$  has just come into contact with the section  $s_2$ . The current from the dynamo reaches the distributor by the terminal  $b_1$ , passes to the copper ring  $d_1$ , along the arm  $m_1$ , to the contact-piece  $t_1$ , thence to the sectional conductor  $s_1$ , along the collector  $y_1$ , to the car-motor, and thence by the wheels to the rails  $x$  and back to the dynamo. But a portion of the current finds its way back *via* collector  $y_2$ , sectional rail  $s_2$ , contact piece  $t_2$ , arm  $m_2$ , ring  $d_2$ , terminal  $b_2$ , and electromagnet  $c$ . This current causes the electromagnet to attract its armature and to release the ratchet wheel  $r$ , so that the weight  $p$  immediately comes into action, and revolves by the ratchet wheel amount of one tooth, switching  $m_1$  on to  $t_2$ , and  $m_2$  on to  $t_3$ , when the whole of the motor current is collected by  $y_2$ ; and the electromagnet, being cut out of circuit until  $y_2$  comes into contact with  $s_3$ , ceases to attract its armature and allows the stop  $q$  to arrest the motion of the ratchet wheel  $r$ , and so on, until the car has passed to the last sectional rail connected to the particular distributor. To this last section is also joined up the first contact piece of the next distributor, which is thus enabled to take up the running.

On looking at Fig. 4 it will be observed that the lower part of the last contact piece, on which presses the arm  $m_1$  conveying the main current, is insulated from the rest, so that, when the car leaves the last sectional rail connected to the distributor under consideration, it leaves the distributor insulated, and the car has to take all its current from



CAR TO BE USED IN BOSTON FOR TROLLEY PARTIES.

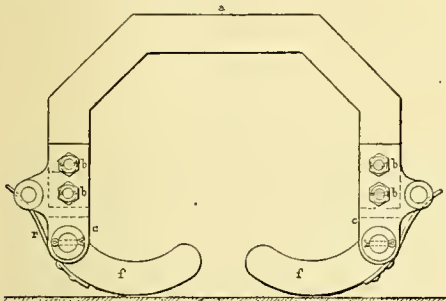


Fig. 6.

the next distributor, and, no current finding its way home *via* the electromagnet  $c$ , the distributor remains at rest until the front collectors of the next car come on to sectional conductor  $s_1$  when the cycle of operations begins once more.

A distributor of this kind, it is obvious, is only applicable to a double-track line; that is, to one on which the cars are always traveling in the same direction along the same individual track. It will also be obvious that the use of distributors results in a perfect block-system, the cars being perforce kept apart by at least the length of the portion of the sectional conductor served by one distributor. To apply the distributor to a single-track line, with cars running in either direction, several additional complications are needed.

In Fig. 6 we have a side view of the collectors used at Lyons, each of which is composed of three pairs of shoes, each car having four sets altogether, two being at the rear and two at the front of the car. The part  $a$  is a permanent magnet,  $b$  being cast iron pole-shoes capable of revolving round  $x$ ,  $rr$  being springs which lift the collecting shoes off the roadway when they are not pulled down by the attraction of the iron sectional conductor.

Reading, Pa.—President John A. Rigg has purchased for the Reading Traction Company the Schweitzer farm, containing 145 acres, a mile below the city. It is the purpose to lay out a picnic grove, to erect a pavilion holding 5,000 people, to construct one of the largest hotels in this section and to lay out baseball, football and cricket grounds and a half-mile racetrack. The Traction company will construct a double track electric railway to this park,

panels in the ceilings are handsomely frescoed, and light is given by a dozen incandescent lamps arranged in handsome fixtures. Several ornamental kerosene lamps are provided so that the car may not be without illumination should there be any break in the electric circuit. The platforms are also well lighted by incandescent globes. Ten seats are provided on each side of the car. They are easy chairs with arm rests and are handsomely upholstered in blue embossed plush. The floor is

covered by a handsome carpet. It has already been said that the several parts of the cars were provided by different companies, but all the fitting of the electrical apparatus was done in the well-equipped shops of the West End company.



INTERIOR OF THE CAR TO BE USED IN BOSTON FOR TROLLEY PARTIES.

which were constructed by the Laconia Car Company, of Laconia, N. H. Each car is equipped with two motors, of 25 H. P. each. One equipment was furnished by the Westinghouse Electric & Manufacturing Company and the other by the General Electric Company. The controlling apparatus on

Last Monday afternoon the cars made an excursion



sion to the Chestnut Hill Reservoir by the Back Bay district and thence back through Cambridge to the center of the city. The excursion party consisted of the president of the West End company, the directors and managers of the road and representatives of the press. The excursion was thoroughly enjoyed by all those who participated in it. The new cars attracted a great deal of attention. In all probability the introduction of the cars will prove extremely profitable to the company. They will be available for excursions to any points of interest on the West End road or for private parties going to theatres, weddings, etc. A large number of applications have already been made for the use of the cars.

#### HUNT COAL HANDLING MACHINERY AT THE BROOKLYN HEIGHTS RAILROAD COMPANY'S STATION.

The power station of the Brooklyn Heights Railroad Company is located between Kent avenue and the East River, Brooklyn, N. Y. On account of the great value of the land on which it was

at right angles to each other. The Hunt Company's solution of the problem has been most satisfactory to the Brooklyn Heights Railroad Company, and has elicited much praise from railroad engineers and others.

The unloading from the vessel is accomplished by means of an elevator and steam shovel, fitted with a double cylinder rapid-hoisting engine arranged as shown in the illustration. The elevator booms projecting over the hatch of the vessel are pivoted on a vertical axis, so that they can be swung horizontally over the wharf leaving the dock front unobstructed when not in use.

#### MEETING OF UNION STREET RAILWAY EMPLOYEES.

The third annual convention of the Amalgamated Association of Street Railway Employees of America was held in Milwaukee this week. The organization now has about 35,000 members, with divisions in 41 different cities. Ten new divisions were formed last year. President Mahon delivered his annual address, the first part of which is as fol-

I would recommend that in connection with our association an insurance class be established on the plan of the Locomotive Firemen, policy payable in case of death, total disability, loss of eye, right hand or foot. Finding our association can carry insurance cheaper than other associations in America, I urge you to give this your careful attention.

#### RIGHT ENGINE IN THE RIGHT PLACE.

There is a right and a wrong place, if not for all, at least for several kinds of engines, says John E. Sweet, in *Cassier's Magazine*. The claims against the high speed are that it is not economical and terribly prone to smash-ups—claims pretty well founded; but, in spite of that, it has built itself up, and was the means of building up the largest half of the electric light business. As to its wasteful use of steam, that has been overestimated and is fast being improved; and as to the smash-ups, better separators and safety devices, and the destructive flywheel accidents of the last two years on slow-speed engines, make it doubtful, when counting delays, whether the cost of breakdowns in the high-speed engines equals that of the slow. With the high-speed engine and Mr. Porter came better work, and much better yet is needed, and will be demanded, for there is a place for the high-speed simple engine that nothing else can fill. There is, too, a place for the Corliss engine and a place for the compound, though already many of them have been put in the wrong place; there is a place, and as yet a good deal of unoccupied space, for a vertical direct-connected machine, and places for the triple and, possibly, quadruple expansion engines. There is an opening for better designs, a field for better workmanship, especially in castings; and as to the opportunity for improvement in steam engineering, as it has been so it will continue to be.

#### LAWYERS' FEES.

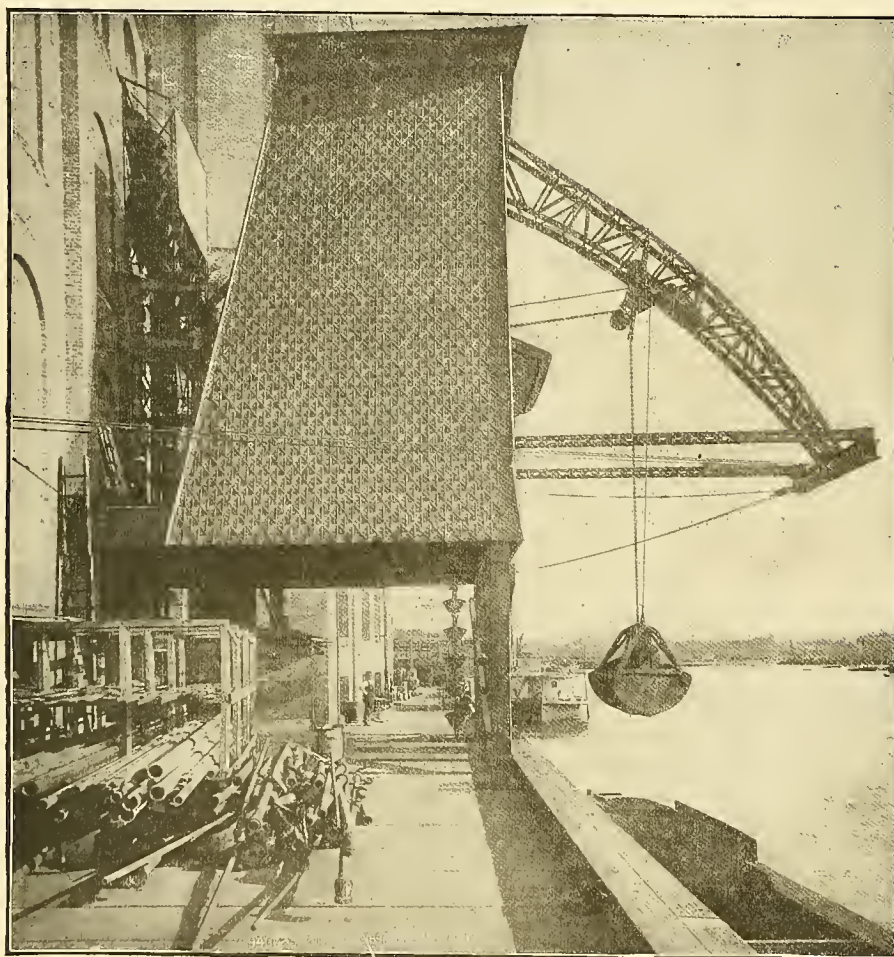
The *Evening Post*, of Chicago, prints the following interesting comment on a decision recently handed down by Judge Stein, of Chicago, in a suit against a street railway company:

It is hoped that Judge Stein carefully considered all the features of the case before he returned his decision in the suit of Ackley vs. The North Chicago Street Railway Company. The judgment seems to us to be opposed to the best traditions of the bar and not in accordance with good public policy.

Three years ago a woman was thrown from a cable car and seriously injured. She decided to sue the company, and hired a lawyer named Ackley. In beginning suit she assigned, by written contract, one-half of all rights of action she might have and one-half of any damages that might be obtained. While the trial was pending the company effected a private settlement with the woman by paying her \$3,750. Thereupon Ackley commenced suit against the company for half the amount, and Judge Stein gave judgment in his favor.

The railway is not to be pitied, for it can lose the money without any serious annoyance, and, in any case, the methods of street railway companies in sending discreditable agents to cajole or intimidate victims of accidents into accepting smaller damages than they are entitled to, place them beyond the pale of consideration. But Judge Stein puts an important weapon into the hands of the jockleg lawyers who are conspicuous in actions for personal injuries. He strengthens a custom that is traditionally odious to clean lawyers. By this decision ignorant people who have cause for action are bound hand and foot to a class of legal extortionists to whose practices the *Evening Post* has frequently called attention. The mangled victim of railway negligence has no appeal from the greed of the lawyer or the greed of the corporation. The court takes no cognizance of him, but decides that his cause of action is a matter of barter and sale, and any one who obtains it by hook or crook is entitled to the same indemnity that the sufferer should obtain.

To say the least this is a curious doctrine to be disseminated by a judge of well known learning. Bating the establishment of the principle that in making contracts for services in such cases lawyers should be compelled expressly to set forth the amount of their fees, it was hoped that at least judicial sanction would be withheld from the present disreputable custom. Is there, Judge Stein, such a thing as barratry or champerty of which the bench of Cook County takes cognizance?



HUNT COAL HANDLING MACHINERY IN BROOKLYN HEIGHTS RAILROAD STATION.

erected the plant is an unusually concentrated one. Specially designed machinery for hoisting and conveying the coal was necessary, and was furnished by the C. W. Hunt Company, of New York City.

The conditions which confronted the latter company in the equipment of the station were as follows: The line of the boilers was parallel to that of the wharf, the coal being received in vessels. In case of the failure of this source of supply, means were to be provided to receive it in wagons from local coal dealers. The building having been erected before the installation of the machinery, it was necessary to adapt the machinery to existing conditions.

Another complication was that the conveyor could not be carried vertically downward at the end of the storage bin, as there was not room for it to pass through. These conditions required that besides being lifted over 100 feet vertically, the coal must be carried horizontally in two directions

lows, the remainder being an indorsement of a communistic scheme for the government ownership of all means of production and distribution:

In the past year we have had five strikes, of which I will submit a report later on, but here wish to call your attention to the necessity of placing some restrictions on the locals to prevent hasty strikes. The haphazard way of going on strikes, whether prepared for them or not, whether the conditions of trade are good or bad, and without having a committee of good, level-headed men wait on the companies, must be stopped. And I recommend that the constitution be amended in such a way that no local can go on strike until the national officers have been called in and arbitration offered. In this way many disastrous strikes can be avoided.

In the past year wages have been well maintained. During the winter several reductions were made, but in most cases it has been recovered, while in the cities of Milwaukee and Detroit large reductions, which would amount to something like \$100,000 in the year, were successfully resisted, and in all I feel we have accomplished as much as could be expected under the conditions.



QUESTIONS AND ANSWERS.

HYSTERESIS.

Will you please explain to me what is meant by "hysteresis"? I know the definition of the word, but it does not convey to my mind any very clear idea of the phenomenon. CHARLES H. DANBURY, Conn.

ANSWER.

The definition, "The lagging of a magnetic effect behind its cause," would seem to give a pretty clear idea of the phenomenon, but perhaps a mental picture will make it clearer. Let us suppose that a bar of iron is made up of an infinite number of molecular magnetic needles pointing in all conceivable directions because of their mutual attractions. They would then exactly neutralize each other, and the bar would appear to be unmagnetized. It would have neither north pole nor south pole. Supposing all of these needles to be pivoted upon points offering some slight friction. If now this bar be surrounded by a coil in which a current is passed it will tend to arrange these molecular compass needles parallel with each other, and with their N. and S. poles in the same direction, and the iron will therefore assume polarity, but it will require the expenditure of some force to move the needles against the friction, and they will not turn quite as far as they would with the same magnetizing current were the bearings of the needles frictionless. Then, again, supposing that after the bar has been magnetized by a given current, the latter be reduced: the needles, by reason of this friction, will not return toward their original position quite so far as their mutual attractions would tend to bring them. In other words, magnetizations caused by gradually or periodically increasing currents are always less than the magnetizations resulting from the same currents applied in a decreasing order.

In soft annealed iron this molecular friction is very small, hence the hysteresis in such iron is small. In iron that has been hardened in any way as by drawing, hammering, by the addition of carbon (cast iron), chilling, etc., the friction is greater, and in the case of highly tempered steel it is very great—so great in fact that it requires a comparatively large magnetizing force to turn the needles at all, but when they are once turned they remain in their new positions and we have permanent magnets. The hysteresis in this latter case would be enormous.

From the above it will be seen that hysteresis means lost energy. It only becomes of importance, however, where the magnetizing forces vary periodically in strength as in alternating currents. In magnetic transformers, such as are used for transforming alternating currents from lower to higher potentials, and *vice versa*, the phenomenon of hysteresis assumes the greatest importance, and every endeavor is made to reduce it to the lowest possible figure.

ELECTRIC MOTORS: THEIR CONSTRUCTION, OPERATION AND MAINTENANCE.

The series of articles by Mr. Nelson W. Perry, which appeared in the STREET RAILWAY GAZETTE during the last eight months, and which attracted no little attention from practical street railway men, has been thoroughly revised and put into book form at the request of many readers, and the book will be ready in a couple of weeks. This is the first work of the kind, and its contents will be found particularly valuable to those who have but a limited knowledge of the construction, operation and maintenance of electric railway motors, as it treats the subject in an elementary manner, and is free from the usual technicalities and intricate terms employed by most writers. Mr. Perry has handled his subject in a way that can be easily comprehended and understood, and it is believed the employees of the various electric railway companies from the manager to the motormen will derive much profit from its pages. Original and simple illustrations are used to represent the principles of construction of motors and a complete index affords a ready reference to the various topics. The book contains upward of 350 pages, and is sub-

stantially bound in cloth, and can be conveniently carried in the pocket. The price of the book is \$1, postage prepaid.

THE ELECTRIC BRAKE IN PRACTICE.\*

BY ELMER A. SPERRY.

PART III.

(Concluded.)

That the important positions and trying circumstances under which the motorman often labors are appreciated, may be seen by the space devoted to it in the daily press. An editorial in an evening paper reads thus:

"One trembles to think what consequences may follow if a motorman gets rattled or has a fainting fit when trying to wind up his hand brake in time. Muscles grow weary and relax at a critical time. Even when a man is in fine working condition, the strain upon him is severe when compelled to handle the grip lever or current controller and hand brake simultaneously."

As to the arrangement for application and control of the brake by the motorman, about a year ago the following appeared from the pen of the author:

At the time the above was written, equipments controlled as therein set forth, namely, by the use of a *single controlling handle for everything*, had been in operation for upward of a year. The methods employed for accomplishing this have been varied, but the form most in use at the present time is that shown in Fig. 9, where the resistance contacts are employed in a twofold manner; the controller handle is made to operate back and forth over the same contacts for controlling both the application of the current to the motor and braking the car. A self-correcting and interlocking device is also provided, shown at A, A, Fig. 10; so if the motorman does not throw the handle clear over, the transformation is completed automatically before the movement of the lever can reach the operating contacts.

At one point where a number of equipments was started last summer a newspaper correspondent described the operation of the brake as follows:

"The connecting beam was taken from the trolley wire several times and the car brought to a sudden stop with the electric brake alone, within three-quarters of a car length. And it was not a sharp, jerky stop, but something as if the car had run into a big feather tick."

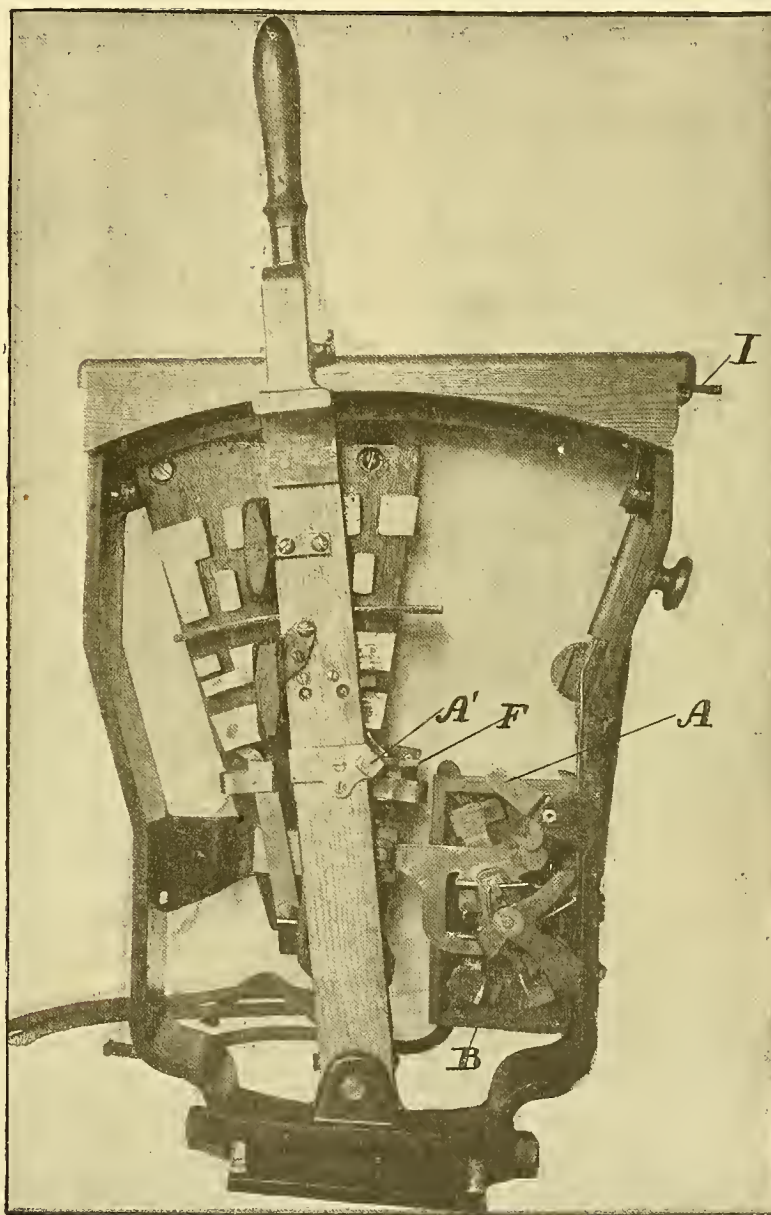


FIG. 10.

"Considering the inexperience of the operator and the responsibility which at times wellnigh overwhelms him, I think that, as engineers, we should be willing to set a very high mark to be attained in the ideal brake for electric street railway service, namely: the use of but a *single controlling handle for everything*: starting, accelerating, retarding and braking the trailer, or trailers and all. Let the motorman have nothing to think of except one handle, and two-thirds of the accidents now occurring will be prevented. Let this handle require no more exertion in its operation than the present controlling handle. Let the motorman fulfill his function with as little physical exertion as possible; he will then have a greater reserve for mental application when necessary. A motorman required to exert an enormous amount of brute force, constantly grinding at the brake, has but little life left to apply in case of emergency. I agree with a prominent writer on this subject, where he says that a multiplicity of handles is fatal in time of emergency."

\* Read before the American Institute of Electrical Engineers, Sept. 19, 1894.

The smoothness of even a sudden stop by the electric brake is quite aptly described by this droll statement. It seems as though the car was running into an air cushion.

It will thus be seen that the brake is automatic and does its work without any special act or even the knowledge of the motorman. He simply "works a single handle" back and forth, and electricity "does the rest." Suppose the motorman wishes to stop his car, he turns off the current by simply swinging the lever over to the right. This operation is made to automatically convert the motor into a special dynamo for generating currents at very low speeds, and also simultaneously to cut off all connection with the trolley current. The brakes are then applied by simply swinging the handle back over the path it has just trav-



ersed; the farther it is swung to the left the stronger the brakes are applied. The act of releasing or letting off the brakes again automatically re-establishes connection with the trolley and reconverts the dynamo into a motor. Fig. 11 shows the switches used in part for the conversion of the motor, and also the finger *F* mounted upon the lever forming a part of the alternate stroke operating device. The trolley brake switch *B* is shown open in Fig. 10, and closed, with dimensions, in Fig. 12. The same rheostat and contacts are applied to control the motor while running the car, and also to control the slight amount of current generated by the transformed dynamo which is sufficient to brake the train.

The motorman cannot turn on the current before the brakes have been released, nor can he apply the brakes before the current has been turned off. This is a result of construction, and constitutes a feature of merit in the new electric brake, effecting an economy in current and a saving in wear and tear. Freeing the conductor of all care in this connection, and leaving the braking of the train—including trailer or trailers and all—solely in the hands of the motorman by placing at his command a power with which he may with the utmost ease accomplish his task, constitutes an important advance in the art of control of electric railway equipment.

It has been found that the electric brake is practically incapable of abuse by any motorman, an

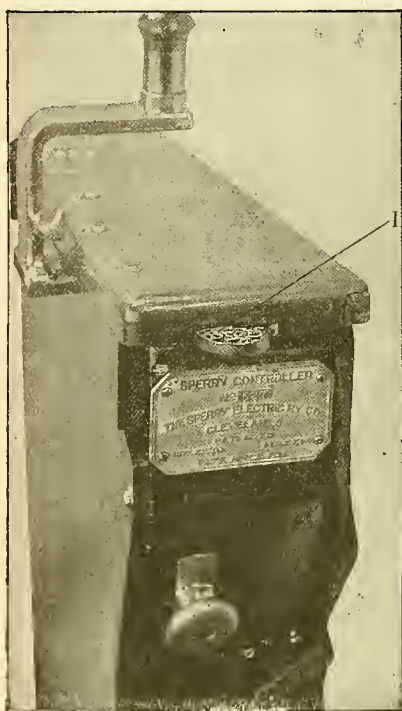


Fig. 9.

advantage which never before has been attained in any power brake, due to the fact above named—that no amount of over-application can cause flattening of the wheels, or any harm whatever to any part of the equipment through their locking and skidding.

The application of the brake, its regulation and also the running of the car, all by a single operating handle, are a result that has only been accomplished by the closest application. It has involved much pioneer work, and been rendered possible through the use of new mechanical movements original with the writer. The principal moving parts are simple and durable, being only two in number. The arrangement may be easily seen in the controller and parts exhibited, as well as in Figs. 10, 11 and 12. The various portions of the controller have been subjected to the severest tests possible, one test made in 1893 consisting in 518,700 consecutive brake applications without appreciable wear, the parts being in regular service at the present time. An indicator at the right side of the controller at the top (see 1. Figs. 9 and 10) shows when the controller is in condition for brake, or is being so used.

Operating the brake in this manner, it will at once be seen that the system is one of the utmost certainty of operation, surer even than the hand brake, air or other power brake, from the fact that every time the car runs, the motor, which is depended on for the braking action, receives a test, and its fitness and capacity for the next brake application are constantly being demonstrated. On the other hand, the motorman never knows whether his hand brake is sure to operate when called upon for the next application. An accident came under the observation of the writer on Case avenue hill, in Cleveland. Here the last hand brake application was successful in every way,

but before the brake was called into action again, a nut dropped off from a brake rod upon the truck, rendering the brake useless. The motorman continued to wind on his brake staff, and before he realized what the trouble was, his car was going at a tremendous speed into a short curve at the foot of the hill. There were a number of casualties and also six demands for damages as a result. With the air or other power brake, this liability to failure is increased in direct proportion to the complexity and number of parts.

The advantages found to result from the prac-

- 13. The smoothness of its operation.
- 14. The fact that its use cannot cause flat wheels.

**AN ENGLISH COMMENT ON THE SPERRY ELECTRIC BRAKE.**

Much interesting and useful information in regard to car and train brakes in general, and electric brakes in particular, is to be derived from the



FIG. 11.

tical use of the electric brake as compared with former brake systems: its qualities as an accident preventer, as well as its general commercial value, may be recapitulated as follows:

- 1. The certainty of its operation.
- 2. The enormous power at instant command and under perfect control.
- 3. The absence of all power absorption at moneyed cost from the central station.
- 4. Its high efficiency, being far superior to compressed air; amply proved in numberless instances where electricity has replaced air. (The air requires a direct application of energy, amounting to an immense aggregate power-absorption during the day from the central station; the working parts of the air machinery are attached to the car axes and require a large quantity of energy, not only while compressing, but at other times as well.)
- 5. Its extreme simplicity.
- 6. Observed saving in wheels, two to three-fold.
- 7. Entire saving in brakeshoes.

paper by Mr. E. A. Sperry, an abstract of which we publish this week, says the *London Electrician*. Accurate data respecting the best practice in the design of brake blocks and of brake levers are by no means as plentiful as might be desired, and Mr. Sperry's researches form a material addition to our stock of knowledge on the subject. Engineers, as a rule, have had to design brakes on the rough-and-ready principle of providing a large allowance for unknown coefficients wherewith to meet unforeseen contingencies. Hitherto the chief difficulty has laid in the limited amount of retarding force which has been available before the wheels commence to skid, a difficulty which, as far as purely mechanical remedies are concerned, can only be surmounted by putting brakes on a sufficiently large number of wheels. The moment

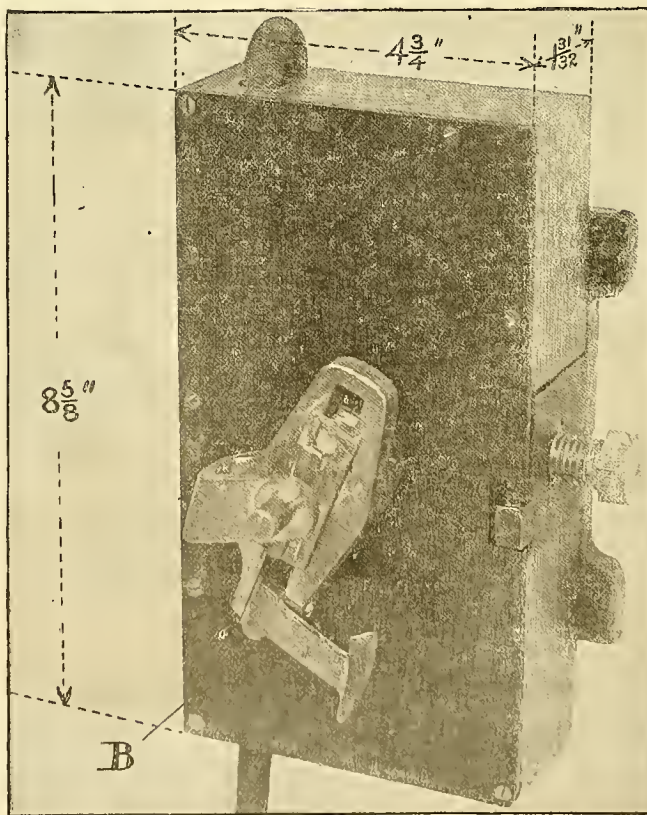


FIG. 12.

- 8. Lubrication of brake face; very little wear of either wheel or magnet.
- 9. Absolute silence of operation and release. (No hissing to frighten horses on streets.)
- 10. The low E. M. F. at which it operates.
- 11. The ease of its application and control.
- 12. Conserving strength, and prolonging the usefulness and life of the motormen.

skidding commences the rail friction diminishes, and the train slides on against a reduced retarding force. A bad result is flats on the tire. Mr. Sperry shows that, with the electric brake, the consequences of skidding can be avoided, and even skidding itself need take place only momentarily. For the force of the



electric brake depends on the fact of the wheel rotating, and is proportional to the speed of rotation. The moment there is any tendency to skid, the brake relaxes its grip and allows the wheel to roll. Of course, what really happens is that the brake adjusts its force so as always to keep the wheel rolling. The effect might even be enhanced, and the retarding force of the brake be considerably raised above the value of the normal adhesion, if the rail friction itself were magnetically in-

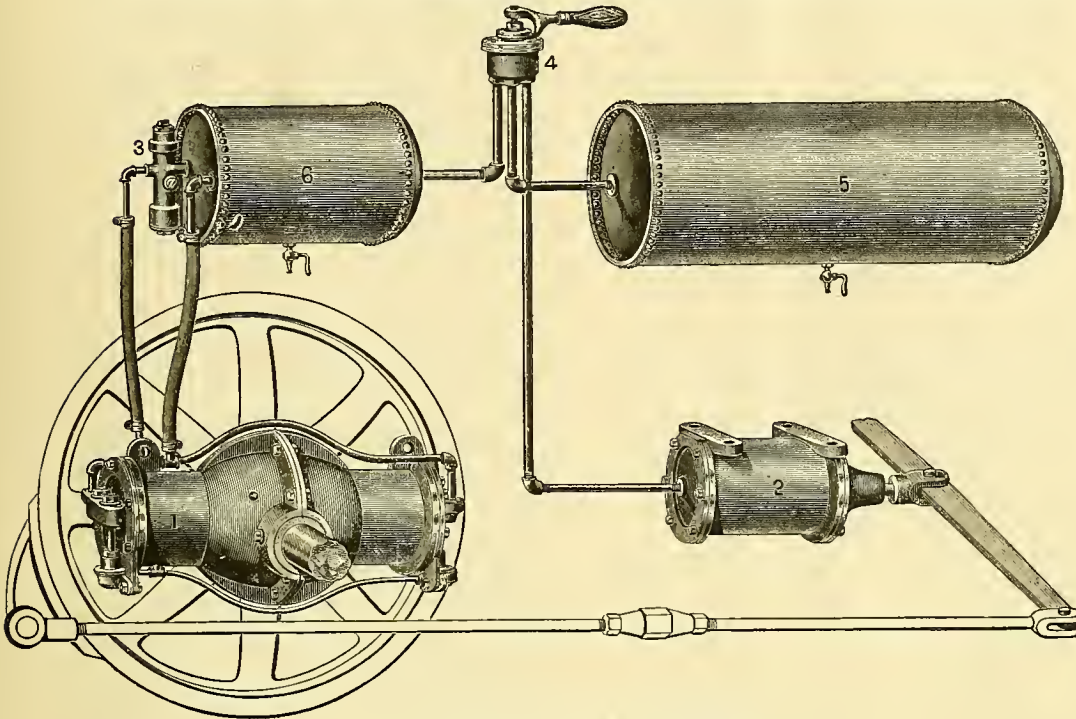
retardation under these conditions is no less than 41.5 feet per second: ten times greater than is usual in practice, and exceeding one-third of the value of *g*. It could not fail to give the passengers a very bad jolt indeed. Nor is it any more comforting to the passenger to be told that the intensity of application of the brake force "should be greatest when the speed is greatest, and decrease as the speed drops off." This, again, is the very way to produce a nasty jolt; and, though it may

of General Manager Wessels, is "neither a scientific toy nor an experiment; it's intensely practical." The company is composed of some of the wealthiest men in financial and street-railway circles. It has some of the finest machinery and tools in this country, and its plant reflects everything good in modern practice.

The company's affairs are managed by Mr. E. J. Wessels, who needs no introduction to street-railway men. The enviable record he has made while handling the Short Electric Railway Company's business is known to the profession. Mr. Wessels for a long time was laid aside by a severe attack of illness which nearly cost his life. He went abroad, and returned six months ago restored to health. Since then he has been pushing the Genett company's business with remarkable vigor and success.

The Genett brake is illustrated herewith, and the pump is shown separately. By means of this brake it has become possible to stop the heaviest cars, no matter how great their weight or speed, in remarkably short time.

In view of the alarming increase of fatal accidents caused by insufficient braking facilities, it is not surprising that the company reports a large number of brakes sold during the past month. It received a repeat order from the Buffalo (N. Y.) Railway Company for 25 brakes, and is engaged in putting 50 brakes on the Atlantic Avenue road, Brooklyn. Six equipments are in operation on the Lynn & Boston road, and 120 on the Third Avenue road, New York; and Genett brakes are in use in Easton, Pa.; Newport, R. I.; Chicago, Ill., etc., as well as in Rio Janeiro, Brazil, and Sydney, New South Wales. Two brakes will be in operation in Atlanta on cars of the Consolidated road.



GENETT AIR BRAKE EQUIPMENT.

creased. Another valuable feature in Mr. Sperry's system of electric brakes is the operation of all the machinery by means of one handle. The act of throwing off the trolley current applies the brakes, and the act of releasing the brakes applies the trolley. This cannot fail to insure efficient service, by minimizing the number of duties of the motorman.

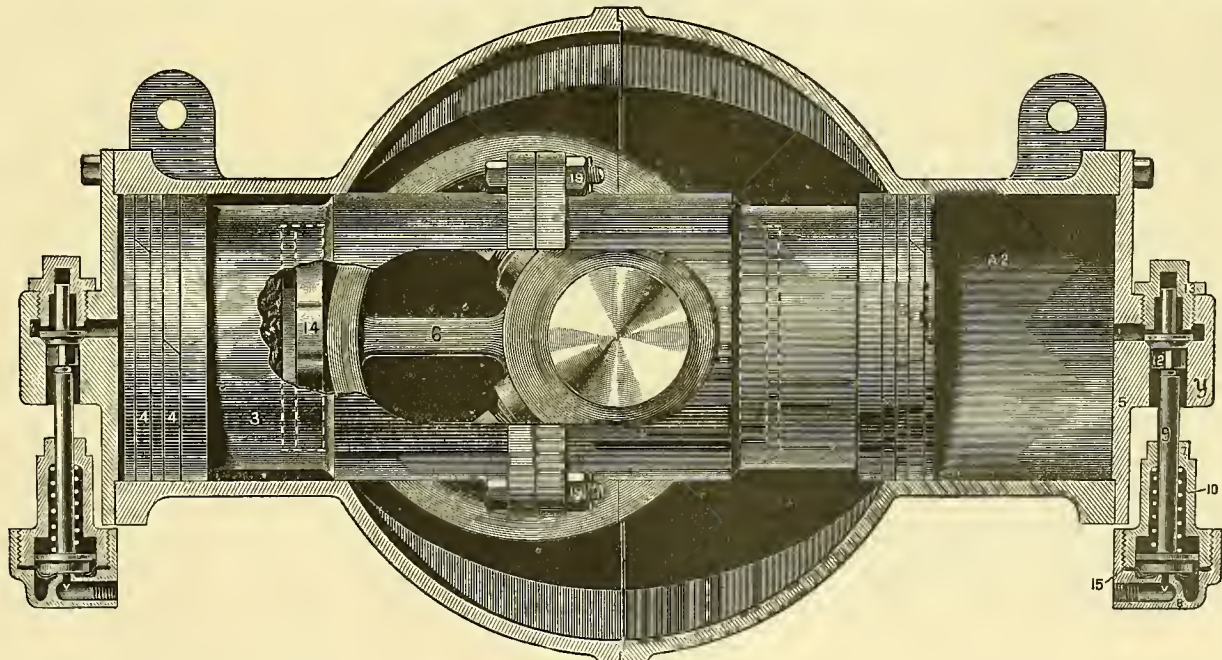
be quite correct from the point of view of the man who is on the verge of being knocked down by the car, it is likely to raise more than a mild protest from the passengers.

GENETT AIR-BRAKE.

The Genett Air-Brake Company were pioneers in equipping surface cars with air-brakes. Their air-

RAPID TRANSIT IN GREAT CITIES.

At the last meeting of the New York Board of Rapid Transit Commissioners William B. Parsons, the Chief Engineer, submitted a report of his visit to Europe, and of his examinations of the different systems of underground, overhead and surface transportation in operation in the principal cities. His report covered not only the technical details of construction, equipment and mechanical operation, but also the statistics of cost of construction, re-



GENETT AIR PUMP.

But Mr. Sperry, although careful of the nerves of the motorman and of the lives of pedestrians who may stroll onto the track, appears to be less anxious to please the passengers inside the car. "It may not be known," he says, "that under proper and standard conditions any car or train may be brought from a speed of 10 miles an hour to absolute rest inside of 10 feet." We hope we may never be inside any car or train at the moment such an extraordinary feat is attempted. The

brake was put in operation a couple of years ago, and excellent results were obtained. Originally the company turned out an open-style pump. This worked very well in daily operation, but suffered more or less from the grit and dust of the street. The company subsequently perfected an inclosed pump, and now confine their energies exclusively to the manufacture of this inclosed pump, which is "water-proof."

The Genett Company's brake, to quote the words

receipts and expenses, and the results obtained in meeting the demands of heavy traffic, in rapidity of transit, comfort and convenience and cheapness of transportation.

Of the cities treated of in this report, London is the only one which has anything like a comprehensive system of internal rapid transit. In addition to the 102.9 miles of underground roads already in operation, three others are proposed. These are the Central London, Waterloo & Baker



Street, Great Northern & City, and Hempstead & Charing Cross. All of these will be underground lines.

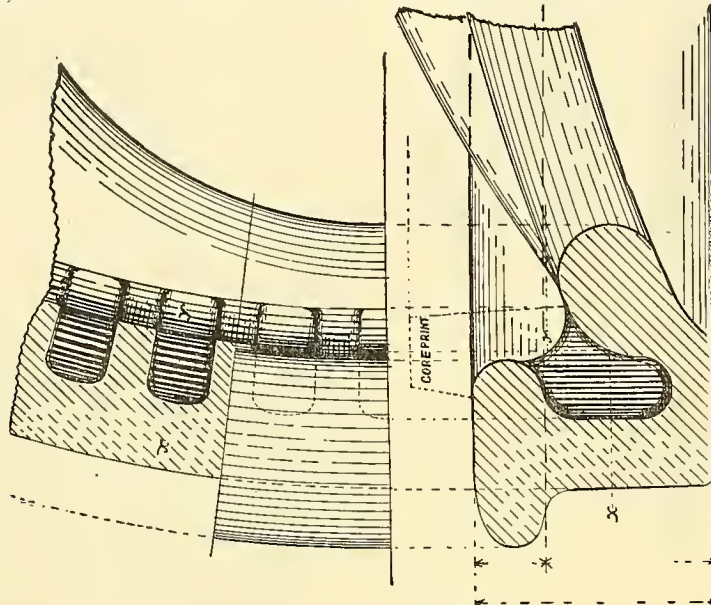
In Glasgow there is one underground road 2.365 miles in length in operation, and another being built 6.4 miles long, directly through the city, connecting with the railroads upon either side.

Mr. Parsons said that the conclusions arrived at from his investigation, both from the study of the actual works and from personal interviews with their designers, are:

- First—That an underground railway operated by steam, even with the most approved system of mechanical ventilation, would be intolerable to the people of the city of New York.
- Second—That a railway with a steady, frequent service can be operated successfully and economically by electricity.
- Third—That an underground railway operated by electricity has a comfortable atmosphere, and that it can be arranged so as to avoid great changes in temperature.
- Fourth—The advice and experience of foreign

**A NEW TYPE OF CAR WHEEL.**

A new style of car wheel has been brought out by A. Whitney & Sons, of Philadelphia, made under a patent granted to Mr. L. R. Faught, their mechanical engineer. As will be seen by the illustration the peculiarity of the wheel consists in the rim being divided circumferentially into a series of cavities or cells, located between the inner and outer diameter of the rim of the wheel. The cells diminish the heavy body of metal usually massed



NEW WHINNEY CAR WHEEL.

in the rim, reducing particularly the thickness of the part which forms the tread, but in such a manner as not to decrease its strength.

Several advantages are claimed for this form of wheel. It overcomes, it is asserted, the difficulties ordinarily attending the production of a deep, durable and uniform chill on the tread of heavy wheels intended for use under severe conditions of service. In casting a heavy wheel of ordinary form, the heat of the mass of metal in the rim, and

the metal being more dense and consequently harder in the chilled portion, from the well-known fact that smaller bodies of cast iron are denser than greater ones. The light section also reduces any tendency to blowholes and shrinkage cavities.

The cellular section equalizes the shrinkage strain on the wheel at time of casting, lessening, it is claimed, any tendency to fracture from heating caused by excessive or prolonged use of brakes.

The cellular form of rim does not necessarily alter the weight of wheel, but wheels of this form the manufacturers claim are stronger for the same weight than the ordinary form. It is held that the principle of a cellular tread is applicable to all forms of cast iron or cast steel wheels.

**NEW ENGLAND NOTES.**

(From Our Boston Correspondent.)

An abandoned street railroad track on Nantucket Island has just been sold. It is reported that the new owner is likely to equip the line with electricity.

The Quincy & Boston Electric Street Railroad Company is extending its tracks to the town of Milton, where it will make another connection with the West End Railroad of Boston. This company now operates 16 miles of track, and is building extensions in various directions.

The Directors of the Boston & Lynn Street Railroad Company for some time past have suspected that the company was being defrauded of considerable sums of money by certain employees, but, until recently, they have been unable to discover the fraud. A short time ago, however, the shrewd method by which the company was being cheated of a considerable sum of money was disclosed. The men implicated were two conductors and a clerk, who is also janitor in the general offices of the company. The latter had access to the tickets that had been cancelled on the cars. He made it a practice to collect these and sell small quantities of them to the two conductors. These latter used them again, and the scheme proved to be quite a profitable one. The conductors were arrested and tried for selling 8,000 tickets. Both men were convicted and sentenced to six months' imprisonment.

The feeder wires of the West End Railroad Company, of Boston, are being rapidly buried. The public demands the removal of aerial wires, and the deplorable accident by which two employees of the Boston Electric Light Company lost their lives a week ago has intensified the public clamor for the disappearance of the wires. By next January some 30 miles of railway feeder wires will be buried in Boston. The company has just contracted for this amount of cable with the Norwich Insulated Wire Company, and deliveries under the contract have already been made.

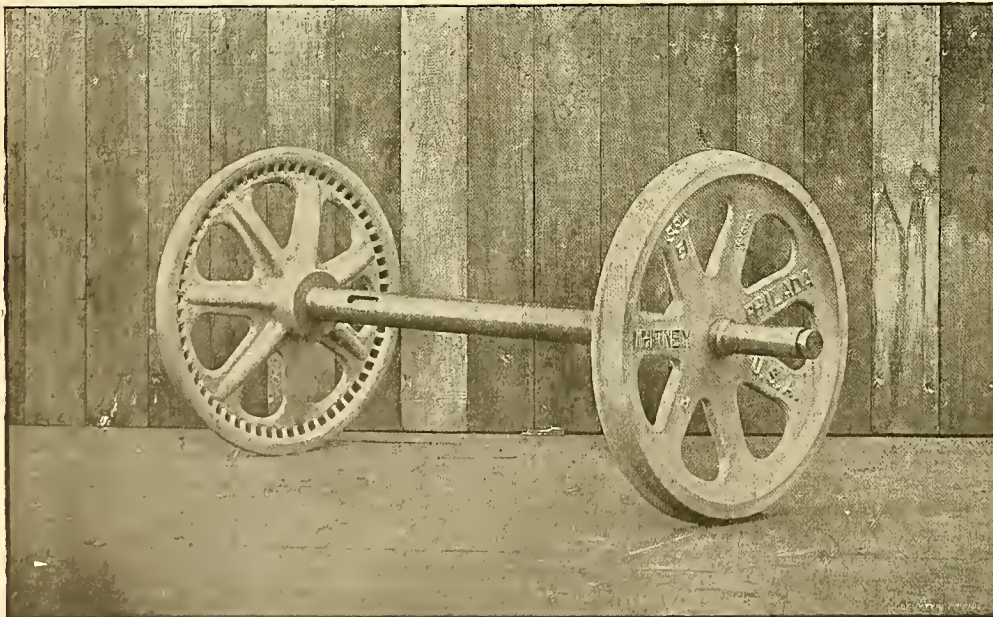
The interest in rapid transit in Boston has subsided for the present. It is by no means decided whether there will be an elevated road or a subway. The chances are about even. Many people predict that it will be years before either one is constructed. Meanwhile, the West End Street Railway Company is doing the best it can to accommodate the public.

**FINANCIAL DEPARTMENT.**

**Financial Notes.**

**People's Traction Earnings.**—Receipts of the People's Traction Company on Saturday and Sunday exceeded \$5,000 a day, being an increase over the corresponding days last year of upward of \$2,400 per day, says the Philadelphia *Stockholder*. The average receipts are, however, something less than \$5,000 per day, but they are steadily reaching that mark, and will probably touch and pass it. Gross receipts of \$5,000 a day would give the company an annual income of \$1,925,000, and it is estimated that a saving of at least 20 per cent. in operation will be made with the new power. For the year ended June 30, 1893, the cost of operating the road was \$740,032; 20 per cent., therefore, would reduce the cost of operating to \$582,026. Deducting this sum from gross earnings (\$1,825,000) the net would amount to \$1,242,974. Interest, taxes, rentals and dividends for the year ended June 30, 1893, were \$511,707, and on this basis a surplus of \$731,267 should be earned. Allowing an increase in interest, rentals, etc., of, say \$31,287, the balance applicable to dividends would be \$700,000, or 7 per cent. upon the entire capital stock, full-paid, or 14 per cent. upon the \$25-paid stock. That the company can earn this amount is hardly to be disputed.

**Pittsburgh and Birmingham Traction.**—The annual meeting of the stockholders of the Pittsburgh and Birmingham Traction Company was held Oct.



NEW WHITNEY CAR WHEEL.

engineers lean toward keeping the rail level as close to the surface as possible, and that excavating from the surface is cheaper and safer than tunneling; but

Fifth—If conditions demand, a deep tunnel can be constructed, for which the circular form is best.

Sixth—That an underground road can be so designed as to be attractive in appearance.

Seventh—That the work can be carried on through a busy street without endangering the houses, and without seriously impeding travel,

also that communicated through the arms of spokes, has a tendency to reduce the depth of the chill so that the necessary strength is obtained at the expense of durability of the tread, and this in spite of the fact that the heavy loads carried call for increased rather than diminished hardness on the tread, as well as greater strength.

The rim of wheel is more elastic under the strains and concussions of severe service, it is stated, and the comparatively light section of the rim insures



9. The report for the year ending July 1, 1894, shows that the line has been operated at a loss of \$7,820.15. The total expenses were \$365,809.78; receipts, \$357,989.63. President Duff said that the money made since July 1 will pay the interest on the bonds and almost wipe out the \$7,820.15 loss. John M. Duff, A. C. Wettengel, Harry Moore, E. H. Jennings, W. R. Ford, Henry J. Loiz, of Pittsburgh, and Clarence M. Clark, of Philadelphia, were elected directors.

**Schenectady (N. Y.) Railway Report.**—The report of the receiver of the Schenectady Street Railway Company for the last quarter shows: Gross earnings from operation, \$5,466.55; operating expenses, \$6,300; net deficit from operation, \$834.29; other income, \$146.15; gross deficit, \$688.14; fixed charges, \$465.67; net deficit, \$1,153.81. For the corresponding quarter of last year the net deficit from operation was \$2,457.03, and net deficit from all sources \$7,378.81.

**New Jersey Road Levied On.**—The sheriff last week levied upon the franchises and corporate rights of the Pen Argyl, Bangor & Water Gap Electric Railway Company, to satisfy a claim of \$15,000 held by Charles Stroh, president of the defendant corporation.

## NEW INCORPORATIONS.

**Chicago, Ill.**—The Prairie State Construction Company has been incorporated with a capital stock of \$500,000. The company was formed to acquire and operate cotton compresses, build railroads, build and maintain electric plants; furnish light, power and heat; construct and operate street car lines operated with steam, electricity or animal power; maintain and operate telegraph and telephone lines. The promoters are: Hosea W. Wells, V. H. Surghnor and E. A. Maynard.

**Newburg, N. Y.**—The Orange Lake & Walden Electric Railroad has been incorporated. The incorporators are: Benjamin Norton, Brooklyn; H. C. Norton, H. R. Newkirk, formerly of Brooklyn; B. B. Odell, Jr., Col. William D. Dickey, Capt. Joseph M. Dickey and Maj. W. H. Weston, Newburg. The new road will be a continuation of the Newburg & Orange Lake Railway and will terminate at Walden, a village 12 miles from Newburg.

**Harrisburg, Pa.**—The Keystone Electric Railway Company, of Philadelphia, capital \$180,000, was chartered to-day. The company proposes to build a road to Doylestown. The incorporators are Thomas W. South, president; Hamilton Diston, Peter C. Costello, David Martin, Harrison Woodward, Frank F. Bell and C. P. Tomlinson.

**New York, N. Y.**—The Havana City Railway Company, incorporated in West Virginia, has been formed with \$1,000,000 capital stock and proposes to build, lease and operate railways within the city of Havana and the island of Cuba. The promoters are: A. J. Sanchez, Havana, Cuba; H. Alexander, M. M. Sanchez, Brooklyn, N. Y.

**Philadelphia, Pa.**—The Philadelphia & Neshaminy Electric Railway Company has been incorporated by Thomas W. South, Tacony, Pa.; Charles P. Tomlinson, Bustleton, Philadelphia, Pa.; Frank F. Bell, Bristol, Pa. The capital stock is \$75,000.

**Chicago, Ill.**—The Lake Shore Electric Railroad Company, of Chicago, was incorporated this week; capital stock, \$10,000,000. It is said that the company is organized for the purpose of connecting Chicago with Milwaukee by electric line.

**Philadelphia, Pa.**—The Hestonville & Overbrook Passenger Railway Company has been incorporated with a capital stock of \$3,000. The promoters are Johns Hopkins, Isaac Blum, Simon L. Martin, Philadelphia, Pa.

## NEWS OF THE WEEK.

**Philadelphia, Pa.**—The boilers and machinery are being installed at the Ridge avenue power station, which is at the corner of Thirty-second and Dauphin streets. The equipment will consist of three 750-h. p. Wetherill Corliss tandem-compound engines directly connected to Westinghouse generators of the same power. The station will furnish the current for the upper end of the Ridge avenue line extending to Manayunk, the York and Dauphin streets and Germantown roads, part of the Eighteenth and Twentieth streets roads and others in the upper part of the city.

**Hackensack, N. J.**—The Bergen Turnpike Company, which owns the toll road between Hackensack and Weehawken, started to build a trolley system in Hackensack last Wednesday, but was prevented from continuing the work by the Hackensack Improvement Commission and the Township Committee. Chief of Police Van Blarcom arrested Contractor Chinnock and about 10 of his men, all of whom were placed under bonds. The commissioners claim that the turnpike company should have submitted its plans and specifications before starting work in the town limits.

**Peekskill, N. Y.**—Peekskill State Camp & Moberg Railway Company, which has just been formed, proposes to build a street surface road from Peekskill to Lake Moberg, with branch lines to Courtland and Yorktown. The capital stock is \$175,000, and the directors are: F. C. Beach, E. B. Gallagher, C. E. Hammond, G. M. Bailey and G. F. Kunz, all of New York City; G. D. Hisecox, of Brooklyn, and H. L. Armstrong, T. D. Husted and J. B. Westbrook, all of Peekskill.

**Philadelphia, Pa.**—The construction of the Chestnut Hill and Norristown Electric road, which is controlled by parties friendly to the People's Traction Company, will give a continuous electric railway from the heart of Philadelphia to Norristown. The track for this road has been laid from the city line at Chestnut Hill to Barren Hill, just over the boundary in Montgomery County, and construction is now being pushed along the Perkiomen turnpike toward Norristown.

**Philadelphia, Pa.**—The Fairmount Park and Heddington Passenger Railway Company has made application for permission to lay tracks, electrical conduits, etc., beginning at Fifty-second street and Merion avenue; on Merion avenue to Lansdowne avenue, to Sixty-seventh street, to Girard avenue to Sixty-first street, to Master, to Sixty-fourth, to Lansdowne avenue, to Fifty-second street, to Merion avenue.

**Doylestown, Pa.**—Charles P. Tomlinson, William Miller, Charles A. Porter, Frank F. Bell, Henry Van Brunt, Thomas Shallcross and Thomas W. South have made application for a charter for a corporation to be known as the Philadelphia & Neshaminy Railway Company. The proposed line to be operated in Philadelphia and Bucks County.

**Carlisle, Pa.**—Sheriff Strook, of Cumberland County, has served an injunction upon the officers of the Cumberland Traction and the Harrisburg and Mechanicsburg Electric Railroad Company, restraining it from building the track across a road in East Pennsboro township.

**Jamaica, L. I.**—The Long Island Electric Railroad Company and the Trustees of the village of Jamaica have come to an agreement as to the terms of a franchise asked for by the company to operate an electric railroad on certain streets of the village.

**Nanticoke, Pa.**—An electric railway is projected to build a line to connect Nanticoke, Glen Lyon, Wanamie and Alden. A company with \$60,000 capital has been chartered to build the line. Nanticoke capitalists are at the head of the scheme.

**Waukesha, Wis.**—It is announced that the electric railway to Pewaukee Lake will undoubtedly be built, as residents have subscribed \$40,000 to the capital stock of the company that proposes to build it.

## PERSONALS.

**Mr. E. E. Downs**, general manager of the Street Railway Company, of Kalamazoo, has resigned his position, and goes to Battle Creek, Mich., to take charge of the new street railway which is to be constructed in that city.

**Mr. Frank S. De Ronde**, of the Standard Paint Company, was married Oct. 11 to Miss Kate W. Bennett, at the residence of the bride's parents, Teaneck, Englewood, N. J.

**A. H. Dollard** has resigned the presidency of the Lewis & Fowler Manufacturing Company. The vacancy will probably be filled at the next meeting of the Board of Directors.

## TRADE NOTES.

**Okonite Products.**—Every known precautionary measure is taken to make the Okonite products perfect in workmanship and absolutely reliable, and thus maintain the original high standard of excellence which gave them popularity when introduced ten years ago, and which has kept them steadily at the front. All the copper wire used is of the highest grade, drawn true throughout and inspected in every particular before leaving the factory at Passaic, N. J., and tested for all possible faults during the various stages of manufacture into insulated wires and cables. The same careful attention is extended to all other departments, only skilled labor being employed and much specially designed machinery being used. For street railway feed-wire purposes, Okonite has proved a most efficient and profitable insulation. It is tough and durable, will not crack when exposed to the severest changes in temperature, and has the highest of insulating qualities. Eminent electrical engineers with large experience in the electric railway field endorse Okonite insulated wire strongly, and, once used, it is generally a permanent fixture in the equipment of the plant. For electric lighting, telegraph and telephone service the Okonite wires and cables are standard goods. Miles on miles are used annually in this class of work, both in this country and abroad, for it must be remembered that the business of this

concern is not confined to the United States only, but extends throughout the continental countries of Europe, a branch establishment at Manchester, England, supplying the trade abroad. Other Okonite products are the "Manson" and "Okonite" tape for making waterproof joints, etc., both popular beyond measure for the work intended. One who has been closely identified with the rise of Okonite products and the fortunes of the Okonite Company, Limited, is Capt. Willard L. Candee, one of the original promoters of the business and at present one of the American directors. The "captain," as he is popularly referred to, has a genial personality, and his enterprising business management has contributed largely to the attainment of the enviable position occupied by the Okonite Company, Limited, among industrial concerns to-day.

**The Ellis Manufacturing Company**, of 218 South Fourth street, Philadelphia, Pa., has been recently introducing the Hansell truck for electric railway service. The truck has given great satisfaction where it has been tried, and many advantages are claimed for it. Among the claims made for the truck are the following: Freedom from oscillation, which is taken up by the patented equalizing beam, supporting an elliptic and a spiral spring at both ends; the "cause" for oscillation is practically eliminated by the cushioning of the journals; few parts and easily accessible; economy of maintenance; wheels and axles removed by simply taking out one bolt under each journal; unsurpassed braking gear, simultaneous and positive in action on all shoes with great leverage capacity; plunger separated and apart from springs, allowing freedom for repairs of either if necessary; long spring base, consequent upon the ability to lengthen the equalizing beam to almost any length and stiffen spiral spring accordingly on inner end of beams, giving easy riding to longer car bodies than any other truck manufactured; great strength of solid steel side frame; yoke giving broad guide surface to journal box; absolute dustproof journal boxes, adapted for either oil or grease.

**Morris, Tasker & Co.**, of Philadelphia, are one of the oldest and largest manufacturers of iron poles for street railway service in the country, and also have excellent facilities for heavy castings and special machinery. This firm was founded in 1821, by Mr. S. P. Morris, and has had a most successful career. Their wrought iron and steel pipe poles, with special S. S. joints, have achieved a great reputation for strength. It is interesting to note that at one time, when the company purchased the square of ground, now bounded by Tasker, Morris, Fourth and Fifth streets, in Philadelphia, Fifth street was the only one of the four streets named that was opened, and that was not paved, and in order to put the street in such a condition that it could be used uninterruptedly to carry material to and from the works in all kinds of weather it became necessary for the firm to loan the District of Southwark money enough to pave the street. The Delaware Iron Company's extensive mill at New Castle, Del., although a separate organization, is owned largely by the above firm.

**The Mather Electric Company**, of Manchester, Conn., reports a large number of orders on hand for its new multipolar generators for railway work. It has just secured, through its Western contractor, J. Holt Gates, of Chicago, an order for a 75 k. w. generator for the Bloomington City Railway Company, Bloomington, Ill., and a 100 k. w. generator for John Jermin, for operating an electric coal tramway at Scranton. The Mather Company also reports the sale of a second order of two 180 k. w. multipolar generators to the Hartford & West Hartford Horse Railway Company, of Hartford, Conn. The first generator, which was installed a short time ago, is giving perfect satisfaction.

**A Practical Fender.**—Mr. L. S. Harrison, the energetic president of the U. S. Street Car Fender Company, Bennett Building, New York city, is hustling among the street railway people with the company's new fender adapted to electric and cable cars. An exhibition of the fender in operation which was given last week at the depot of the Atlantic Avenue Railroad Company, of Brooklyn, N. Y., occasioned much favorable comment from prominent railway men who witnessed its operation.

**The Sterling Supply & Manufacturing Company**, of New York, is now occupying the new addition to its factory, and reports an increase in business. It will have a full line of manufactures on exhibition at Atlanta, and the Sterling fare register, the Sterling sandboxes and fenders will, no doubt, interest street railway men. Mr. J. H. Carson, the energetic president of the company, will be on hand to look after the interests of his company.

**Mr. George E. Austin**, the manager of the Imperial Rubber Company, 134 Liberty street, New York, reports business brisk in his line with street railway companies. Orders received of late have



been very satisfactory and indicate a growing improvement in the demand. The Imperial Rubber Company are sole agents for Charles Munson Belting Company and the American Steam Packing Company.

The General Electric Company received an order on Wednesday of this week, for 50 equipments, from the Consolidated Street Railway Traction Company, of Jersey City. They also received an order from the Cincinnati Street Railway Company for an 800-k. w. direct-connected generator; also an additional order for 30 equipments from the Bridgeport Traction Company, Bridgeport, Conn.

Advertising for Profit.—Mr. Benj. R. Western, of the Manufacturers Advertising Bureau and Press Agency, 111 Liberty street, New York, has

issued a pamphlet entitled "Advertising for Profit," which contains some suggestions that will aid the advertiser. It is very neatly printed and reflects credit on the ability of Mr. Western to prepare "catchy" pamphlets.

The Lyon brake handle for street cars, which is manufactured by the Consolidated Electric Manufacturing Company, of Boston, is increasing in popularity. The company has just been awarded a contract for equipping all the electric cars of the Chicago City Railway Company, on which Westinghouse motors will be used.

Franklin Institute Award.—The Franklin Institute, acting through its Committee on Science and the Arts, has just presented an exhaustive report on the chloride electric storage battery, and has recommended the award of the John Scott Legacy

Premium and Medal to Clement Payen, the inventor.

National Conduit Contract.—A contract for the conduit work for the West Chicago Street Railroad has been awarded the National Conduit Manufacturing Company, of New York. This contract will amount to about \$75,000.

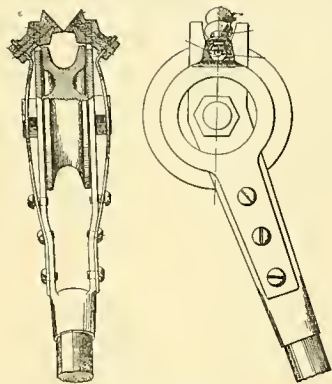
The Standard Paint Company, of New York, has found it necessary to reopen its office at 871 The Rookery, Chicago, owing to the large increase of Western business, Mr. J. C. Shainwald, who is well known to the trade, is in charge.

The Mather Electric Company, of Manchester, Conn., will be represented at the Street Railway Convention, Atlanta, by the vice-president, Thomas C. Perkins, and J. Holt Gates and E. F. Seixas, of Chicago.

## RECORD OF STREET RAILWAY PATENTS.

### U. S. Patents Issued Oct. 2, 1894.

**526,704. Trolley-Wire Hanger;** John J. Green, Boonton, N. J., Assignor to the Loando Hard Rubber Company, same place. Filed June 4, 1894. The support-



No. 526,704.

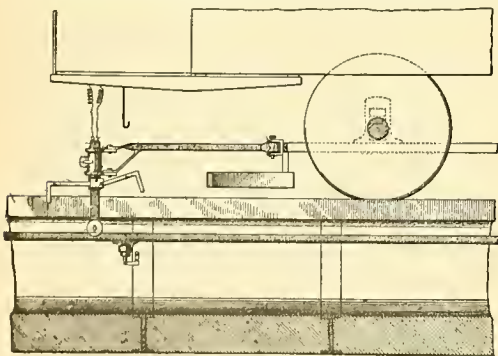
ing devices consist of parts struck from sheet metal and formed so as to be adapted to conjointly engage the trolley wire supports.

**526,705. Trolley-Spring;** Julius L. Hanson, U. S. Army. Filed May 14, 1892. The trolley spring is made up of the two similar clasp springs having their spiral heads interlocked, and the ends of their members oppositely connected.

**526,721. Composition of Matter for Electric Conductors;** Duncan Macfarlan, Philadelphia, Pa. Filed May 16, 1894. This is composed of asbestos or mineral wool, graphite and a binder.

**526,722. Composition of Matter for Electric Conductors;** Duncan Macfarlan, Philadelphia, Pa. Filed May 19, 1894. This is a baked compound structure, consisting of graphite, clay, asphalt or coal tar, chloride of aluminum and a binder.

**526,736. Lightning Arrester;** Fred S. Pearson, Boston, Mass. Filed Sept. 7, 1891. The invention comprises a lightning arrester, a switch, its detent, an elec-



No. 526,736.

tromagnet, a fuse, a main circuit, and a branch circuit with two branches, one branch containing the arrester, and the electromagnet in series, and the other the fuse.

**526,742. Commutator;** Henry G. Reist, Schenectady, N. Y., Assignor to the General Electric Company, of New York. Filed June 28, 1894. The supporting spider has inner beveled face; a clamping ring and a beveled nut are provided, the latter adapted to fit the space between the clamping ring and the inner beveled face of the spider. The commutator segment is adapted to fit the opposite surface of the clamping ring.

**526,756. Trolley Guard;** Henry J. Tanner, Lynn, Mass. Assignor of one-half to Harry Fairfield Hamilton, Boston, Mass. Filed April 2, 1894. Balls or wheels meet above the trolley wire for the purpose of retaining the trolley wheel on the trolley wire, and are separated by the pressure of the trolley wire upon them when the wire enters and when it leaves the space inclosed by the retaining devices and the trolley wheel. (See illustration.)

**526,767. Electric Railway Conduit;** Robert B. Wilson, Cincinnati, O., Assignor of one-half to Jeremiah M. Wilson, Washington, D. C. Filed Jan. 2, 1894. The conduit has a projecting or flanged base, continuous and integral therewith; each section having an inlet or a socket at one end and a reduced portion at the other.

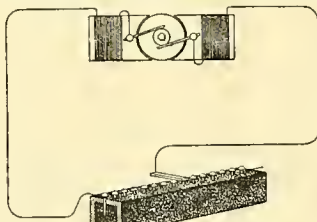
**526,835. Conduit Railway Trolley;** Robert J. Hewett, St. Louis, Mo. Filed Feb. 9, 1894. The collector comprises a pivoted bar mounted on the vehicle so as to permit of lateral and vertical movement, and a detachable plow mounted on the bar capable of rotary movement in a horizontal plane, a current collector engaging the conductors within the conduit mounted on the plow. (See illustration.)

**526,851. Car Fender;** Ambrose J. B. Berger Hingham, Mass., Assignor to the Steel Cable Engineering Company, of Maine, filed Nov. 15, 1893. The fender consists of a platform pivoted to the car, to which a sustaining chain is connected. A dog having a hook to engage the chain and an upturned shank is provided. Pivoted at the base of the hook is a latch to engage the shank and hold said dog in operative position. Means are provided to trip the latch to release the shank, whereby the weight of the platform turns the dog upon its pivot to disengage the hook and sustaining chain.

**526,867. Rheostat;** Duncan Macfarlan, Philadelphia, Pa. Filed May 18, 1894. A homogeneous baked composition structure is used for controlling or adjusting voltage of an electric circuit, and is provided with pin contacts. (See illustration.)

**526,879. Dynamo Regulator;** John Van Vleck, New York, N. Y. Filed May 31, 1894. A series of radial contact strips is disposed on one side of a support of segmental shape, and extends over the periphery thereof. An arm pivoted on the support carries plates in contact with strips. There are resistances located at a distance from the support and conductors connected to the strips on the side of the support opposite to that on which the arm is located.

**526,897. Electric-Railway Trolley;** Robert A. Grant, Providence, R. I., Assignor of three-fourths to



No. 526,897.

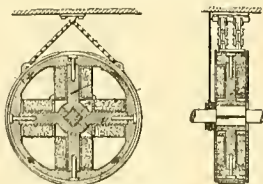
August F. Borchardt, Clifton A. Hall and John Conrad Schott, same place. This is the combination with the trolley-mast of an endpiece secured thereto, and a pivot shaft of a bifurcated side frame pivotally connected to the shaft outside of the endpiece. The trolley wheel is journaled in the bifurcated side frames. The whole is adapted to overbalance the weight of the trolley wheel and support and form a stop.

**526,949. Car-fender;** William L. Shockley, Colorado Springs, Colo. Filed Dec. 20, 1893. A vertically swinging spring-depressed fender is hung beneath the car, a revoluble vertical shaft being mounted on the car platform. There is a cable and lever connection between the shaft and the fender, whereby the latter may be raised.

**526,951. Apparatus for the Manufacture of Carbon Brushes;** John W. Taylor, Peterborough, Canada. Filed May 7, 1894. The upper die has holes drilled in it, in combination with plugs, steam inlet and steam outlet.

**526,963. Conduit for Electric Railways;** Michelangelo Cattori, Rome, Italy. Filed April 3, 1894. Patented in Italy May 13, 1893. The conduit consists of tubular sections provided with supports connecting the sides of the section above the bottom thereof, and longitudinal beams carried by the supports and constructed to receive the covering of the conduit.

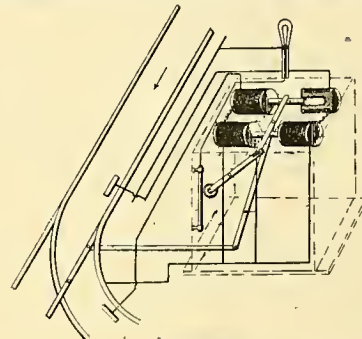
**526,966. Electric Friction-Brake;** Bergen Davis, Newark, N. J. Filed March 28, 1894. This is the com-



No. 526,966.

ination with a rotatable axle, of a drum mounted fast thereon, the same consisting of a metal hub and radial arms, and a peripheral portion formed of separate sections attached to the arms and insulated from each other, bobbins placed on the arms, a magnetizable strap surrounding such drum, and an electrical circuit extending through the bobbins. (See illustration.)

**526,985. Automatic Switch for Electric Railways;** Wilbur S. Wright and John E. Venus, New Orleans, La., Filed Dec. 6, 1893. This is the combination of magnets, an armature common to both, a pivoted lever connected at one end to the armature and at its

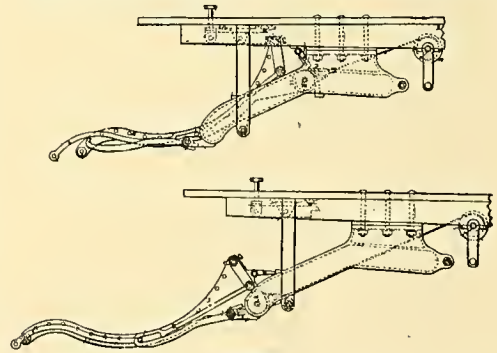


No. 526,985.

other end to a switch-rod, contacts arranged adjacent to the main track and to the switch, two independent electric circuits, one through one magnet and the other through the other, and respectively connected at one end to the contacts and grounded at the other, a contact maker carried by the car and operating to complete the circuit from the trolley line through said magnets, a conductor leading from the trolley wire through an electric light to a stationary contact, and a movable contact connected with a ground wire and operated by the armature to make and break the circuit through the lamp. (See illustration.)

**527,004. Car Fender;** Robert Raphael, Brooklyn, N. Y., Assignor to William J. McKelvey, same place. Filed Oct. 27, 1893. The fender is composed of brackets adapted to be secured to the bottom of a car, downwardly inclined guides formed on these brackets, a cradle constructed to engage the guides and means for causing the cradle to move on the guides. (See illustration.)

**527,018. Operating Device for Fare Registers;** Martin T. Graf, Buffalo, N. Y., Assignor of one-half to Frank W. Barker, same place. Filed Nov. 13, 1893. This patent covers the combination with a base plate or support, of an elbow lever pivoted to the base plate, swinging in a plane parallel therewith, and having one of its arms constructed to engage with the actuating device of the fare register, and an actuating lever, adapted to be operated by a cord or rod and having a



No. 527,004.

laterally projecting arm which engages with the other arm of the elbow lever, whereby the latter is swung on its pivot by the movement of the actuating lever.

**527,024. Advertising Apparatus;** William H. Rieff, Philadelphia, Assignor of one-half to Robert E. M. Evans, Norristown, Pa. Filed July 14, 1894. The claim reads: "In an advertising apparatus for street railway cars, etc., the combination with a seat provided with a series of normally elevated independently movable sections, of a rotatably mounted display drum arranged lengthwise of the seat, a series of ratchet wheels thereon corresponding with said sections, pawl bearing arms adjacent to said sections respectively, levers adjacent to said sections respectively, and independent connections between said levers and the respective pawl-bearing arms whereby the said drum is progressively rotated by the action of either seat section."

**527,334. Scale and Index for Electrical Measuring Instruments;** Edward Weston, Newark, N. J. Filed March 15, 1891. Claim.—1. There is a scale-plate of salient cross-section, a movable index and traverse arm or projection on the index extending over said scale plate.



# Street Railway Gazette.

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Atlanta Street Rail-This issue of the STREET way Convention. RAILWAY GAZETTE is devoted almost wholly to a report of the convention of the American Street Railway Association in Atlanta, last Wednesday, Thursday and Friday. We publish the papers and reports of committees in the following pages, and next week we shall print the discussions and other matters of interest connected with the meeting. The papers which appear in this number are, for the most part admirable, and one or two of them might well serve as models of what convention papers should be. Some of them are too long, a fault which is only too common in papers presented at conventions. The explanation is simple enough. The writers are busy men, and prepare their papers so hurriedly that they string them out to an unconscionable extent. If they had time at their command they would be able to shorten them materially, with the result that the papers would be far more interesting when presented and infinitely more readable when published. There was more than one paper presented at Atlanta that could have been made much more effective if its author had used his blue pencil judiciously. What strikes one who carefully reads the convention papers is their decidedly practical character. Some suggestion that is worthy of consideration, some idea suggested by experience, is constantly recurring. In reviewing the papers that appear in this issue, we can touch only on the most important points.

Mr. E. C. Foster's paper on "City and Suburban Electric Roads" was one of the most practical and interesting. He gives information that ought to prove of the utmost value to every one who is concerned in the construction and operation of roads leading out into the country. In speaking of track construction, he throws out a suggestion that in certain places it may pay to return to the old tram rail. This sounds curious enough in this day of heavy rail construction, but the idea is well worthy of consideration. There are plenty of locations where traffic is so small that construction costing \$30,000 or more per mile is out of the question. Something must be substituted for it if the company is not to be swamped by fixed charges. Mr. Foster also has suggestions of a practical kind to make on that difficult subject to treat--fares on interurban roads. On the question of heating he is quite conservative. He believes thoroughly in warm cars, but he discards the electric heater, because as he asserts, it is too expensive, and he sticks to the old-fashioned coal stove. Every manager would prefer the electric heater, if it can be proved to his satisfaction that its use does not necessitate a too rapid decrease in the size of the coal pile. They would be glad to discard the smoky coal stove, but a great many of them are in just the position of Mr. Foster in maintaining that the economy of the electric heater has not been demonstrated. A great many other practical matters were treated by Mr. Foster which cannot be referred to here. The paper is commended to all our readers as one of unusually practical value.

We think that most street railway men will be surprised to learn from the paper of Mr. Richard McCulloch that so many street railway companies are engaged in carrying mail and express packages and in transporting freight. Fifty-eight roads have contracts with the government for hauling mail pouches, and four others are engaged in the service under subcontracts; 35 companies do an

express business, and no less than 55 are engaged in transporting freight. Surely the street railway companies are enlarging the field of their usefulness, and it is not surprising that the steam roads are viewing with alarm the growth of trolley companies, especially as the latter, in a great many places, are contemplating engaging in these new avenues of activity upon which five or six years ago no street railway company could have thought of entering. Mr. McCulloch speaks at some length of the excellent work performed by the electric railway mail car, which was first introduced in his own city, of St. Louis, and latterly has been put into service in the city of Brooklyn, and he mentions the advantages that may accrue to a company in assisting in the work of the post-office department. He speaks also of the conditions under which an organization of a freight service may be profitable to a company, and again he describes the circumstances under which it may be advisable for the company to transport freight into suburban districts, even though the traffic may not prove very profitable.

The paper of J. H. Vail and H. S. Wynkoop is somewhat more technical than those which have been alluded to, but certainly it is none the less practical as it relates to the all-important question of reducing the investment of money in copper. If the "booster" system can be applied with as great success as is claimed for it, its adoption in a great many power stations is simply a question of time. The economy of the booster method under certain conditions is figured out by the authors of the paper to be remarkable in comparison with that of direct feeding. If these figures are in all respects reliable, the cost of a booster equipment would be extremely small in comparison with the cost of the copper required for feeders.

If surface cars move rapidly on city streets they must be provided with a reliable braking equipment, and in his paper Mr. E. J. Wessels describes the advantages of an air-brake when used on street railways. The hand-brake he considers to be no longer suitable for the ponderous coaches used on electric railways, and he regards it, in fact, as the weak point in a splendid equipment. He predicts a decreased number of accidents on street railways if cars are equipped with a standard form of air-brake. He devotes a considerable part of his paper to a comparison of the merits of the air-brake and that form of electric brake described by Mr. Elmer A. Sperry in his paper before the American Institute of Electrical Engineers. Mr. Wessels found that the claims of superiority for the electric brake were far from being well founded. He held that the air-brake was by far the more reliable and desirable device.

The tendency in the street railway field is toward standardization of apparatus. This is as it should be, and street railway men almost without exception, we think, will indorse the views expressed by D. F. Henry and Powell Evans regarding the brake-shoes. They urge the adoption of a standard form, and there is every argument in its favor. When street railway companies decide upon this standard, an economy by no means insignificant will be introduced.

The last convention paper which we publish is that of W. S. Harrington, who discusses the subject of the destructive arcing of 500 volt fuses. While this paper is of a technical character it has a decidedly practical bearing, and the author's conclusions will be read with interest.



### EXTENSION OF A NEW JERSEY ELECTRIC RAILWAY.

The Camden, Gloucester & Woodbury (N. J.) Street Railway Company has decided to make a number of extensions, and the greatest interest is taken in these projects by property-owners in all the territory likely to be affected by the construction. It is announced that along some sections of these proposed trolley routes the right of way would be secured with little or no expense, and there is also an inclination on the part of many of those possessing teams to turn in and help grade the road.

The decision of the officials of the Woodbury road that they would extend their system to Mantua, providing the citizens and landowners would secure the right of way, has induced a number of prominent citizens in this place and in the towns and hamlets north, to take the matter into consideration, and now proposed trolley roads are talked of in almost every section of the county.

With the right of way yet unsecured it is altogether probable that the road will pass through Barnsboro and Pitman Grove, the latter place having a good permanent population, and in the summer season the population is greatly increased, independent of the many thousands of visitors during the camp-meeting season.

This whole section of country is thickly settled, and it is believed by those who are interested in the building of a road that it would be a paying investment from the start.

With the construction of a trolley road through Pitman Grove it is probable that a branch road would be constructed to Aleyon Park and Lake, the new pleasure resort west of the Pitman Grove grounds. This resort has already jumped into popular favor, not only with the permanent population at Pitman and the immediate vicinity, but thousands of the summer visitors enjoy the advantages and from all over the country large picnic parties, societies, Sunday schools and the Grangers are beginning to look upon the park as one of the prettiest pleasure resorts and picnic grounds in west Jersey.

With trolley roads touching at Gloucester, Woodbury, Mantua, Barnsboro, Pitman Grove and Glassboro, and with the not improbable extension to Mullica Hill, from some point on the main line, Aleyon Park, with its advantages of a fine sheet of water, would soon be the popular picnic resort in this section of south Jersey.

Mullica Hill, with its roundabout railroad communication, heartily favors a trolley road, and, from present indications, it looks as though a road would be built in the not distant future to connect with the main line at Mantua. Such a road, if built, would, it is thought, be one of the best paying branches of the system, owing to the fact that the entire route is thickly settled and passes through the prettiest farming section of Gloucester County. Such a road, it is claimed, is badly needed, as now, in order to reach Woodbury, the county capital, the residents have to drive to Mickleton, on the Swedesboro road, or to Wenonah, on the main line of the West Jersey road, where the cars are taken for Woodbury or Philadelphia.

### TO PARALLEL A STEAM ROAD.

In Hartford last week Judge Robinson granted the petition of the Hartford Street Railway Company for permission to extend its line from East Hartford to East Windsor Hill. This proposed extension parallels the New York & New England railroad. According to the laws of Connecticut a street railway company before it can construct a line parallel to that of a steam road must prove to the satisfaction of a judge of the Superior Court that the proposed railway is a public necessity. The New York & New England Company was represented at the hearing by two attorneys who opposed the granting of the petition. Witnesses were introduced who testified that the construction of the road would be a matter of great convenience. It is interesting to note that Congressman Sperry who represented the town of South Wind-

sor emphasized the fact that the electric road was especially needed because the facilities afforded by the railroad company were exceedingly poor.

### FENDER QUESTION IN PHILADELPHIA.

The fender question has been attracting a great deal of attention in Philadelphia. The local papers have been urging the companies to adopt some sort of life-saving apparatus, and the latter have done considerable investigation to ascertain the best forms to adopt, but as yet, like companies in most other cities, they have been unable to discover any type that they deem satisfactory and reliable. Officials of the three great companies were interviewed recently on the fender question, and the opinions which they expressed were as follows:

George D. Widener, Second Vice-President of the Philadelphia Traction Company, said:

"Though we have made every effort to do so, we have so far been unable to satisfy the demands of the newspapers and the public, and the strongest wishes of the officers of our company. Inventors are calling on us constantly, and we have made every effort to secure a fender that is efficient and reliable.

"Trials have been made by this company of the best fenders on the market, but every one has proved deficient. Our mechanics have also endeavored to produce one that would be satisfactory, so far without success. We tried two new ones last week on North Broad street, but they did not stand the test.

"There are many difficulties to be overcome in the production of a fender that will give satisfaction to the managers of the passenger railways. The inventions composed of wire net, that project four feet or more in front of the cars, may do very well on suburban roads or on cars running in the strictly residential parts of the city, where there is little traffic. But upon any crowded street they would be broken and damaged nearly every trip by collisions with trucks and wagons.

"The Philadelphia Traction Company is more anxious than any one else to get an efficient fender. We are ready to give a test to any fender that appears to have merit, and hope inventors will be able soon to produce one that will meet the conditions of city traffic."

L. H. McIntire, General Manager of the People's Traction Company, when asked what that company was doing in regard to the selection of a fender, replied:

"We have been considering the question very carefully and thoroughly for some time, and think we have one of sufficient merit to warrant a trial. A few cars are being equipped with this fender, and will probably be ready for trial next week. We recognize the very difficult problem before us, and if some device can be provided that will prevent a person knocked down from going under the wheels, about all that can be expected will have been accomplished.

"The fenders that have been tested so far have all failed when put to a practical test. We do not want to equip our cars with such. A fender must be sufficiently high above the pavement to clear small obstructions or it will be broken. If high enough for this purpose the arm or foot of a person lying on the track will pass under it, and acting as a wedge the whole body will be sure to go under also. That is one of the greatest problems which have to be met.

"My judgment concerning fenders that protrude in front of the cars is that they render no service whatever in saving a person. They are expected to run under a person, or cause them to fall into the net. Practice shows that they usually knock persons down on the track; and then go over them. The only fender practicable is one attached directly to the trucks. This method insures a fixed distance from the track, and allows several feet in which to stop the car after a person has been knocked down. Such a fender should pick a person up or push him along until the car is stopped."

Jeremiah J. Sullivan, of the Electric Traction Company, said the matter of fenders had been discussed at a recent meeting of the board of directors, but no decision had been reached.

"We want to get the best," Mr. Sullivan said, "and how can we decide when more than 240 patents have been granted to different inventors? We have one on trial now that is very satisfactory, but in some respects it is deficient."

Mr. Sullivan expressed himself in favor of a "pick-up" fender on the front of the car, because, after a person has been struck, there is little use for a fender afterward. The fenders, which extend in front of the car for a distance of three or four feet, Mr. Sullivan did not think so objectionable as an obstruction which teams might collide with, but he thought them very unsightly.

## ATLANTA CONVENTION

### Annual Meeting of the American Street Railway Association.

#### Live Topics Considered in the Papers and Reports of Committees—Practical Suggestions Relating to the Construction, Operation and Management of Electric Railways.

The thirteenth convention of the American Street Railway Association was opened in Atlanta last Wednesday morning, and sessions were held on the two following days. President Henry C. Payne, of Milwaukee, presided. The address of welcome was made by Governor Northen, and was responded to by President Payne. Meetings were held in Machinery Hall of the Piedmont Exposition, in which the exhibit of street railway apparatus and supplies was located. The attendance was large, and it was agreed that the meeting was one of the most interesting in the history of the association.

The visitors received the heartiest welcome from the residents of Atlanta, who did everything in their power to make the stay of the delegates enjoyable and profitable. On Wednesday evening a reception took place at the Capital Club, and on the following night the banquet was held at the Kimball House. All the social features of the meeting were unusually pleasant.

The topics which were considered by the convention were of unusual interest, and for the most part were of the most practical character, and this issue of the STREET RAILWAY GAZETTE is devoted almost entirely to the publication of these valuable reports of committees and special papers. Those which are published are the following:

"City and Suburban Electric Railways," by Elwin C. Foster, superintendent of the Lynn & Boston Railway.

"Mail, Express and Freight Service on Street Railways," by Richard McCulloch, Citizens' Railway Company, St. Louis, Mo.

"The Use of the Booster on Electric Railway Circuits," by J. H. Vail and H. S. Wynkoop.

"The Destructive Arcing of 500 Volt Fuses," by W. S. Harrington.

"Brakes Shoes," by D. F. Henry and Powell Evans.

"Power Brakes vs. Hand Brakes," by E. J. Wessels.

The list of papers and reports contained in this issue by no means comprises all the matter of this character presented to the convention. The report contained in this issue is merely the installment that had been received up to the hour of going to press.

The programme includes several other reports, which will appear in the next issue of the STREET RAILWAY GAZETTE. In that issue will be published the discussions of the topics, and a description of the exhibit of street railway apparatus, which made an exceedingly handsome showing.

The papers and reports will be found in the following pages.



## CITY AND SUBURBAN ELECTRIC RAILWAYS.\*

BY E. C. FOSTER.

The subject that has been assigned to me for discussion, that of "City and Suburban Electric Railways," is decidedly a comprehensive one. Inasmuch as the inter-urban electric railways are comparatively few, it covers nearly the whole electric railway field. The latter class of roads is a growing one, however, and as my work is in connection with lines of this kind, connecting Boston with the smaller cities surrounding it on the north, I shall assume that it is excusable in me to devote a considerable part of this paper to the consideration of the inter-urban roads.

It is difficult to make the distinction between city roads and suburban roads. The function of nearly all city roads is largely to convey the people from the residential districts, mainly in the suburbs, to the business sections, and likewise from the latter to the former. In the improvements it has made in this class of transportation lie the greatest benefits of the application of electricity to street-car propulsion. The growth of our great cities has resulted in the appreciation of value of all real estate near the business sections to a point where the only residence a workingman can afford in these districts is a tenement house. These tenements are invariably crowded to a degree that is unhealthful. That the electric railway has done much for humanity in enabling the working population to leave these homes in the congested districts and procure more comfortable and respectable ones in the suburbs, goes without saying.

Next to this most important use of the electric railways comes their use in furnishing recreation for the masses of the people. Nothing accomplishes so much in the elevation of our population as frequent opportunity to cultivate acquaintance with nature. Optimism is the natural and healthy condition of the mind, and nothing encourages one to look on the bright side of life as does a ride or ramble through the country. The combination of fresh air and pretty scenery makes the only tonic that tones. The two necessary considerations in the accomplishment of the scheme of country air for the masses are, first, the public parks, and second, the means of transportation to them. It is only within the past year that, in the State of Massachusetts, a State Public Park Commission has been created for the purpose of purchasing large tracts of land and opening them to the public, that they may enjoy the beauties of nature without trespassing upon private property. On a portion of the Blue Hills, only 10 miles distant from the heart of the city of Boston, over 1,200 acres have been secured to be preserved forever for the benefit of the people. Also, in Arlington, a like distance in another direction, a large reservation is made; Middlesex Falls is another, and the Commission is now turning its attention to the shores of Revere Beach, immediately north of the city, one of the grandest beaches of this continent. It is needless to add that the street railway companies are doing their share in the matter of providing the necessary transportation. While their motives are not purely philanthropic, the results accomplished are of almost as substantial benefit as though the people only were considered. While this fact is very greatly appreciated, there seems to exist a growing feeling on the part of some that the street railway companies get everything and give nothing. Certainly the very evident benefits the people have secured, coupled with the fact that few companies have earned more than moderate dividends, and many none, should be enough to convince the most skeptical that the stockholder's experience is not always a profitable one.

However, I presume that it was not expected of me to devote this paper to a demonstration of the advantages accruing from the existence of electric railways, but rather to consider the question of the operation of roads and the projection and construction of new lines. It seems almost useless for me to tell you, who know, certainly as well as, if not better than I, how to operate existing roads, and how to determine what lines will pay and under what conditions of fares and traffic. When I say, hereinafter, that such a thing should be so, even though it be without modification, you must understand that I offer such only as my opinion, formed from my own experience, and not necessarily as an established fact.

As a road is projected and studied from a financial point of view, first, then constructed and then operated, it may be well to consider these topics in this same order. The first point, covering the work preliminary to the construction, admits of nothing but rather general discussion. As it is not the purpose of this paper to consider roads built to yield their dividends in benefits to allied interests, as in developing real estate, it may be taken for granted that the question of primal importance, in the consideration of a proposed line, is its probable earning capacity. The stimulation to the growth

of the country crossed may be considered, only in the reflex effect that such growth may have upon the business of the road. A line to pay should be one that makes itself a necessity to the people in offering them the best facilities for transportation in the particular direction. Competing lines should be avoided, excepting where the volume of business is large enough to support both. Besides the assurance that the line is necessary to the people accommodated, it must be ascertained that the number of the latter is large enough to support the road on a paying basis, not only the first year, when the repairs are slight, but later, when reconstruction becomes necessary. I consider that there are very few cases where a company is warranted in investing its money in a line, on the strength alone of the future that may be expected from it. A road should be, at least, capable of earning its operating expenses from the start, and the evidence of a more prosperous time, later on, should be very strong, before it is constructed, without immediate promise of good dividends. It is sometimes necessary for an established company to build on a location, merely to keep out competition. The only thing that warrants this is the knowledge that the opportunity exists for the proposed competing company to be self-supporting from the start, and ultimately a serious rival. Otherwise it is economy to allow them to build the road, and buy them out at the foreclosure sale.

Track construction is a subject that has been so thoroughly discussed in all its details that I shall not attempt to do more than express my opinion, in a general way, as to what forms are best suited for the various demands of the suburban roads. The kind of construction most desirable for a certain location depends, of course, entirely upon the particular conditions. For roads connecting towns I think that it is often possible to secure an independent right of way for a very slight cost per mile, and very often for nothing; this might require special legislation. Progressive landowners realize that the one way to enhance the value of their real estate is to put it within means of easy communication with the surrounding neighborhood, and especially the principal town. For this reason they are often willing to give the necessary land for an electric railway—without any undesirable conditions or restrictions—and oftentimes to contribute something toward the grading. If, in this way, the right of way can be obtained, that is desirable as to route and grade, it offers many advantages that cannot be had on public highways. For such a right of way the regular steam road form of construction would be employed. About a 60 pound T rail, 6 x 7 inches oak or chestnut ties, laid 2 feet centers, needle switches with lever throw, etc., would give a track that would allow a speed of 40 miles an hour, making it necessary to slacken speed only for curves, and as much for switches as the overhead construction demanded, the track switches requiring no reduction of speed. Curves, in such a road, should be few, and of the longest possible radii.

Where it is decided to build on country roads, a location at the side of the road is, of course, preferable. Here T rail may be laid, and the track filled with gravel, covering the ties and leaving the heads of the rails entirely exposed.

In the streets of smaller towns, where permission can be obtained, it is also desirable to lay T rail, although there is always more or less trouble maintaining the paved brow that is usually required, and consequent difficulty in plowing snow from the track, due to the shears and diggers of the plow striking the partially displaced blocks.

In city streets, and others that are paved, the girder rail seems to be the only one suitable. In order to obtain the necessary depth of paving, this rail should be 9 inches deep, and should weigh about 90 pounds per yard. This makes very expensive construction, but the expense is justifiable when the conditions are considered. While such construction is necessary, where laid in streets paved from curb to curb, it is an open question in my mind as to what is best in macadam streets. There are many lines that are operated on 15 or 30 minutes, or even on hourly, intervals, where the business is hardly such as to warrant the use of track construction costing from \$30,000 to \$30,000 per mile. The frequency of the service is an important factor in determining the most economical construction for use under particular conditions, and I think that the 9 inch girder rail ceases to become a necessity, and becomes a luxury, when the number of cars run over it daily is reduced below a certain figure. Further, there are positive objections to the use of such rigid construction as this in dirty streets, as in macadam streets where the top dressing contains a great deal besides stone. My experience has been that the rail becomes covered with dirt, and that the cars rattle and "chatter" badly in running over it, more than in the running over a dirty rail of less rigidity. It may seem revolutionary to suggest it, but I think that for certain places it is at least worth while to consider relaying good tram rail, using some approved form of joint plate. I am

not quite convinced in my own mind that there are conditions existing where this is warrantable, but the subject is certainly worthy of discussion and consideration.

Overhead line construction has kept pace in its improvements with those of the other branches of electric railway work, and the success that has been had with the lines built during the early periods of development encourages one in the belief that modern lines may be depended upon to give little trouble.

Regarding equipment, my idea is that the longest car that can be operated successfully on four wheels is the most desirable for the ordinary conditions. For long distance lines having heavy traffic, I would recommend 30-foot bodies on double trucks for box cars, and 15 bench open bodies on similar trucks. Where there is a sufficient demand I should run a combination smoking and baggage car as the trail car of a train of two.

In building a new road for short distance travel, I should give all curves the necessary radii for the use of 7 foot wheel bases through them, and have trucks this standard. On these trucks I should use 20 foot box cars and 10 bench open cars, either class measuring about 29 feet 6 inches over the buffers. As a supplement to the regular equipment of motor cars, I recommend trailers, and that they may be run economically, a power brake is necessary. To meet this demand, the air brake is being developed, and promises to fill the requirements. For convenience in attaching trailers to motor cars, automatic couplers are necessary. There are several forms of latch couplings that can be made to do the work satisfactorily. An important thing in connection with the use of trailers is the adoption of, and adherence to, a standard, that all buffers and draw-bars may be of one height, and other parts right for the proper operation of cars in trains.

For electrical equipment, it goes without saying that the modern multipolar, single reduction motors, with series parallel controllers, are the only ones that a road can afford to use. The performance of the various equipments, now manufactured by the different companies, has been so universally satisfactory that I feel that a great deal has been accomplished in the past two years in the development of the car equipment.

I am a firm believer in the desirability of heating all cars in the North, thinking that it has a very important effect upon receipts. As much as I like the results obtained from electric heating, I hardly feel that we can depend upon this method. Our experience is that it takes from 8 to 12 amperes to keep a 20 foot car comfortable, that is, 40 degrees above the outside temperature. This means that it requires about as much current per hour as to propel a car four miles. This would make 72 car miles of power per day of 18 hours, chargeable against the heaters. When it is considered that this extra power is often demanded when power is needed for other purposes, as in snow storms, it may be seen that, aside from the question of cost of coal, the consideration of the necessary increased capacity of the power station and feeder system is an important one. Having put myself on record as opposed to electrically heated cars, it is probably expected of me that I present a method that is satisfactory. Unfortunately, though, this I am unable to do. For short trips, run from a car house, the hot water storage system may do. We still depend upon the stove, and "with all its faults we love it still," until we can find something that we consider an improvement upon it.

It is not improbable that before long, a telephone will be considered a necessary part of the equipment of each car operated on suburban lines. It often happens that means of communication with the nearest car house, or with the starter, would save much delay, and even danger, in cases of cars disabled, or thrown off their schedule time by other causes. Either a telephone in each car, with means of plugging in on convenient poles, or 'phones, arranged at the turnouts, in boxes, may be used. As a substitute for this arrangement, or in connection with it, a system of signals between turnouts may be desirable, under certain conditions. By the use of lantern boxes, containing incandescent lamps, and the necessary hand or automatic switches, a simple system of signals may be devised, by means of which cars running between turnouts on single track lines will be protected from meeting other cars.

While these devices may be necessary in some cases, they will always be more or less burdens, in the complications they add. The signal system, especially, has one important objection. Regardless of the most carefully enforced rules to the contrary, men will learn to consider it as freeing them from the necessity of maintaining the same careful lookout for approaching cars, and in cases of failure of the signals, accidents will be more likely to occur than they would without the signal system.

The adoption of a proper schedule of fares and transfers is a most important matter. Where lines are short enough to allow the use of the one

\* Read before the Convention of the American Street Railway Association, Atlanta, Oct. 17-19, 1894.



standard fare throughout, this question is a simple one, but where routes are longer, and it becomes necessary to collect higher fares, complication commences. When this latter condition is aggravated by systems of transfers, the complexity increases. My experience has been that, in general, it is best to divide such a line into sections, collecting a single fare in each, and registering all as the standard fares. These sections are arbitrary, of course, but in our case are determined by town boundary lines. For instance, where we have a line running through several towns, we collect a single five cent fare in each town. In connection with this I would say that there are instances where further restrictions need to be made. Cases have arisen where towns of large area have comparatively small centers of population a long distance apart. Single fares have been established as being good anywhere within the limits of either town. A line is then built connecting the two towns, and instead of 10 cents, it is considered necessary to get 15 cent fares. The question then arises as to how the required three sections can be arranged. According to established precedent, the five cent fare sections include each whole town, although the line in question did not exist when this understanding was originated. In this case, however, it becomes necessary to establish the third section as including that part of the line between the boundaries of the more thickly populated portions of the towns, and including the intervening open country in both towns. As an exception to this method of paying fares "on the installment plan," I would mention the case where there exists a very heavy through traffic on a line, compared with which the local traffic is slight. In this case I consider it best to collect the whole fare at once, issuing to the through passengers conductors' private checks. These latter are held by the passenger, as evidence that he has paid through fare, and surrendered to the conductor before the end of the trip.

The selection of the best rates of fares is a matter requiring the consideration of numerous conditions governing the particular case in question. It is safe to assume that the result to be worked for is the earning of the largest possible net revenue, considering, at the same time, the development of the business. Exactly the best way to accomplish this is the problem to solve. The expense of operating may be approximated reasonably close. It is more difficult, however, to determine the amount of traffic that different rates of fare may bring. It is well to study the classes of travel that may be expected, and fix such a basis of rates as will probably yield the largest margin of profit. After having done this, the basis thus determined may be increased by a considerable percentage, and this new basis adopted as one to use in opening the road. As every one knows, it is a simple matter to decrease fares, and, while I do not believe in starting out with high rates merely for the opportunity of obtaining the credit of cutting them at some future time, I do consider that it is necessary to have a margin of safety, to avoid the possibility of being burdened with rates that are too low, and cannot possibly be raised. In this state, with the existence of a law making it illegal for railroad companies to withdraw transfer checks issued without permission from the Railroad Commissioners, it becomes more than every necessary to very carefully consider all proposed changes, studying them especially as to their probable effect in the future, when the road has developed and taken in new territory. It is aggravating to see the opportunity for a new line, into a district that might naturally be expected to pay, by means of a rate of fare higher than the standard, and have the fact of a previously established rate, that can be construed to cover the line in question, standing in the way of the consummation of the scheme. I consider  $\frac{1}{2}$  cents per mile a minimum rate for the basis of a system of fares, no fare to be less than 5 cents, and would advise the establishing of higher rates, up to 2 cents, as the particular conditions would seem to recommend.

In certain cases I think it advisable to sell round trip tickets. Our fare from Lynn to Boston is 15 cents, but we sell two tickets for 25 cents. We think that the possession of this return ticket leads people to use our cars when they would otherwise patronize the steam roads. We have no other commutation, excepting workmen's tickets over certain routes, good only during the hours of six and seven, morning and evening.

Transfers may be used within reasonable distances. The system must, of course, be carefully worked out, to avoid the possibility of abuse. In all of our efforts to be just to the public we cannot lose sight of the fact that the public is not just to us when it can avoid being, and that it behooves us to take the necessary precautions to protect ourselves, inasmuch as the popular moral code includes no provision for our protection. The existence of this unfortunate condition of affairs demands that we use care to prevent the abuse of the privilege we grant the public, the most common form of which abuse is the failure to observe the "not transferable" restriction.

Suburban roads work at a disadvantage com-

pared to city roads, when the question of operating expense is considered. There are many reasons why a given number of cars can be operated for less money within a small territory than when spread over a large area. These reasons are obvious. In the former case a large number of cars may be cared for in one car house, thus allowing a minimum expense of maintenance. A small car house cannot afford the motor tables, traveling cranes, etc., that do so much to lessen the cost of motor and truck repair, nor can the work of the small house be divided among different men, giving each his specialty, as in a large house. In one of the largest car houses in the world, the Lenox street house of the West End Street Railway Company, of Boston, two men fill all grease cups, examine and replace brushes, and inspect other parts of the motors of from 120 to 150 cars daily. The other work in this house is divided up among some 20 men, including carpenters and blacksmiths, so that the average is about six cars per man. This number of cars per man is often assigned, but probably the work is seldom so well done as in this house. Another important disadvantage under which the suburban road labors is that of the high cost of power. It usually is dependent upon a number of small stations, due to the fact that it is impossible to cover the necessary territory from one station, and both the labor and coal consumption of small stations are necessarily greater per car-mile than are those of large ones. The opportunities of making the expense in the first instance, that of car house work, compare favorably in the small house with the large are rather few. They lie in the dependence upon one capable man, circulating among the houses, directing the efforts of lower priced labor. Another idea that suggests itself is the equipping of one house with a complete outfit of labor saving appliances and bringing all unusual repairs to this house. This is objectionable, however, in that it requires the moving of cars over long distances, at a time when they are least in condition; and, further, that it makes two gangs of men responsible for the care of the cars. Regarding the elimination of the difference in power costs, now existing in favor of the city road, the indications are that the time is coming when it will be no longer necessary for the country road to maintain its numerous steam plants. I refer to the probable introduction of the alternating system of long distance electrical transmission into railway work. Suppose the case where it becomes necessary to distribute power for railway purposes over large areas, as on many suburban roads where several power stations are now used. With this system, there need be but one main power station, which can be located at the point possessing the greatest advantages for cheap production of power. At various selected places rotary transformers may be placed, one for each section of road. These receive alternating current, over long distance lines, from the main station, and deliver it as direct current to the trolley wires, or possibly to such local feeders as may be necessary for the distribution throughout the particular section. These rotary transformers require only the same care as generators. Besides them, the only apparatus in the sub station, needing attention, would be the circuit breakers. The latter would be arranged between the rotary transformers and the lines, in the same way that those in the present stations are. It will be seen, therefore, that one ordinary dynamo tender would be all the labor required in a sub-station. Further than this, the sub-station might often be in car houses, where one of the regular employees could care for the machinery, thus reducing the labor charge to a minimum. By this arrangement power could be distributed to cars operating over areas of from 25 to 50 miles radius from one station, at cost slightly above that for distribution within the ordinary distances of present practice. I am told that with such a system, using 6,000 volts, three-phase currents, from a station located at the central point, we could supply power by the use of three No. 0 B. & S. wires to a road 50 miles in length when 50 cars were being operated. The total efficiency of this transmission, neglecting the loss in the trolley wires, would be about 65 per cent. These 50 cars on the 50 mile road would give 15 minutes headway, with a speed of 8 miles per hour. With the higher speed, that would more probably fit the conditions of such a road, the number of cars would be reduced, allowing a proportionate decrease in the size of the wires, so long as the current allowance, 20 amperes per car, was sufficient. To accomplish these same results with the present system of 500 volts would require 600 No. 0 B. & S. wires, the use of which would, of course, be impracticable.

While this system has many advantages which are sure to result in its extensive application, it has its attendant disadvantages, which must be overcome. Most important of these is the difficulty of insulating the lines. Practice has been to use bare wire, simply because the covering is of no use with such voltages. The principal use of the insulation on the majority of overhead wires is a

sentimental one. The public prefers the appearance of the covering to the bare wire. It is probable that it will be wise to recognize the existence of this preference, and cover the wires, merely to save comment. The most serious difficulty, however, lies in the fact that it seems to be absolutely necessary to keep the wires out of the trees. Mr. George D. Johnson, superintendent of the Hartford Electric Company, writes that a twig short circuits their 5,700 volt mains, almost as readily as a wire.

It will be evident that the adoption of a long distance transmission system will admit of the use of any suitable water power that may be located too far away to be available under the direct method of transmission.

Although I have discussed no branch of my subject sufficiently in detail to treat it thoroughly, I feel that I have already taken more than my share of your time. In conclusion, I would say that I have very great faith in the future of the electric railway. It has demonstrated its ability to live through periods of adversity. The lesson in economy that the country in general has had has taught us a great deal with the rest. Roads that have paid expenses, during the past two years, will have nice margins of profits left from the receipts of the years to come, and those that have paid their dividends will pay larger ones and add to their sinking funds. While a considerable part of the curtailment, made necessary by reduced receipts, has been in the line of the sacrifice of repairs that should be made in prosperous times, there have been many unnecessary expenses brought to light and cut off. Things which we thought necessities proved to have been luxuries, when we learned how well we could do without them. I am a firm believer in the policy of putting everything into the best of condition and keeping it so, as being the one that yields the largest net revenue, present and future, but I realize now better than I did two years ago, that in our zeal to have the best of everything, kept in the best of condition, we allow extravagances to creep in with the necessary expenditures. The education in economy that we have gained will help us wonderfully in the future, and the combination of increased earnings and reduced expenditures will give an increase in the net revenue that will be substantial.

#### MAIL, EXPRESS AND FREIGHT SERVICE ON STREET RAILWAY CARS.\*

BY RICHARD M. McCULLOCH.

In beginning a discussion of this service it seems necessary to explain that the first word of the subject is spelled with an *i*, because a gentleman from the rural districts of Wisconsin proudly wrote, in answer to a circular asking for information regarding the carrying of mails, that "His road sometimes carried females too." He desired, however, that all information given should be regarded as confidential, so the name of this most fortunate road is withheld. That the street railroads of this country operate a heavy freight business has long been the opinion of the itinerant tinware peddler, the "umbrellas to mend men," the lady who takes in washing, and all the merchant princes of the tribes of Israel, notwithstanding the fact that a generation of sweet-tempered conductors have talked themselves hoarse in endeavoring to explain matters differently.

The first feature, which strikes one in endeavoring to study a subject such as this, is the great difference existing between what are known as street railroads. We have city roads and suburban roads; we have summer resort roads; we have belt roads operated by different motive powers, some of them almost approaching steam railroads. There are large city systems operating over many miles of track and running hundreds of cars, and there is one road down in North Carolina, from which the statement was received that: "This here road is owned, directed, managed, superintended and driven by Yours Truly." All these railroads haul different classes of passengers, bent on different errands, and are operated under different conditions. It is manifestly impossible, therefore, to lay down any fixed rule for mail, express or freight service—to say that it should be put into practice on street railroads or that it should not be put into practice. This is a problem which must be solved for each railroad individually. In this paper it is intended merely to give a general discussion of the question without attempting to solve it.

In order to ascertain as well as possible how much has already been done, a circular asking for information in regard to mail, express and freight service was sent to every street railroad company in North America. Nine hundred and seventy-eight letters were sent out and 413 replies were received. These replies are tabulated below. As a great many railroads were not heard from, it cannot be assumed that the table is absolutely correct,

\* Read before the Convention of the American Street Railway Association, Atlanta, October 17-19.



but it is probable that most of the railroads having such a service answered the circular. Roads which are enumerated as having express or freight service are only those which have this service fully developed. The carrying of packages by conductors of passengers cars was not called express service, but is enumerated in a separate column. From some of the states, notably Pennsylvania, Rhode Island and Massachusetts, it was reported that the transportation of express and freight by street railroads was prohibited by state law, and many of the roads answered that their franchises allowed only the transportation of passengers.

The rate charged on express matter was usually five or ten cents per package, while the freight rates vary from four to ten cents per 100 pounds. The mail is usually carried either under a direct contract with the Government or under a sub-contract with a mail contractor. The income from the transportation of the mails varies according to the amount of mail, the number of trips per day and the length of the haul, from \$100 to \$1,000 per annum.

STREET RAILWAY MAIL, EXPRESS AND FREIGHT SERVICES IN NORTH AMERICA.

	Any form of such service.	Under contract with express company of U. S. Government.	Haul steam R. R. freight cars over street R. R. tracks.	Operate special cars for this service.	Carry small bundles in passenger cars for pay.	Contemplate such service.	Distribute matter beyond station.	Use combination express and passenger car.
Mail.....	62	58	.....	5	.....	10	.....	8
Express.....	55	.....	.....	31	.....	7	.....	.....
Freight.....	55	.....	6	37	.....	12	.....	.....

*Mail Service.*—That the street railroads of this country are already alive to the possibilities of the mail service is shown by the table. Sixty-two street railroads are now carrying Uncle Sam's mail, while 58 have government contracts. Most of these railroads are suburban roads or roads joining to towns; but the postal authorities, realizing the advantage of quick delivery and collection, are now beginning to make arrangements with the large city systems for transportation of the mails from main post offices to branches and for distribution and collection throughout the city.

Various methods of utilizing street-railways for this purpose have been proposed by different local post office authorities. In one large western city, in which all the roads are controlled by one company, it was proposed to equip one car of each line with a mail receptacle. At stated times, the carriers along the route were to meet this car and drop into the receptacle all the mail collected by them, which was in turn to be taken from the receptacle as the car passed the main post-office. This plan, however, did not meet with the approval of the great fathers at Washington, and in consequence was abandoned by the local authorities. Any system of this kind would greatly expedite the collection of mails, but the weak point seems to be that no provision is made for their distribution.

The only method of handling a large mail service, in which it is necessary to collect and distribute along the route, and handle it satisfactory both to the patrons of the road and the post-office department, seems to be in the use of a separate car—an independent mail car in charge of a railway mail clerk. This system is already in use on street railroads in St. Louis, Brooklyn and several other places, and so far as we can learn is giving excellent satisfaction, both to the railway companies and the post-office authorities. The mail is quickly and promptly handled; the service is regular and certain; great and small quantities of mail may be collected and distributed with equal facility, the residents along the line are greatly accommodated, and no interruption or inconvenience to the passenger traffic need result.

As an example of such a service, it would probably be interesting to describe the operation of a United States mail car, which has been run by a street railway in St. Louis for some time. The St. Louis & Suburban Railway begins in the business part of the city and runs through the choicest residence and suburban settlements of the town of Florissant, 16 miles from the center of the city. After leaving the city limits, the line penetrates the beautiful Florissant Valley, thickly dotted with pleasure resorts, country clubs, summer homes and suburban villas. The down-town portion of the road was formerly a cable, and the suburban part a narrow-gauge steam line, but with the onward march of progress the grip and the locomotive have gone to join the mule car, and the road is now electric throughout its entire length. The mail car makes three trips each day, two through to Florissant and one as far as the city limits. The railroad company furnishes a conductor and motorman, while the postoffice department supplies the mail clerks. The car, which was built especially for

this purpose, is equipped with its own motors, and is furnished with the necessary desks, cases, racks for mail bags, etc. At a schedule time it is run up in front of the post office and receives the mail put up in pouches from a wagon there to meet it. The mail clerk receives a bag for each station outside the city limits, and for each carrier along the route a bag designated by his number. He also receives all mail which has come in too late for assortment, which is distributed on the car to the proper bags before reaching the first station. Letters are received, canceled and distributed on this car, just as in the ordinary steam railway mail car. The first stop is at a point about one and a half miles from the post office. At this point six carriers meet the car and each carrier receives from the mail clerk the pouch bearing his number. Another stop is made about two miles out, another two and a half, another three, and another four miles from the post office. Any mail for the suburbs is handed to the mail clerk by the carriers and dropped into the proper bag by him. After the city limits are passed bags are exchanged at each station just as on a steam railroad. On the return trip the same system is followed until the city limits are reached. Within the city the post office department has placed letter-boxes at the principal corners along the line. Each carrier brings the mail collected in his district to the nearest box on the line of the railroad. Stops being made at each box, the mail clerk removes the mail, and assort it before arriving at the next station. The letters thus canceled and assorted are delivered at the main post office, tied up in bundles ready for shipment. The mail car makes no stops for passengers, and for this reason can easily keep out of the way of the passenger cars. A light freight business is also done on the car. Provisions, light furniture, milk, trunks, etc., are carried, and the charges collected by the conductor. The mail service has now been in operation three years. New features are constantly being added to it, and aside from the accommodation afforded the residents of the territory through which the road runs, it is a source of profit to the railroad company.

The system just described seems the best that has yet been devised for the handling of a large mail business. Where the mere carriage of the mails in pouches from the main post office to branches, or from depots to post offices, is undertaken and there is no attempt made at collection or distribution along the route, there can be no objection to carrying the mail sacks on the front platform, if their number is not too great; but passenger cars should not be stopped and held for mail collections, nor should valuable space within a passenger car be taken up with mail sacks.

The question as to whether or not mail service is called for depends almost entirely upon local conditions.—the length of the road, the territory through which it runs, the proximity of depots and post offices to the line of the road, and many others. An advantage is estimating the advisability of inaugurating a mail service, is that a certain, fixed income may be assumed, which is not the case with any other service. It is usual in Government contracts to pay a certain sum per one hundred pounds per mile, the weight being determined at stated intervals by weighing the mail. For this reason, a certain fixed income is assured during the interval. A number of cases may be cited in which it would be well for the managers to look into the profits which might accrue from a mail service. Large city systems covering various parts of the city and passing close to post offices and public buildings would afford great advantages in distributing and collecting the mails. Suburban roads, roads connecting towns, and roads running to depots in the outskirts of the city are other instances of openings for mail service.

An advantage, independent of any financial return, and one which is regarded by many as the one reason for street railways embarking in this service, lies in the prestige of Uncle Sam's name. This point was never so thoroughly illustrated as in the late labor troubles in Chicago. Rioters may have no fear of the city police or of the State militia, both of whom are often entirely in sympathy with them, but they regard with the greatest awe a company of regulars armed with Springfield rifles. Uncle Sam will tolerate no interference with the distribution of the mails, and no other point has been so thoroughly impressed upon the dangerous element in our communities during the last year. Some railway managers on securing mail contracts have proposed to paint upon each car, "U. S. Mail," as a kind of official notice that their roads are under the protection of the U. S. Government. How effective will be the protection against blockades and riots, and how great a moral influence this will exert to prevent strikes and other stoppages, remains to be seen.

*Express and Freight Service.*—The answers to the circulars showed that 35 roads are now engaged in the freight business, while 55 are hauling freight. As a matter of fact, however, few roads through the country are doing a regular freight business, most of the so-called freight ser-

VICES partaking more of the nature of express. As operated upon street railways, the distinction between express and light freight service is ill-defined that it is deemed best to consider both subjects together.

There are many points in the street railroad as now conducted which make it almost an ideal agent for the transportation of packages and light freight. The great number of points reached by the cars, the absolute certainty with which they run, the thousand and one precautions taken against any stoppage of however short a duration, the rapidity with which distant points are reached, and many other causes combine to make the street railroad of to-day a common carrier of exceptional advantages, when only short distances are considered. Many conditions will suggest themselves to railway managers in which an express or freight service may be made a paying institution. In the case of a town in which the railway station is some distance from the business part of the town, there can be no quicker, safer and better plan of conveying express and freight to some distributing point in the heart of the town than by the street railroad. Whether or not this will pay depends upon the amount of material, the competition, the distance, and the scope of the street railway franchise. A case often met with through the country is that of two towns connected by an electric railroad, one of which, having no steam railroad, is obliged to get all its supplies through the other town. The installation of a freight service of some kind would at once suggest itself in this case, and the profits would depend upon the size of the towns, the character and occupations of the inhabitants, the distance between the towns, etc.

The operation of an express service on large city systems has not been attempted to any great extent, but it has been contended by some enthusiasts on the subject that a street car express service will eventually take the place of the many city deliveries and city express wagons now in use. As an example of a city road operating an express and freight service involving collection and a house to house delivery, it would be interesting to cite the case of the Southern Railway of St. Louis, which has been operating an express service on this plan for almost two years. The Southern Electric Railway begins in the heart of the city, and runs in a southerly direction for seven miles, following the general direction of the river, to Carondelet. The territory penetrated is thickly settled for almost the entire distance, and in no essential does the road differ from the ordinary city street railway. Three trips per day are made upon schedule time by the express car, which is entirely independent, being mounted upon motors of its own. At the down town end is a receiving station where a clerk receives all express consigned to the company, and keeps all the books pertaining to the service. The especial feature of this service, however, is the collection and delivery. This is effected by means of wagons, two of which are kept at the downtown end of the road, and three of which meet the car on all trips at certain points along the line. On receiving notice by mail, telephone or otherwise, a wagon calls for a package, delivers it at the car, from which it is handed to the proper wagon and delivered to the address marked on the package. A charge of 10 cents per package is made for this delivery, and trunks are taken from houses to the Union Depot, checked and the checks returned, for the sum of 50 cents. A corresponding charge, according to size, is made for the delivery of large boxes and bundles. A compliment to the efficiency of the service is paid by the large dry goods and clothing houses, who have ceased to run their delivery wagons into this part of the city, and now consign all of their bundles to the railroad company. Where formerly one delivery daily was made by the wagons, three are now made by the railway. An interesting feature of the service is that several large factories located in the southern part of the city consign all their freight to the electric express. The goods are put on the car, taken to the proper railroad stations, shipped, and the bills of lading returned to the consignor. Packages are received by the express car C. O. D., the charges collected, credited to the proper account, and settlements made at the end of each month. The railway company assumes all the responsibilities of a common carrier, holding itself liable for all loss and damages. This, however, is a contingency which seldom occurs. The service has now been in operation for about two years. It is well patronized both by the residents along the line and the large retail stores in the center of the city. It does not interfere with the regular running of the cars, and its inauguration has never failed to pay.

Up to this point we have considered an express and freight service merely as a paying or non-paying institution, to be adopted in the one case and to be rejected in the other. There is another view which may be taken of the case, however, which is in many instances the most proper solution of the problem. This is to regard the establishment of this service merely as an auxil-



itary to the passenger traffic, to be operated whether or not it pays in order to gain increased passenger travel. The most notable instances of this sort are the roads which run from the hearts of our large cities out into the suburbs. It is manifestly to the interest of these roads to promote building and settlement along their lines, and how can they better attract builders than by giving their patrons all the advantages of city life, not only in furnishing them with rapid transportation to and from the city, but in aiding them in receiving their provisions and supplies? This calls for some form of express service, and although the receipts from this source may not equal the expenses, the increased passenger receipts and the advertisement given the road must also be taken into account.

In all street railroad practice, the cardinal point of any service, whether mail, freight or express, must be that it does not interfere in the least with the passenger travel, and this point should always be kept in view in the arrangement of such a service. For this reason we would strongly advocate the use of separate cars, operated by separate motive power and by separate men. In roads between towns, or suburban roads operated on the same plan as a steam railroad, where stops are made only at certain stations, a combination car or a trailer might be used; but in city roads the system of piling trunks and boxes in the passenger cars and on the front platform, and stopping for these to be put on and taken off, is not of the era of the electric railway. Another system more fitted to the mule and the hobtail is the custom, yet in vogue in some places, of receiving small packages for transportation and allowing the conductor to deliver them along the route, stopping the car and forcing the passengers to wait. If the addition of a package service renders necessary such reduction in the efficiency of the passenger service, it is difficult to perceive the gain in accommodation. A passenger car should carry passengers. It should stop and start for passengers alone, and it should reach the end of the road in the shortest possible time.

If mail bags may be thrown on the front platform of a car, carried to their destination and delivered without causing any long stops, this is perhaps the best way of solving a mail service on a small scale; but in a freight or express service it is better that the work should be done with cars especially devoted to such service and by men especially trained for it. A single box car equipped with motors of its own will handle the light freight and express of quite a territory without any interference with the regular running of cars. A 25-foot car, equipped with double trucks, supplied with the most approved form of motors and controllers, and fitted up either as a mail car, express car or combination car, can now be obtained for \$2,000 to \$2,500. A smaller car mounted on a single truck can be obtained for less money. If heavy freight is to be hauled, it should be carried in motor and trailer cars built especially for this purpose.

If it is proposed to establish a freight or express service, estimates should be made of the amount of business which could be procured, of its reliability, and of the rates which could be charged, taking into account the existing competition. On the other side, the cost of operating such a service should be estimated, allowing liberally for the time the investment is in idleness on account of nothing to do. If a reasonable assurance can not be obtained of a steady and regular traffic, it is best not to venture into it, for an unreliable trade is liable soon to develop into a losing one. There are cases, however, as has already been pointed out, when it would be good policy to operate such a service at a loss, merely to give accommodation to patrons; and it is possible that a service, started for this purpose alone, might in a growing community develop into a paying one.

Before leaving the subject of express service, it might not be out of place to give a brief description of a novel form, soon to be introduced upon the Union Depot Railroad of St. Louis, in which the freight is to consist of members of the genus *homo*, in a more or less disjointed state. This great railroad system in its ramification extends to almost all parts of the city, passing nearly all of the city institutions, including the dispensary, city hospital, and several of the other hospitals, and at the desire of the city authorities it is now having built a hospital car. As designed, it is a 25 foot body, double truck car, having a double floor filled with asbestos to deaden sound. It is proposed to utilize it primarily in conveying patients from the dispensary to the city and other hospitals. It can also be used in case of a great fire or calamity in which there are many injured and where the horse ambulances are not capable of handling the work. It is expected that other uses will develop for it after being put into service. The car is to be equipped with stretchers, folding chairs, a tank of water, apparatus for heating water by electricity, an emergency drug store, dressings, instruments, earth closets, and all necessary apparatus for taking care of the sick and injured. A surgeon is to be in charge of the car and will accompany it on all its

trips. The car is now being built, and the innovation will no doubt be watched with a great deal of interest. It is intended by the city authorities to make arrangements to run the car over all the electric tracks in the city, as this will enable them to reach almost any point within the city limits.

Information received from several of the states, as before stated, shows that in some places the transportation of freight or express over street railroad tracks is prohibited by state law or municipal ordinance, and it has been suggested that associations of managers of street railroads in those states be formed for the purpose of securing favorable legislation. The enactment of these laws may be due to hostile steam railroad influence or it may be due to a misconception of the nature of the services which street railroads would put in operation. Surely, a smooth-running electric car, moving swiftly onward, would not prove such a nuisance as the great lumbering wagons which block the streets of our large cities. Where a freight or express service is needed, the accommodation to the public would be so great that many citizens might be enlisted on the side of the railroads to secure the proper legislation.

In closing, it would perhaps be well to note some of the principal points which, it is hoped, have been brought out in this paper—

1. That a mail service involving collection and distribution is best handled on a separate car, operated on the same plan as a U. S. railway mail car.

2. That it is supposed that a great advantage arising from the transportation of the mails comes from the fact that the road is under the protec-

THE USE OF THE BOOSTER ON ELECTRIC RAILWAY CIRCUITS.\*

BY J. H. VAIL AND H. S. WYNKOOP.

The question of investment in copper is one which has always been a bugbear to the street railway manager, and is to-day the most serious problem confronting the operating company, inasmuch as it tends to restrict the extension of long distance lines for serving suburban traffic. Since the cost of copper for a given service increases directly as the square of the distance, the necessary investment becomes prohibitory when the line extends more than three or four miles from the station.

Railway generators and motors are becoming more satisfactory; we are still allowed, in the absence of a conduit system inspiring confidence, to suspend our trolley wires overhead; and in some cities the authorities will look the other way while we string cables as large as hawsers from pole to pole, in pairs, in dozens, and—if poles could be found to stand the strain—probably in scores.

Even then we are not happy. The power-house site is usually chosen, so far as circumstances will permit, with reference to convenient coal delivery and the distribution of traffic. In the heart of the city crowded streets render slow speed imperative; in the suburbs, where a clear track invites to rapid transit, the pressure is low—usually abominably so. In fact, the writers have in mind a city not far from the metropolis, where two motor cars are run upon a single car's time; and they have witnessed the fading out of the electric headlights as the two cars started out together. The reduced voltage was in this case self-evident; and the net horse-

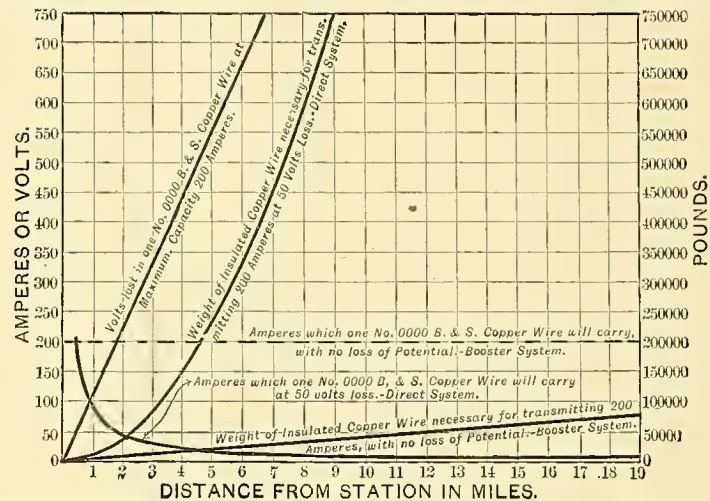


DIAGRAM 3 COMPARISON BETWEEN DIRECT AND BOOSTER FEEDING FOR ELECTRIC RAILWAYS.

tion of the Government, and is thus secure from riots, strikes and blockades.

3. That the most promising opening for an express or freight service is a road running between two towns, or a city road running through well-populated suburbs.

4. That the question, whether or not such a service will pay, is entirely a local question, and must be estimated for each road separately, under existing conditions.

5. That there are cases when it would be advisable to operate such a service, independent of the profits, in order to accommodate the patrons of the road and to induce building along the line of the road.

6. That such a service operated upon the ordinary street railroad must not be allowed to interfere in the least with the passenger traffic.

7. That in states having laws prohibiting this service, associations of railway managers should be formed to secure favorable legislation.

Five years ago such an institution as mail, freight or express service on street railways would not have been thought possible. Such a service has always been considered as a prerogative of the steam railroad, and the fact that some street railroads have already gone into this business and that many others are engaged in investigating its merits, goes to show how eagerly the street railroad is encroaching on the domains of its elder brother. And it is not only in this respect that the electric railway is pushing the steam railroad. Belt lines, suburban lines, dummy lines, summer resort roads, mining roads and many others are rapidly being converted to the electric system. Everywhere we see instances of the screech of the locomotive being hushed by the busy hum of the trolley. We peer into the darkness of the future and we see great systems of railroads operated by power houses located in the neighboring coal fields; we see the great cities connected by electric lines, operated at marvelous speed, and perhaps at no distant date will some new "Empire State Express" or "999 Limited" be pointed out as the development of the electric street railroad.

power secured to move the cars was probably less than half the proportionate amount originally generated in the station. The loss in transmission does not require further demonstration.

Accurate tests show that the commercial efficiency of the street-railway motor at normal voltage is 78 per cent., while at two-thirds of the normal it is only 52 per cent. We all undoubtedly recognize the fact that the resultant effects of too little copper show up to the non-expert traveling public in slow speed and dimming of lamps; but to the railway company the results are actual losses—decreased traffic and increased coal bill; which is the direct opposite of what we desire. In other words, instead of aiming at the greatest receipts for the least expenditure, we are actually getting least receipts for greatest expenditure.

The usual remedy suggested is, use more copper. Very good. But if the owners of the road are already groaning under weight of the copper mine that has been saddled upon them, together with the cash invested therein; if they live in constant fear that they will be forced to place all feed wires in large cities underground, what then?

Leaving out of this discussion improvement in generating station, car equipment and track, we must look for higher economy to the alteration of our methods of electrical distribution, adopting such as will prove, after careful comparison, to be of least first cost, of reasonably high commercial efficiency, of interchangeability on different divisions of the system, and of practically automatic action.

We are in need of a marked advance over present practice in this direction, and must devise some method of distribution that shall give better and more economical service over a large area, and which shall at the same time enable us to reach out from the power station to distances at present inaccessible.

The alternating current system, which has done

\* Read at the Convention of the American Street Railway Association, Atlanta, Oct. 17-19.



so much to develop the distribution of electricity for lighting by incandescence, has not yet reached that stage of eminent perfection in motive power service which will warrant us in admitting its value for railway work at the present time.

Another method which might be suggested is one which contemplates the use of motor generators located at intervals along the line and actuated by high-tension currents. Such a system must be automatic under all conditions of load and short circuits, working with cool bearings and not requiring careful attendance. This scheme also requires practical development.

The well known booster system, invented by Mr. W. S. Barstow, and applied by him with great success to the feeders of constant potential electric lighting plants covering large areas, is worthy of our careful investigation, as it promises to offer a practical aid to the economic solution of what may be called the medium long-distance electric-railway problem.

With direct feeding we can overcome the loss in transmitting energy only by incurring the heavy cost of copper as a first investment. With the booster system we overcome the loss in transmission by incurring the cost of operation of a machine which shall automatically raise the initial voltage above that of the bus bars by an amount which may exactly equal the drop in potential on the feeder at that instant.

When using this machine we calculate our feeder

$M$ , the length of feeder in miles;  $m$ , the circular mileage of feeder;  $\$$ , the initial cost of as much of the steam generating and transmission plant as is due to the feeder under consideration;  $I$ , the per cent. interest on investment;  $D$ , the per cent. depreciation on investment;  $s$ , the cost of steam plant per horse-power;  $g$ , the cost of generating plant per kilowatt;  $b$ , the cost of booster per kilowatt output;  $k$ , the cost of insulated wire per pound;  $p$ , the cost of placing 544 feet No. 4-0 wire, including insulators, pins, cross-arms, sundry hardware and labor—5 per cent. allowance for sag;  $z$ , the cost of supplying 1 H. P. per year, in quantities of over 100 H. P.

Then for direct feeding

$$\$ = \frac{C_1 V_1 + C_1 (V - V_1)}{z E g} S + \left\{ \frac{C_1 V_1}{1000} + \frac{C_1 (V - V_1)}{1000} \right\} g + \frac{2315.488 M^2 C}{V - V_1} K + \frac{.5664 M^2 C}{V - V_1} p. \quad (I.)$$

And for booster feeding

$$\$ = \frac{C_1 V_1}{746} + \frac{C_1 (V - V_1)}{746} + \frac{C_1 V_2}{746 E b} S + \left\{ \frac{C_1 V_1}{1000} + \frac{C_1 (V - V_1)}{1000} + \frac{C_1 V_2}{E b} \right\} g + \frac{C_1 V_2^2}{1000} b + .019318 m M k + \frac{m M}{211600} p. \quad (II.)$$

coal, the loss in the line (represented in the new method by the power required to operate the booster) becomes an important factor in the discussion; and it is necessary to establish equations for the operating expenses, taking into account the fixed charges of interest and depreciation on the investment, as well as the cost of furnishing the required power.

The following equations will enable us to determine these values for different distances:

Direct feeding:

$$E' = \frac{C_1 V_1 + C_1 (V - V_1)}{746 E g} z + \$ (I + D); \quad (VI.)$$

$$E'' = \frac{C_1 V_1}{746} + \frac{C_1 (V - V_1)}{746} + \frac{C_1 V_2}{E b} z + \$ (I + D). \quad (VII.)$$

Making the same substitutions in Eqs. V. and VI. as were made in I. and II., placing  $(I + D) = .10$ , and remembering that  $\$$  varies according to the method and distance under discussion, we get

$$E' = 155 z + \frac{\$}{10}; \quad (VII.)$$

$$E'' = (1.9 + 36 M) z + \frac{\$}{10}. \quad (VIII.)$$

Diagram II. represents these equations plotted for varying values of  $M$ , being taken at 40.

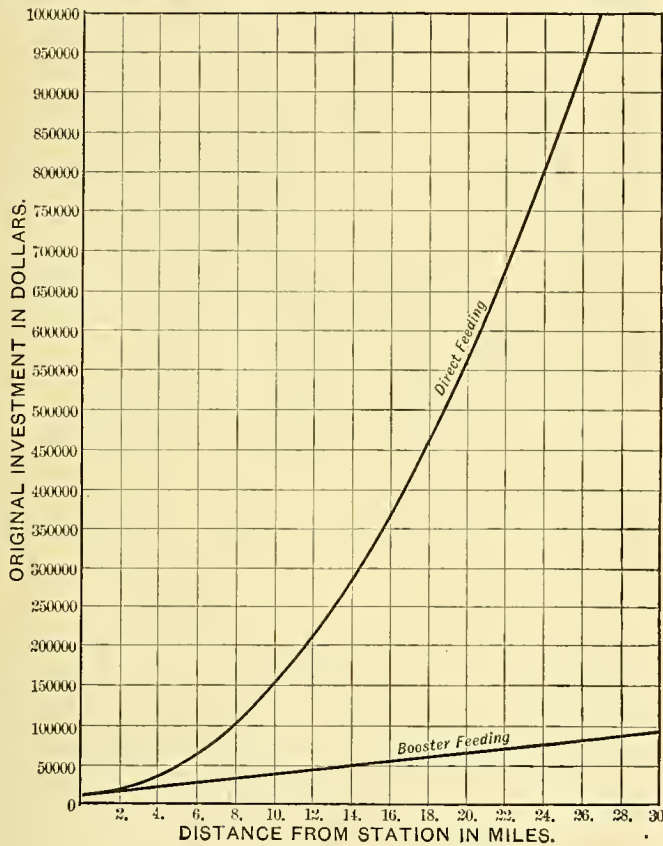


DIAGRAM 1.

Initial Cost of Steam and Generating Plant, Copper and Special Apparatus for Delivering 200 Amperes at 500 Volts.

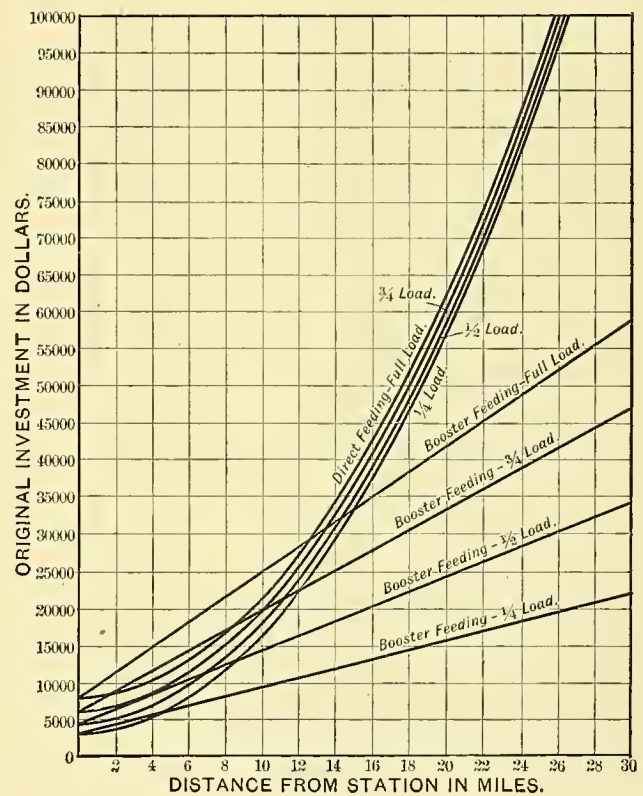


DIAGRAM 2.

Operating Expenses of Plant Delivering 200 Amperes at 500 Volts, Including Coal, Oil, Waste, Water, Labor; and Interest and Depreciation on the Investment.

for ampere capacity only, and constantly maintain the pressure at the service end of the feeder equal to the pressure at the bus bars, irrespective of the length of the feeder or the load.

In any given instance the cost of a direct feeder increases as the square of the distance, while the cost of the booster feeder is directly proportional to the number of miles. These characteristics of the latter system result in a reduction of first cost of from 25 to 75 per cent. as compared with the first cost of the ordinary direct-feeding methods of our present practice; and it thereby becomes possible for numerous electric street-railway companies to extend their lines into suburban localities from 10 to 20 miles distant from the power station, at the same time retaining the investment within reasonable limits.

In order to present these matters in a manner easily comprehensible, we can readily establish equations for the two systems to be compared; and then, by assuming certain accepted values, plot the results. Let  $C_1$  represent the current delivered to trolley wire;  $V$ , the voltage at generator;  $V_1$ , the voltage at trolley wire;  $V_2$ , the voltage of booster;  $Eg$ , the efficiency of generating apparatus;  $Eb$ , the efficiency of booster;  $E_1$ , the operating expenses for direct feeding—coal, oil, water, waste, engineers, firemen, and interest on so much of the steam generating and transmission plant as is due to the feeder under consideration;  $E_2$ , the operating expenses for booster feeding—details as before;

Substitute the following values in Eq. I.:  $C = 200$ ;  $V = 500$ ;  $V = 550$ ;  $S = 45$ ;  $Eg = .95$ ;  $g = 25$ ;  $K = .13$ ;  $p = 75$ .

We have

$$\$ = 9735 + 1374 M^2. \quad (III.)$$

Substitute the same values in Eq. II.; assuming 211,600 as the value of  $m$ , taking  $Eb = .90$ , and finding an expression for  $V_2$  in terms of  $M$ , we get  $\$ = 8,732 + 2,857 M$ . (IV.)

In order to graphically represent the relation between initial investments in the two methods of feeding under discussion, Eqs. I. and II. have been solved for varying values of  $M$  from 1 to 30, and the results plotted on Diagram I. An inspection of this diagram shows at once the immense superiority of the booster system over direct feeding in cases where first cost is the essential feature. It will be noted that the curves have been carried out for the entire thirty miles, without regard to the practical voltage limit in direct current machines, or the point at which the cost of operating an independent station becomes less than operating from the main station.

Diagram I. shows that for distances greater than one and one-half miles it will cost less to install a booster system than to place copper and machinery in the usual manner for feeding direct. In cases where motive power is water, costing little or nothing per horse power, these curves give at once the relative economy of the two methods; but ordinarily, on account of the consumption of

The intersection of the upper curve with the upper straight line is the point at which the booster system costs as much to operate as does the direct system. This distance we find to be 12 1/2 miles. For shorter distances, direct feeding is more economical, while for longer distances the booster system has an absolute advantage. Now, the assumption upon which equations V. and VI. were solved is a feeder constantly loaded to its maximum capacity. The absurdity of this assumption is apparent when one considers the actual conditions which obtain in railway work; the average load on the feeder during the entire year will be more nearly one-third or one-quarter of the maximum. We have therefore established and plotted equations similar to V. and VI., for 1/3, 1/2 and 1/4 load, and the resultant curves are shown in Diagram II., in order to afford ready means of comparison.

A careful study of these diagrams demonstrates in what the economy of the booster system consists. While the method we have outlined may seem like robbing Peter to pay Paul, it must be remembered that in direct feeding there is a large amount of capital invested in the pole line, accruing interest day and night, in storm and sunshine, irrespective of the traffic on the line; while with booster feeding, the interest on copper investment is nominal, the power required to drive the booster itself being proportional to the load on the line. Thus we can readily understand why, under the



conditions given, with an average load of one-quarter the maximum, the booster system is absolutely more economical than the direct feeding system for distances over  $4\frac{1}{2}$  miles.

The equations here laid down will serve to answer any questions that may arise as to relative first cost or operating expense. It has been impossible to represent results derived under varying conditions without multiplying the diagrams indefinitely. All calculations have been based upon the most recent methods of rail bonding and track feeding; and the assumption that the resistance of the return circuit is equal to that of the outgoing circuit is therefore perfectly safe.

It may occur to some that the installation of a special high voltage generator to supply the feeder in question would be a simpler method of reducing the copper; but a cognizance of the enormous variations in drop under extreme changes in load, on a long feeder calculated for ampere capacity only, leads at once to the discarding of such a scheme until such time as manufacturers can furnish efficient generators over-compounded from 50 to 150 per cent.

The adaptability of the booster to railway work of all kinds is wonderful. A few specific instances are noted, in the confident belief that the suggestions thus thrown out will impel each and every electric railway manager to personally investigate this system, with a view to ascertaining exactly how far it would prove of advantage when applied to his particular road.

Ordinarily in calculating copper for distribution, we are obliged to allow for special features influencing traffic, such as ball grounds, race-tracks, picnic groves, etc. As there is seldom any necessity for bunching cars at all these points simultaneously, and as the various features are usually scattered, it follows that at all times one or more of the feeders is lying comparatively idle. Under the plan suggested, the copper is figured for average conditions, and a booster, placed in the station, is arranged to be thrown immediately upon any

DESTRUCTIVE ARCING OF 500-VOLT FUSES.\*

BY W. S. HARRINGTON.

The destructive effects of the arc accompanying the opening of 500-volt circuits with switches, lightning arresters and fuses have led the writer to inquire into this phenomenon, particularly in reference to fuse practice. A series of carefully conducted tests was made to find the relation between the fusing currents of different size copper wires ranging from No. 30 to No. 21 B. & S. gauge, the time required to open the circuit, and to what extent the arc contributed to the time required.

An inclined trackway was constructed, having two copper tracks upon which a traveler, consisting of a block of hard wood having copper plates in contact with the tracks, could run, the circuit from rail to rail of track being completed through an electro-magnet on top of the traveler. Parallel with and alongside of the track was a raised board, on which a paper was attached. An impress was made on paper by a lever on the traveler, when released by electro-magnet, owing to stoppage of current.

Before tests were made the trackway was carefully calibrated as regards time for traveler to go from top to bottom and the intermediate points, resulting in knowing the time to  $\frac{1}{100}$  of a second.

The tests were conducted across the bus bars of switchboard of the Camden Horse Railroad Company, Camden, N. J.; average voltage, 515.

Before throwing a fuse in circuit, a water rheostat was set, using a Weston ammeter for this purpose, so that the current desired would flow through the fuse, when the circuit was completed by the traveler on the trackway.

The different size fuse wires were subject to the following limitations: The time of the traveler running full length on the trackway, 1.5 seconds; the current ranging from 20 to 130 amperes in 10 ampere steps.

The curves as given in chart No. 8 for No. 28 B. & S. copper wire illustrate excellently the erratic character of the fusing of wires under conditions as observed in the practice of to-day.

The time required to open a protected terminal fuse wire becomes less and less as current increases and grows less regularly, showing that a regular law is followed. The curve is a hyperbola having its asymptotes for its axes, and the equation for it is  $xy = 13$  for No. 28 cop. Whereas the two unprotected terminal fuses are uncertain and show in a very pronounced manner wherein the terminals contribute to this end, the conclusion one is forced to draw is that a fuse wire in practice, when it fuses, does not do as it was intended to, open the circuit, but establishes a condition, though the time may be limited, wherein the terminals act as a magazine to furnish the gas through which the circuit is continued. The curves throughout do not show any superiority of the 6-inch fuse over the 3-inch. Looking at the results in comparison, as given by the Board of Fire Underwriters, which is attached to this paper, the very point they should have observed was overlooked, to wit, the continuance of the arc through but a short period of time, at the expense of the terminals, and the possibility of the vicious gas thus generated, coming in contact with other circuits and establishing other and more serious conditions, such as short circuits and possible fires.

Not to be misunderstood, while the tests as are herein recorded show no superiority of the 6-inch unprotected terminal fuse wire over the 3-inch unprotected terminal fuse wire, the 6-inch fuse wire is unquestionably safer when conditions are more extreme, such as for instance when a short circuit occurs.

The determining factor in this matter of fuses is: What are the conditions required to protect against absolute short circuits across the bus bars of a large power station, 500-volt switchboard? Tests are conducted showing how fuses act under conditions that are predetermined, certain cur-

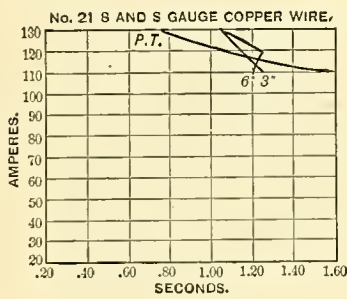


FIG. 1.

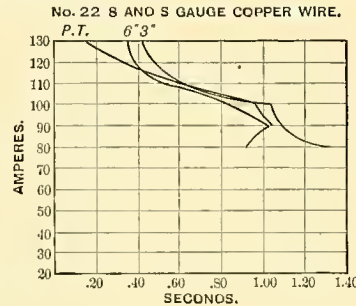


FIG. 2.

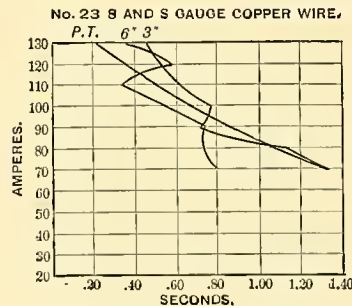


FIG. 3.

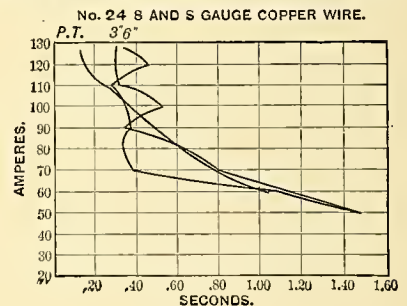


FIG. 4.

feeder which may become burdened with an excessive load.

Another feature of this system which makes for economy becomes prominent on long suburban lines forced to run an infrequent schedule late at night. On such a road the booster may be shut down and cut out of circuit entirely when the load on the long-distance feeder drops to say one-quarter of the maximum, depending upon the amount of copper in the line.

If this suburban line extends to a park or pavilion which is open only during the summer months, the advantage of the booster over direct feeding is enormous, since the investment on a booster lying idle is a small fractional part of the interest on the idle copper of a direct feeder.

On many lines already in operation the copper in the line has proved entirely insufficient, and the erection of additional feeders is contemplated. Would it not be worth while to consider the installation of a booster at one-tenth the cost of the extra copper, provided calculations showed the economy of operating the two systems to be equal?

In the progress of electric railways, as in the growth of cities, development frequently fails to follow the lines predicted for it. It therefore happens that many a road to-day is worrying along, the victim of misplaced judgment—and copper. In many instances the adoption of a booster and a redistribution of the present copper will remedy the evil in the most economical manner.

In large cities such as Boston, Brooklyn and Philadelphia the tons of copper could in this way be largely reduced, with a gain at the same time in uniformity of pressure.

Ballston, N. Y.—Stephen C. Medbery and Herbert C. Westcott, secretary of the Ballston Electric Light and Power Company, have applied to the trustees for a franchise to build and maintain an electric railroad within the corporation limits of Ballston Spa, the objective point being Rock City Falls, seven miles distant. If built the road will carry freight to and from the various pulp and paper mills and factories along the route. If the franchise is granted the road will be built by June next.

The smaller fuse wires would fuse with the minimum current of 20 amperes, and in all instances inside of the 1.5 arc limit. Consequently, the curves show a wide range, but in the larger size wires a greater current was required to fuse the wires in the 1.5 second limitation, consequently the curves given for the larger fuse wires show less and less range as the fuse wires increase in size.

In order to strike an average, the tests were repeated under similar conditions as regards current and gauge wire with a 3-inch horizontal fuse, a 6-inch vertical fuse, both of which were connected to a standard form of fuse block, also a  $4\frac{1}{2}$ -

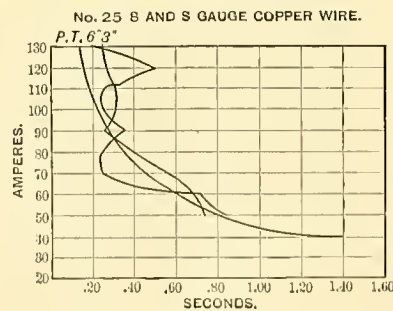


FIG. 5.

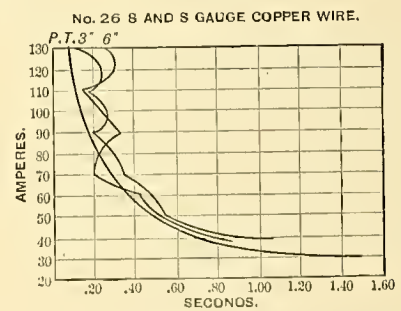


FIG. 6.

inch fuse, the average in length of the 3 inch and 6 inch was employed connected in a specially-constructed fuse block, which absolutely prevented any arcing of the terminals. In other words, the fusing of the fuse wire could not burn the terminals to which it was attached.

The results recorded graphically in the following charts give, therefore, the time required in fractions of a second for the circuit to be opened under identically similar conditions as regards current and gauge of wire for a 3-inch, a 6-inch unprotected and a  $4\frac{1}{2}$ -inch protected terminal fuse.

\* Read at the Convention of the American Street Railway Association, Atlanta, Oct. 17-19, 1894.

rents which are made to flow, etc., but you never see anything published or advice given in this matter of fuses for the condition which really occurs the most frequently, that is absolute short circuits. The Board of Fire Underwriters' report, herewith attached, gives the different length fuse blocks required for 10 amperes, 20, 30, 40, and so on.

Now the requirements and limitations as prescribed in the Board of Fire Underwriters' report are true and perfectly safe when the fuse "blows" under the conditions as outlined in the tests, as made by the committee appointed to make such tests.

But on an absolute short circuit across bus bars, as above stated, a 10-ampere fuse block constructed as specified, will, instead of protecting one when most in need of such protection, burn up in the most vicious way, and will open magnetic cut-outs in a power station requiring currents up to a 1,000 amperes to open. Understand, the fuse does not itself do this, but the arc established at the expense of the terminals is the immediate and sole cause, and the circuit must be opened elsewhere. As stated, the magnetic cut-outs, above referred to, open the circuit.

This matter of arbitrarily adopting a series of fixed dimensions and conditions, under which



fuses are to be used, is absurd, and is very similar to a case which came up on the railway with which I am connected.

A man came to the president with a car fender which he was anxious to have adopted. After expatiating for some time upon its merits, it finally came out that under certain conditions the fender was really good, and if a person should fall in one particular way the fender would surely save him; and he promised to send printed instructions with each fender, so that the people could be instructed to fall properly.

The conclusions one is forced to draw from the above tests and the general literature upon the subject of fuses are as follows:

First. The proper and only fuse block to be used is one having protected terminals.

Second. That fuse blocks should be furnished so

Much has been done in this direction, but there is more still before us. We do not yet require the absolute steam railway standards, due to the interchange of cars over the various lines, but, with the growth of our suburban roads, it is not too much of a prophecy to predict this necessity in the near future.

It is not, and probably never will be, possible for all managers to agree on all points; but why should there be a difference of height of car floor above track, or diameter of wheel, on any two new or remodeled street railway lines? For our city and suburban service practically similar conditions exist all over the country, and like the steam railways we should have universal standards.

With the increase of standards comes a parity in the experience of those using them, and by the continued comparison of such experiences it be-

comes possible to approach perfection. There is a decrease in the cost of standard parts due to the elimination of constant experimental work, the production of the same article in large quantities, and the increase of competitive manufacture.

When standards are adopted, we need not carry a large stock of the various parts; and our men, becoming familiar with these parts, can save time and money in replacing them when broken or worn out. We believe in standards throughout; but now wish to call your special attention to the subject of the "shape" and "material" for brakeshoes. Brakes are applied to the track as well as the wheel; but as the latter practice, with few exceptions, is the rule, what follows has special reference to it.

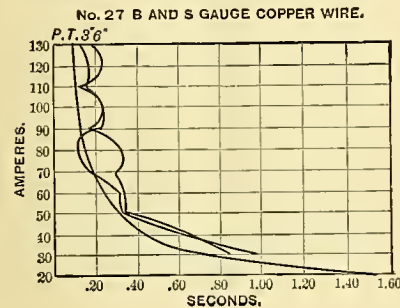


FIG. 7.

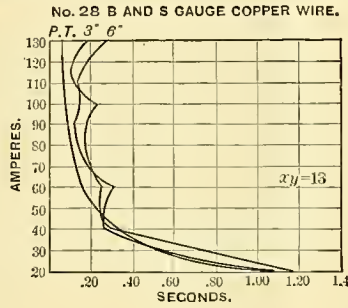


FIG. 8.

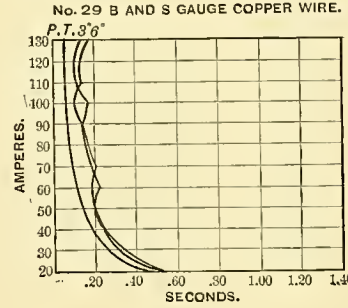


FIG. 9.

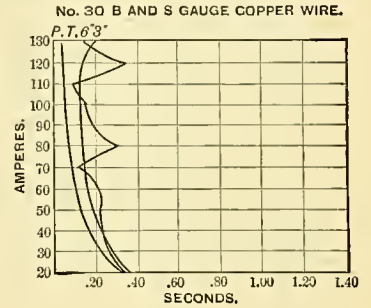


FIG. 10.

that the terminals would not be burned under conditions approaching an absolute short circuit across the bus bars of a 500-volt power station.

Third. That magnetic cut-outs are immeasurably preferable under all circumstances.

REPORT OF UNDERWRITERS' INTERNATIONAL ELECTRIC ASSOCIATION.

The following data give the maximum lengths between terminals at which arcing occurs, the minimum lengths at which no arcing was observed, and the safe lengths on 500-volt circuits for fuses, whose melting points are identical with the various current strengths designated:

Amperes.	Maximum length at which arcing occurred.	Maximum length at which no arc was observed.	Safe lengths.
10	1/4 inch	1/2 inch	1 inch
20	1/2 "	3/4 "	2 inches
30	2 inches	2 inch s	2 3/4 "
40	2 1/4 "	2 1/2 "	3 1/4 "
50	2 3/4 "	3 1/4 "	3 3/4 "
60	3 "	3 1/2 "	4 "
70	3 1/4 "	3 3/4 "	4 1/4 "
80	3 3/4 "	4 "	4 3/4 "
90	4 "	4 1/4 "	5 "
100	4 1/4 "	4 3/4 "	5 1/2 "

BRAKE SHOES.\*

BY D. F. HENRY AND POWELL EVANS.

The street railway is quite as old in this country and abroad as the steam railway proper. Owing to the immensely greater size of the latter, however, early in its existence the importance of even insignificant items of cost in construction and maintenance was made clear. As the various original steam roads became consolidated into the present great systems, economy required on every hand the adoption of standards wherever possible for each system. This principle then extended to the adoption of standards, applying not only internally to each system, but externally to all systems.

The necessity for effecting standards was the prime cause of existence of the Master Car Builders' Association, which includes representatives from about every steam railway in the United States. This association has collected most facts relating to the operation of all lines, and gradually reduced the greater number of details to standards. Among other net results at the present time are—the standard track gauge, coupler, wheel, and all such parts as must necessarily be similar to permit cars from any one line to be operated on any other.

If standards have proven simpler and more economical in every way for steam roads, the fact should apply with equal force to street railway operation. Up to 1886, when electricity began its revolution of the latter industry, the horse railways were often conducted in a rather careless manner, without due regard for petty economies. Until the last year or two, since the introduction of electric motive power, the enormous change and growth of the business have taxed its managers to the uttermost to care for the vital necessities for keeping their respective roads in operation. Now, however, when the power station, track, overhead line, car and motors are quite as perfect as similar parts of the steam railway, it is full time that this association should proceed to the adoption of standards for details.

comes possible to approach perfection. There is a decrease in the cost of standard parts due to the elimination of constant experimental work, the production of the same article in large quantities, and the increase of competitive manufacture.

When standards are adopted, we need not carry a large stock of the various parts; and our men, becoming familiar with these parts, can save time and money in replacing them when broken or worn out.

We believe in standards throughout; but now wish to call your special attention to the subject of the "shape" and "material" for brakeshoes. Brakes are applied to the track as well as the wheel; but as the latter practice, with few exceptions, is the rule, what follows has special reference to it.

The steam railways have reduced the parts of their brake gear to a standard of shape—the beam, link, release spring, hanger, clevis and shoe. They have found designs good enough for all to use, and so good that no one road seems able to improve upon them.

Having decided upon these standards, they specify them when buying rolling stock, get them and use them. Why should not our various truck manufacturing companies use a standard brake attachment? and if they can, why do we not decide upon one and insist upon its use? As was stated above, the steam railways some time ago settled the matter of "shapes," so this point does not appear in their recent discussions on brake shoes.

As regards "material" they are still undecided, but are unanimous on one fact, viz.: that the best thing for one road is best for all. Is this not true also among our roads?

[The last report of the Master Car Builders' Association on this subject was read. The authors then speak of the fact that they sent to street railway companies a circular asking for information regarding brake shoes, but few facts were elicited. The lack of accurate information indicated that members took little interest in the matter. The conclusions of the authors' investigation are then presented.]

In our opinion, a standard shape of shoe proper could be put in practical and immediate use. Out of 24 circular replies on this point 23 favored such a plan. The principal objection made to it is that the hangers wear and will not hold shoes tightly for any length of time. Is this not largely due to faulty design, as the Master Car Builders' Association standard for some years has consisted of a separate shoe and hanger? We are using the word hanger as meaning the clevis in steam railway practice.

The Graham Equipment Company also use this standard on their trucks, and in a recent letter on the subject they state: "We have no trouble with hangers wearing out. We find they hold the shoes tight, and so far in our experience of three years we have not yet found a case of the hanger or shoe rattling loose." The Atlantic Avenue Railway Co. of Brooklyn uses the Master Car Builders' standard, varying the hanger attachment to fit their trucks. The Electric Traction Company, of Philadelphia, the Baltimore City Passenger Railway Company and many other lines using the McGuire Truck Company's shoe, or designs similar to the Master Car Builders' standard, vary the hanger to fit different trucks. You will find samples of all the above mentioned shoes among those now on exhibi-

Without further attention to shape, we will proceed to some consideration of material. From conclusions based on the foregoing Master Car Builders' report and letters immediately following it, there appear to be three main conditions involved in the "best material," viz: that it should be economical in wear itself, economical as regards wear on wheels, and should have a good coefficient of friction. Different men will vary in opinion as to the relative importance of these three conditions.

It seems to be generally conceded that neither chilled iron or steel is advisable, as they have not a sufficiently firm hold on the wheels, and wear them too much.

Soft cast iron, on the other hand, is satisfactory on both these points, but wears out too fast. Various combinations of soft and medium hard cast iron, with wrought iron, chilled iron or wooden segments inserted in the frictional face—from 20 per cent. to 40 per cent. of the face—have given the best results in all these respects in street railway service so far. The Lappin and Baltimore Car Wheel Companies' shoes represent the soft and chilled segment type; the Composite Brake Shoe Company's shoe, the iron and wood segment type; and the Wharton Company's shoe the wrought and cast iron type. Still another type is the Wharton wood shoe, in which the frictional surface consists of oak cut across the grain. The Pennsylvania Railway Company uses a medium hard or soft, if you please, cast iron mixture for its shoe; but it is well to remember that the pressure of the shoe against the wheel, and the circumferential velocity of the wheel, are much greater in steam railway practice than in ours, and the former could not use at all with safety material which might do our work.

A chilled iron shoe would burn their wheels and a wooden shoe would be set on fire. Another point of difference in conditions of the two practices is the normal freedom from dirt and grit on the steam track, and the necessary presence of both on all tracks laid in city streets. This grit undoubtedly increases the frictional coefficient between the wheel and the shoe on street cars, but also tends to increase the grinding of both.

Messrs. A. Whitney & Sons, wheel manufacturers of Philadelphia, have designed a shoe having open cuts across the frictional face to permit this grit to fall out. As the area of the frictional face must necessarily be as great as in others of continuous surface, they practically apply a number of small shoes instead of one large one, and the total amount of grit retained by the former type is probably equal to that retained by the latter, so we cannot see any actual difference in result in this respect between the two. The grit is always with us and must be considered an ineradicable factor in our problem. In connection with the area of frictional surface, the best practice seems to be for the shoe to be not less than 12 inches long, and to rub on both the tread and flange of the wheel.

Regarding this question of material, we have collected the available information, but are free to confess our inability to suggest final conclusions. We must think and work over the matter for a time.

The object of this paper is to call your attention to the value of standard design in the practical business of squeezing dividends out of the operation of your roads; to show you that steam rail-

\* Synopsis of a paper read before the Convention of the American Street Railway Association, Atlanta, Oct. 17-19, 1894.



ways have standard shapes for brake shoes and attachments, and that we should and could have our own; to inform you that our roads, as a whole, are inconsistent in their selection of material for brake shoes; and to lay before you for further consideration the facts known regarding the merits of various materials for this purpose.

Too much stress cannot be put on the value of good records in this and other details. The results will more than repay the trouble and book-keeping costs.

The limited time permissible for the preparation of this paper—about three weeks—will make you lenient in criticising its shortcomings.

We now beg to suggest the appointment of a committee to investigate the subject during the coming year, to make experiments, if deemed advisable, and to report at the next convention. A sum of money should, in our opinion, be appropriated by the association for their use. The Master Car Builders' Association is now having a series of experiments made at the works of the Westinghouse Air-Brake Company, on brakeshoe material.

### POWER-BRAKES VS. HAND-BRAKES.\*

BY E. J. WESSELS.

Hand brakes and friction brakes have not materially changed since the day they were first put in service.

It is obvious that a brake only powerful enough to stop a small, slow-moving, light-weight car has outlived its usefulness when applied to cars weighing seven tons or more, propelled by an unseen force which has driven live-stock from the field.

The modern brake, when placed alongside of the old-time brake, bears the same relation to it that an arc light does to a kerosene lamp. Brakes of all kinds are useful, but the brake installed to-day should answer all the severe requirements of modern practice.

By common consent, the two things regarded as most important in steam railroading are the wheel flange and brake. None of us would like to travel on the Empire State Express if we had to depend upon hand brakes instead of the well-known air-brake.

It is not strange that car builders have not kept pace with present requirements, in their braking apparatus. They have done well for the street-railway fraternity, but heads and hands have been occupied in developing trucks, wheels and car bodies, and builders have not been able to do justice to the brake. The radical changes in car building brought about by cable and motor cars have kept builders busy. They could not devote their entire attention to improved brakes.

We have no controversy with car builders on this question, and wish to suggest rather than to criticise. If buyers demanded improved brakes, builders would conform. As such demand has not been made, the brake of to-day remains in appearance substantially what it was 20 years ago.

The evolution of the electric motor has been rapid and astonishing. Motor builders have had great odds to contend with, but have overcome them, and the leading types of machines combine efficiency with low cost and economy of operation. Motors have been standardized.

It will not be denied that hand brakes are inadequate. If power brakes could be furnished at the same first cost as hand brakes, they would be universally adopted. The day is approaching when brakes will be considered as separate equipments, and will not be quoted in the lump sum named per car. There is no more reason for including brakes in the estimates than for including motors.

On roads free from grades there is obviously not such imperative necessity for reliable brakes as there is on roads which have grades of from 5 to 14 per cent., or where travel is congested, and especially on suburban roads operated at high speed.

Railway men are seeking the most improved appliances of all kinds. They have found it profitable to include many things in their rolling stock which formerly were not used. Thus elegant cars have come into use equipped with vestibules, plate glass, stained glass, Pintsch gas, upholstered seats, electric heaters, fine headlights, and even call bells. These are radical departures from the old-time cheerless cars, which were generally not heated and had smoking oil lamps, and floors littered with straw. Improvements pay. If they did not, they would not be made. Formerly it was difficult to work one's way to the door of a car, and when one got there, it was at times hard to get out. To-day, with improved facilities for ingress and egress, crowds are comfortably carried. This change in car construction involves additional expense. It is paid without complaint, because the outlay is found to more than pay for itself in increased business. Then, too, the public demands improvements, and there is more disposition on managers' part to give the public what it demands, if practicable.

It will not be maintained that the improvements are absolute necessities, nor can it be shown that they are in any sense "life-saving."

Ocean flyers in service have twenty thousand dollar oil paintings ministering to the aesthetic tastes of tourists, in their saloons. In the hour of collision it is far more important that passengers have a properly constructed lifeboat at their disposal than any creation of the painter's art. Each has its sphere, but the more important thing is the lifeboat.

It is so in street railway practice. Cars should be artistic, but they should be equipped with brakes that will do their work quickly when danger impends.

On steam roads hand brakes proved utterly inadequate. They were tested and found wanting. When the first air-brake made its appearance it encountered great opposition. Where would steam railway practice be to-day if air-brakes were eliminated? The battle of power brakes vs. hand brakes on steam roads was fought years ago, and air-brakes remained in possession of the field. It is questionable if the need for power brakes is as great on steam roads as it is on surface roads, especially when trailers are run. Steam road stations are miles apart. It was comparatively easy for an engineer to whistle "down brakes," to cut off steam and bring his train up standing. The inertia to be overcome was greater, but he had not the grades to contend with that exist on surface roads.

Electric cars in even out-of-the-way places ascend grades that no mogul engine has to confront. Of course there is a corresponding down grade, and it is here that the difficulty arises, for surface cars ought to stop for passengers, no matter how steep the grade or high the speed may be. Otherwise earnings decrease.

The braking power on an electric or cable car should be so positive as to permit of stopping in less than the car's length, if necessary. One has only to watch the men braking cars going down such grades as exist in Albany and Jamestown, N. Y., Easton and Allentown, Pa., and scores of places, to have a full appreciation of this point.

Recognizing the inadequacy of a single hand-brake on grades, many roads have provided a duplicate inside equipment. This extra equipment is additionally expensive, not only in first cost, but especially in maintenance.

A motorman realizes how difficult it is to keep his car under control, hence he sets one brake before a car starts down grade. He then depends upon his other brake. Manifestly, when one brake is set from start to finish, it means wear and tear of apparatus and short life for the shoes. Moreover, the speed of car is needlessly retarded and fewer car-miles per day can be run than would be made if he had a positive braking outfit at command.

In a good air-brake the brake cylinder is constructed of iron and contains a piston and piston rod, which are attached to brake levers under the car. The rear end of the brake cylinder is made air-tight, and connected with the train pipe, so that when air is applied from the reservoir it forces out the piston in the cylinder and sets the brakes.

The power of the brake cylinder can be easily calculated, and is equal to the square inch area of the piston multiplied by the air pressure carried in the reservoir, hence:

Brake cylinder 6 inches diameter and 30 pounds pressure gives 848 pounds power at the brake cylinder.

Brake cylinder 7 inches diameter and 30 pounds pressure gives 1,154 pounds power at the brake cylinder.

Brake cylinder 7 inches diameter and 32 pounds pressure gives 1,231 pounds power at the brake cylinder.

Brake cylinder 8 inches diameter and 35 pounds pressure gives 1,759 pounds power at the brake cylinder.

This may be increased by using larger diameters, or higher pressure, and by arrangement of brake levers any additional power may be obtained; at the same time it can be graded suitably to the weight and speed of car.

Friction (or continuous) brakes operated from the axle have been used for years on cable systems, and the jar from them has caused constant complaint. On electric cars friction brakes, of course, cannot be used. The braking force requisite to bring a car or train to a stop should never exceed the weight of load resting upon the wheels to which brakes are applied. Any power applied in excess of this is wasteful and dangerous. The full power of a friction brake depends upon the load carried on axle to which friction discs are attached. For example, with a grip car and passengers weighing 8,000 pounds, the weight being equally divided between two axles, leaves 4,000 pounds carried by the axle with friction discs. With car wheels of two and one-half times the diameter of friction drum, we gain that much leverage, which multiplied by 4,000 pounds gives the direct pull power of friction brake of 16,000 pounds.

Nor is this all. The brake levers of street cars

are as a rule adjusted to about four and one-half times leverage. If, then, we multiply the 10,000 pounds pull of friction brake by this leverage we have a strain of 45,000 pounds upon brake beam and shoes. This is vastly more power than is ever required. When two or more cars are coupled together it is impossible to regulate brake chains and brake gear so that every shoe shall press with equal force against the wheel.

When, therefore, a gripman applies his friction brake, the entire 45,000 pounds is carried by the beam and shoe that are adjusted nearest the wheels, and the remaining wheels revolve without noticeable check.

In a train of three four-wheeled cars with passengers, weighing 36,000 pounds, resting on 12 wheels, a brake power of say, 2,900 pounds applied to each wheel would make the most perfect stop. If the entire 45,000 pounds power of friction brake is applied to only two wheels of such train, there will be 38,000 pounds more power exerted than necessary to stop wheels from revolving, and at the same time only one-sixth effectual braking power is obtained as compared with a braking pressure distributed against every wheel under the train. Such harsh, rigid, excessive power of the friction brake, applied quickly by the momentum of the whole train, will wear out any kind of brake gear, no matter how good or how strongly made, and the constant jar adversely affects the life of cars. In cold, wet and stormy weather (with slippery tracks), when grip car is abandoned except by the gripman, the pull power of friction drum is greatly reduced just at the time it is most needed to set brakes on trailers, which are always overcrowded at such time.

A 28-foot closed electric car, weighing without passengers 20,000 pounds and running at 10 miles per hour, has over six times the energy to overcome when brakes are applied that a horse car has weighing one-fourth as much and traveling at less than one-half the speed. Moreover, when horses were employed there were 10 feet extra length in which to stop car. This extra length is no longer available since the advent of electric cars. Unless cars have proper brakes high speeds are most dangerous.

Without entering the humane feature of braking, it cannot be denied that at best hand-braking is a great task for even strong men. They report fresh in the morning and for a time muscles stand the strain; but after a few hours handling of a grip lever or controller handle they find their strength decreasing. Realizing this, for the rest of the day they slow up earlier than strictly necessary or (as often happens) they do not stop at all and let cars run past crossings, missing passengers, who do not always wait for the next car, but walk instead.

If, however, the men have ready for instant use an ally in the shape of power requiring but the touch of a handle to become available, they are placed in the best possible position to make as many stops in as short a distance as is necessary. Not being fagged out, they are better able to do their company more justice and are more on the alert to prevent accidents.

In the distressing accident which occurred seven weeks ago in New Jersey, this point was particularly emphasized. We quote from New York Herald, Aug. 27, after having ascertained from the officials that the report is accurate: "When the crowded car began to go down the incline, the brakes would not respond promptly to the demand of Motorman Gornley. Tight as he could wind up the chain he felt it slip repeatedly. He knew what this meant, and, with full strength he set the brake as hard as he could. But his efforts were in vain, and the car gained greater headway every instant. It was beyond his control, and he realized that in a few seconds the car would strike the sharp 'Crab-tree' curve. As it dashed down the steep mountain-side tracks he turned and shouted to Conductor Badgely to put on the rear brake chain.

"Badgely was inside the car, and at Gornley's call every one suddenly realized the danger. The conductor was wedged between the passengers, but he fought his way to the rear platform and wound up the remaining chain of the single brake system from there. In an instant he saw that it too was of no use in the emergency, and turning, he shouted: 'Jump for your lives! The car is running away and will strike a curve.' The car was rushing on to that fateful curve. Like a shot propelled by some awful power it went. Then it struck that curve. A section of one of the wheel flanges snapped off, and an instant later the car left the rails. It plowed its way across the track with scarcely any perceptible diminution of speed, was jerked sharply to the right, when the wheels struck the opposite rail and then capsized, landing squarely on its side with a crash which was heard a quarter of a mile away."

We need not pursue the account further, except to say that 18 people were hurt, many of them badly, and one boy's arm had to be amputated. A thirty-five thousand dollar damage suit is pending against the accident insurance company which wrote the risk on that road, and the same com-

\* Read before the Convention of the American Street Railway Association, October 17-19, 1894.



pany has settled a number of cases out of court. It is only fair to state that had that entire system been equipped with power brakes equal to such emergency, the chances are the car could have been stopped long before the danger-point was reached, without injury to limb or property.

It is not the purpose of this paper to make capital from such sad occurrences: we are opposed to sensationalism, but it is proper to call attention to such a calamity, as a warning. What happened on that road has happened on others, and will again occur, so long as implicit reliance is placed upon hand brakes, which cannot possibly do the work required of them at such crisis. The first cost of equipping the entire line with power brakes would have been but a fraction of what the damages will cost.

It is unnecessary to multiply instances where hand brakes have shown radical defects. That practical men have been apt to think too lightly of the question of improved brakes is explainable by their having so many other important things to oversee. Then, too, the aim of a railway man is to incur as few obligations as possible, and to operate with utmost economy and earn dividends. But often seemingly cheap apparatus proves dearest in the end.

Probably 75 per cent. of recorded accidents is chargeable to inefficient brakes. Statistics of this sort are hard to tabulate, and some records show even a higher percentage. While hand brakes often stop cars quickly, they do so by consuming excessive energy. This means waste and increases maintenance account. Then, too, it is impossible for a motorman to maintain his maximum strength for a long time. In active service he has to apply brakes between 250 and 400 times daily. He can only exert his maximum strength spasmodically and temporarily, even when aided by the weight of his body. "A chain is no stronger than its weakest link."

The day is past when railway employees are considered merely automatons. Not all men make good motormen and gripmen. These positions, like that of conductor, are ones of trust. The men as a rule are intelligent, and during the recent financial depression many recruits have been made who formerly filled much higher spheres. The strain of a day's work on these men is very severe.

When we consider how many chances people take in crossing tracks in front of moving cars, or in jumping on or off despite printed warnings, this strain becomes more apparent. No matter how fast or slow cars go, people are always dodging them with reckless disregard of danger. A motorman is not allowed to shout. He is required to keep silent. In the presence of danger he can only rely upon his gong or whistle and his arms. These alone are not adequate when drunken or deaf men are on the tracks.

The most painful thing which comes under a street-railway man's notice is the killing or maiming, especially of children. When a little child, ignorant of danger, toddles to the track and sees the car coming, it generally stops, hesitates, starts off and usually rushes in front of the car. The motorman who has to depend upon a hand brake at such time seldom succeeds in stopping his car. It is not an unusual sight to see a little child taken from under the wheels.

Touching the legal aspect of the brake question, while it often happens that plaintiffs are nonsuited on the ground of contributive negligence, to the railway man this frequently means outlay for legal talent. Even though his company or the underwriters are not called upon to pay damages in such cases, it is surely better to prevent accidents than to defend lawsuits, especially as prevention is cheaper.

It is a menace to life and property to have a high-speed motor at work without having suitable power to control it. Thus far "reversing" has not proved a success, and, while theoretically one motor acts as a generator to drive the other (if there be two, which is not always the case), in practice this has proved a failure. The danger of relying upon the same current which propels a car to stop it, too, is only too apparent. If the current fails to work in one case, how can it be expected to work in another? The trolley may run off, or there may be a break in the line when current is needed for braking a car plunging down grade. "It's the unexpected that happens."

Hand brakes have no emergency stops. Air-brakes have and, if necessary, stops can be made so quickly as to apply brakeshoes instantly to every wheel on one car or a train of cars, in the most effective manner. No hand brake can do this.

When hand brakes are used it is necessary to have a separate brakeman for each trailer. When an air-brake is used, these extra men are entirely dispensed with. On a train of a motor car and two trailers, if air-brakes are used, only one motorman and one conductor are necessary. If hand brakes are used to control the same train, four men instead of two are necessary. This means a saving in wages of at least \$21 a week, and will soon pay for an air-brake equipment.

Moreover, when air-brakes are used, there is no

shuttle movement, jerking or bumping, and the shoes are applied evenly to all the wheels; whereas in hand braking it is impossible for different men on different cars to brake in harmony. One car will be braked hard and another not so hard. Of course no good results from such ununiform braking.

Air-brakes are provided with reserve power stored in reservoirs, and, by having large enough capacity, the air pressure required for braking becomes practically inexhaustible. The air pump of a thoroughly good air-brake is most economical in operation. It requires no power when a car is starting or when it climbs grades. As it takes ten times the power to start a car that it takes to keep it going, the advantage of this is obvious. A good air-brake is so compact that very little room is required for it under the car body. It has no cumbersome or complicated machinery to get out of order. It works automatically. It needs much less attention than an electric motor gets. It is only necessary to keep the mechanism clean and in order, and to lubricate pump regularly. No hinges or springs annoy inspectors or employees. A good air-brake pump, the moment it has compressed sufficient air, cuts out and runs in free air with the axle. A good air-brake entirely replaces a hand brake. The hand brake may be left on the car, and the air-brake can be so attached as to leave the hand brake available should it be required. A good air-brake requires no expert to operate it. It is so simple that a child can work it. This being so, a railway manager is not restricted to hiring men of a certain height or weight, for when work is done by compressed air instead of muscular strength, no Samson is required to work the handle.

In steam practice trunk lines maintain schools of instruction in which men are taught to handle air-brakes, and only qualified engineers are trusted to operate them. A good air-brake for surface roads is so constructed that, when used by men not schooled in its use, it does not get out of order. It is capable of being misused without proving defective. The physical labor involved in working the ordinary hand brake causes the other good qualities of a gripman or motorman to suffer. This has a direct bearing on accident account, wear and tear and repair accounts. The application is obvious. "A stitch in time saves nine."

A good air-brake enables a man to make the best possible stops without noise, jar or injury to apparatus. In hand braking much excess force is used. This means that rods and bars are strained when stopping cars, and often the brake gear in such shape that, when a quick stop is required, some part is sure to collapse.

One type of air-brake equipment in service enables a gripman, with but a small handle, to work grip and brake either simultaneously or independently. When this type of brake is used on a car, grip and brake levers are entirely removed, giving more space for passengers on platforms. Through its use, what formerly involved painfully hard work is now accomplished with ease. This device is in successful operation on car 421 of the Third Avenue Railroad, New York.

We believe it is better to keep the motor controller and the brake handle separate; but if railway men demand a single handle to operate both it can be supplied, just as was done in the air-brake on Third Avenue, New York, car 421, which works grip and brake. We doubt, however, if a real necessity for a single handle exists.

Recently a new form of power brake has been announced, in which electricity is relied upon. The electric brake, while undoubtedly possessing some valuable features, has some which are a decided disadvantage. It is, of course, in its infancy, and the future of the electric brake will be watched with interest. We saw the paper read by Mr. Sperry on the 19th of last September before the American Institute of Electrical Engineers, entitled, "The Electric Brake in Practice." Mr. Sperry, unknown to himself, quotes our language verbatim, which was used as an editorial by one of the dailies and subsequently was copied in the journals. It is to be regretted that, when using a part of our matter, the able electrician did not use other parts also.

He says that a locomotive engineer has his pressure gauges, which allow him to adjust the brake application to a nicety. A good air-brake for surface roads is also supplied with a pressure gauge, but in practice no Westinghouse air-brake engineer looks at a gauge, and they are more ornamental than necessary. He states that with an electric-brake the brake shoes are entirely dispensed with. Do the street railway men intend to abolish brake shoes? Suppose, as may happen, the electric-brake fails to work, what will become of the car or train? There is an apparent contradiction in the article on this point. In one place it states that the electric brake does away with brake shoes, and in another place it admits that it will be necessary to resort to hand-brakes. How can hand-brakes be used without shoes, and how can a car be held by an electric-brake after the residual magnetism (or Foucault current) is dissipated? He says that the one grave fault of an air-brake in railway service is that the

maximum brake application does not exist as it should at the high speeds. This is an error. The immense advantage of an air-brake over an electric-brake is the fact that power can be applied in varying degrees—great power, when needed, and almost imperceptible power if only very slight retardation is wanted.

An air brake holds the wheels and keeps doing so. An electric brake, after first stop, depends wholly upon residual magnetism. This, at its best, is an uncertain factor. As we understand the paper, the residual magnetism in the electric brake is only available for something less than one-half minute after the car has stopped. When this magnetism is consumed the electric brake possesses no more braking power whatever, until the car is again in motion. It is right here that the air brake shows its immense superiority, for it has the air reservoirs to draw upon when a car has stopped, and therefore ample power is available for immediate and constant use. This failure in source of supply is a tremendously weak point in an electric brake. The paper states that "the current flowing after motion ceases, though small (mark this admission), is found exceedingly useful in holding the car from starting itself, even on quite a heavy grade, as only a small quantity of energy, added to the already great friction of quiescence, will prevent the car from starting." We fear that at such times the advocate of electric brakes would need something more reliable and constant to lean upon. The paper says, "when an electric brake is used it seems as though the car was running into an air cushion." This pays a well merited compliment to airbrakes, for by them an air cushion stop is made possible. The paper adds "operating the brake in this manner it will at once be seen that the system is one of the utmost certainty of operation, surer even than the hand brake, air, or other power brakes." If the speaker had not been for some years in the electric motor business he might not take such decided exception to this claim as he does; but since working with air pressures he has found them much more reliable and safer than electricity. The inventor referred to makes 14 claims of the advantages of his brake over other brake systems. As this paper is not written for advertising effects we purposely refrain from naming any special make of airbrake in contrasting the airbrake with the electric.

1. He speaks of the certainty of an electric brake in operating.

So is a good airbrake certain in operation.

2. "The enormous power and under perfect control."

A good airbrake has much more power, more constant power, and is under better control. It will be noticed that the inventor omits all reference to electric brake power being constant. This lack of constant braking power is the objectionable and fatal defect of the electric brake. It will not be noticeable on a level, but it will be only too apparent on a grade. At the Institute meeting, before which the paper on electric brakes was read, one of the members stated he had been on a train in Connecticut where two motor cars and three trailers were ascending a 9 per cent. grade. While doing so a fuse on the second motor car blew out, throwing all the work on the first motor car. This it was unable to do and hand brakes had to be immediately applied to prevent train from running away. The author of the paper was asked, "What would you do at such a time with your electric brake?" Mr. Sperry, in reply to the question, said that a case of this kind was rather unusual, but that he would have applied the electric brakes, which would have brought the train to a stand-still, and by that time the hand brakes could be applied to prevent the car from running backward down the grade. How then can he claim that the brake dispenses with brakeshoes, and if the electric brake had been used on the train in question to the exclusion of hand brakes and brakeshoes, what would have become of the train and passengers?

3. "The absence of all power absorption at non-neyed cost from the central station."

This may be true if brake-shoes are not used, but remains to be proved in daily service. Shoes probably will continue to be used. A good air-brake consumes very little power. You can test how little by watching the readings on a car operated at this time with an air-brake on the Atlanta Consolidated road.

4. "Its high efficiency, being far superior to compressed air; amply proven in numberless instances where electricity has replaced air. (The air requires a direct application of energy, amounting to an immense aggregate power absorption during the day from the central station; the working parts of the air machinery are attached to the car axles and require a large quantity of energy not only while compressing, but at other times as well.)"

We are unaware of a single case where electricity has replaced air. We are informed on high authority that air-compressors for driving rock drills and coal cutters so greatly outnumber electrical machinery for such purposes that hundreds of air-



compressors are sold for every drill or cutter sold. The statement that an air-brake requires a large quantity of energy, not only while compressing but at other times as well, is wholly inaccurate and entirely incapable of proof. A good air-pump requires no perceptible power after it cuts out.

5. "Its extreme simplicity."

So is a good air-brake very simple.

6. "Observe saving in wheels, two or three fold."

A good air-brake properly applied saves the wheels.

7. "Saving of brake-shoes."

We believe brake-shoes will be retained and would not care to ride on a car without them. Under certain conditions the paper admits hand-brakes will be needed. How can hand-brakes be applied without shoes?

8. "Very little wear of either wheel or magnet."

There is little wear to a good air-brake, and lightning plays no pranks with an air-brake, but is likely to do so with an electric-brake.

9. "No hissing to frighten horses on streets."

We have yet to hear of a case where a horse was frightened by an air brake.

10. "The low E. M. F. at which it operates."

This is true of a good air-brake. It is easy to test power consumption with a watt-meter, by running car with air-pump, and then running car (under exactly similar conditions) with air-pump detached; the slight power consumed will then appear.

11. "The ease of its application and control."

Nothing surpasses a good air-brake in these respects.

12. "Conserving strength, prolonging the usefulness and life of the motorman."

This is open to question when one sees the despair of motorman when fuses melt and switches burn out. Gripman Williams, on air-brake car 421 of the Third Avenue road, New York (where 120 equipments are in daily operation), told the speaker: "This job is so soft I expect some of you Wall street fellows will come here to run cars, since times are hard."

13. "The smoothness of its operation."

Nothing can surpass the air-cushioning effect of a good air-brake.

14. "Cannot cause flat wheels."

A good air-brake properly applied also prevents flattening of wheels.

We had no intention to refer at length to electric brakes, but have felt constrained to do so because the statements we have replied to appear in the printed Transactions of the American Institute of Electrical Engineers, and should not remain uncontradicted.

Lastly it must be remembered that the magnetic clutch of this electric brake has to bear on the surface of a flat disc cast upon the car wheel. This can hardly be called "ease of application," for the brake cannot be applied to the ordinary type of street car wheel. It requires a special casting to be made on one wheel on each axle. This on a large system means an additional outlay for wheels, as "extras are charged for."

We have purposely avoided tabulating the fatal accidents of the last twelve months, directly due to inadequate braking facilities. It, however, is timely to call attention to the charge of Judge Lippincott to the Grand Jury of Hudson County, New Jersey, last month. He devotes special attention to the subject of "killing by the trolley," which he characterized as being sometimes manslaughter. He said: "Deaths by accident have become very frequent. Personal injury, not resulting in death by accident, has become frequent. Now, from mere unavoidable accident, resulting in death or personal injury, no liability whatever arises; but the general rule of law is that where death or other personal injury results by reason of the omission on the part of another to discharge a legal duty, there a criminal liability arises for manslaughter in the case of death, or for an assault and battery where death does not ensue. If the neglect of a legal duty is the cause of death, the person guilty of such neglect is chargeable with manslaughter. If death does not result, but only other personal injury, then he is chargeable with assault and battery. The law imposes upon every one reasonable care in his acts toward another. There is a legal duty owing from one to the other, and a negligent omission of the performance of that duty, resulting in death or other bodily injury, is indictable." He proceeds: "There are many familiar illustrations of these principles of law: A motorman, running his electric car along the streets carelessly, negligently, runs over another and kills him, it is manslaughter, although it was not his intention to injure him. A motorman running his car at a dangerous rate of speed along the streets, running over another by reason of his dangerous rate of speed, the death arising from this omission of duty to run at a reasonable rate of speed, he becomes guilty of manslaughter. If persons in charge of the running of steamboats, railroad trains, electric trolley cars, horse cars or other public conveyances neglect the duty of using reasonable care, and death results therefrom, they are answerable for manslaughter,

whether it be in the erection of buildings, the running of machinery or any other employment."

It will be seen that the judge's charge covers the operating of motors. A jury will certainly class an air-brake as being more than a reasonably safe appliance. It is certain that a plaintiff's attorney in prosecuting a suit for damages will call attention to the fact that it was possible for a company to have availed itself of an air-brake which would have been reliable.

Recently two verdicts were given against one traction company in New Jersey, one for \$3,000, the other for \$5,000; and there are other suits pending for over \$500,000 damages in that place alone on account of trolley car accidents. Thirty-eight deaths to date are charged against that one road since it adopted electricity.

On Sept. 21 Motorman Michael Lewis was convicted of manslaughter in the Court of Special Sessions at Newark. Lewis ran the motor car which killed four-year-old Martha Henry on Aug. 4.

On Sept. 25, Judge Kirkpatrick sentenced Lewis for one year in the County Penitentiary. The judge lectured him severely for carelessness and said he felt it his duty to make an example of him. Lewis was crushed by the unexpected sentence. He expected only to be fined and that his company would help him. On the same day Motorman Desmond was arrested in Brooklyn for nearly killing a six-year-old girl. His car cut off her right foot. He claimed he did not see her until she was directly in front of the car and that it was impossible to stop it in time.

In Alliance, O., it is recorded that "The motorman, when he found his car going down hill at too great speed, immediately lost his nerve and deserted his post." The car was equipped with a presumably good hand-brake. This would not have occurred, had a good airbrake been available.

More than one motorman has lost his reason as the result of a fatal accident. Recently a motorman committed suicide owing to his remorse for having run over a child. It may be said this was not his company's affair, but had this unfortunate man had a power-brake at hand, he would not have killed the child and taken his own life. In a sense we are our brother's keepers. Would it not be well to place in every motorman's hand apparatus which would render indictment by a grand jury out of the question?

There are some railway men who complacently tell us they have no accidents on their road. It may be that such fortunate individuals exist, but we have not found them. It is somewhat curious that after men made this statement there were bad accidents on their roads.

The newspapers have been hounding the fraternity so much in Brooklyn and elsewhere that trolley accidents have become household words or a subject for jest.

There is no part of electric or cable railroading so important as the ability to stop cars quickly and to keep them stopped! This is especially true where electric or cable cars cross steam roads at grade. At such times hand-brakes show their inherent inadequacy.

We do not advocate the adoption of a scientific toy, but submit for your consideration the fact that you can procure at comparatively low cost air-brakes which are positive, simple, economical and highly efficient, and which have been tested in the crucible of daily operation.

In advocating the adoption of airbrakes we are often told by railway men, "We haven't time for experiments. Let somebody else do the experimenting and then we will look into the thing." Had this position been taken by progressive men would there be a single commercial electric motor in existence?

The experimental stage was passed long ago and with 350,000 air-brakes on locomotives, passenger and freight cars, it is untimely to talk about experimenting, for steam roads and surface roads have much in common. If a freight car loaded with pig iron needs an air-brake, how much more is one needed to brake a car carrying living beings?

There are air-brakes and air-brakes. Of the merits of the different ones buyers will do well to satisfy themselves before contracting.

The all-important question is whether the first cost of a good air-brake is too high, or not, in proportion to the advantages gained. No accountant can figure accurately how many dollars of damage claims will be avoided; nor how much revenue will be increased by the quicker schedules made possible with air-brakes (for even seconds count); nor what the gain in labor account will be by not being restricted to hiring any particular height or weight of man; or how much the life of car body, truck and motor will be prolonged. There is a decided gain from whatever point we view the air-brake; and with an air-brake an employee is armed at all points.

Will it not be worth your while to give this braking matter earnest attention? If but a few of this audience will determine to investigate the advantages of the airbrake over all other forms of

brakes, this paper will not have been prepared in vain.

It was written to suggest the value of good power-brakes over hand-brakes, in minutes snatched from busy days.

## NEWS OF THE WEEK.

**Kansas City, Mo.**—Another suit has been instituted to break the consolidation of the Grand avenue and Ninth street cable lines and the Independence dummy line. The suit is brought by dissatisfied minority stockholders of the old Kansas City Cable Railway Company. The court is asked to issue an injunction restraining the consolidated company from operating that portion that was formerly owned by the Kansas City Railway Company, and that a receiver be appointed to take charge of it.

**New York, N. Y.**—The work on the conduit in Lenox avenue is well under way. The iron work is in place from 138th street to 145th street, and ground has been broken to 132d street. Over 600 men are at work. The power station will occupy most of the block between Lenox and Seventh avenues, 146th and 147th streets. Work has been begun on the foundation. The Siemens & Halske electric conduit system will be tried.

**Trenton, N. J.**—Mayor Shaw refused to carry out the instructions of the Common Council to stop the cars of the electric railway company until the company grants transfers over its lines. The city solicitor has advised the mayor that he has no right to do so and that other means must be resorted to.

**Caldwell, N. J.**—Vice-Chancellor Pitney has notified the authorities of Caldwell that he has vacated the injunction against the town forbidding the Town Board to grant a franchise for a trolley railroad. The injunction was obtained by property owners, who were against the trolley.

**Somerville, N. J.**—The New York and Philadelphia Traction Company has abandoned for the present its proposed plan of building a trolley road between Somerville and New Brunswick because of the conditions imposed by the township committee of Bridgewater.

**Batavia, N. Y.**—Work on the new electric railroad from Batavia to Lakeside, passing through Medina and Waterport, has been begun. It is said the new company will construct a dam at Oak Orchard Creek, and water-power will be used for operating the machinery.

**Philadelphia, Pa.**—Officials of the Philadelphia Traction Company made tests of several fenders a few days ago. Attempts were made to pick up dummies on the tracks. The tests were not in all respects successful.

**Brooklyn, N. Y.**—The Board of Aldermen has adopted a resolution prohibiting the use of all open trolley or horse cars from Sept. 30 to May 1, and at all other times when the temperature is below 60 degrees.

**Port Jervis, N. Y.**—The trustees have voted to grant the franchise for operating an electric railroad to the company allied to the one that is to build a road up the Delaware Valley from Stroudsburch.

**Chillicothe, O.**—An officer of the Chillicothe Electric Railway and Lighting Company states that that company proposes to expend \$75,000 in improvements.

**Baltimore, Md.**—Residents of Westport have appointed a committee to secure if possible the extension of the Baltimore City Passenger Railway to Westport.

## TRADE NOTES.

**Siemens & Halske Electric Company.**—The Siemens & Halske Electric Company's factory in Chicago was destroyed by the great lumber fire in Chicago, Aug. 1. The company leased the Grant Locomotive Works on the 11th of that month and commenced moving into the new works Aug. 15. It finished and shipped the first generator built entirely at the new factory, Oct. 15. Every available tool in the new works is now in operation and many of the tools which were destroyed in the fire have been duplicated, so that from now on the company is in the position to furnish one direct-coupled generator each day. These facts indicate the enterprising spirit of the company, and it is now in better condition for competition in the electrical field than before the fire.

**The Coe Brass Manufacturing Company,** of Torrington, Conn., is increasing its boiler equipment and has almost completed a new boiler house. The Coe Company will handle its coal from the storage to the boiler rooms by an equipment of narrow-gauge cars and track designed and manufactured by the C. W. Hunt Company, of New York.



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**Atlanta Street Railway Convention.** The convention of the American Street Railway Association was in all respects a successful assembly; the attendance was large, the papers excellent, the exhibits interesting and the social features unusually enjoyable. One thing was amply demonstrated; that is, the extreme inadvisability of locating the exhibits and holding the sessions at a considerable distance from the hotels. The distance was so great at Atlanta that the attendance at the convention hall was far less than it ought to have been.

**Mr. Joel Hurt, the New President.** The presidency of an organization that includes in its membership so many enterprising, progressive and brainy men, that represents an interest of such splendid proportions as the American Street Railway Association, is an honor of no mean character. Our congratulations are extended to Mr. Joel Hurt, of the Atlanta Consolidated Street Railway Company. If the association does not enlarge the sphere of its usefulness during the next year it will not be Mr. Hurt's fault. He has the ability, the ingenuity and the perseverance to accomplish large undertakings. He has demonstrated during the last year the possession of these traits of character; in fact, if we are not mistaken, Mr. Hurt has achieved within the last twelve months results which were thought to be even too great for him to attain.

**Next Convention in Montreal.** The American Street Railway Association has voted to hold its next convention in Montreal. An urgent invitation had been extended, and there can be no doubt that the members of the association will be warmly welcomed by the Canadians. The residents of Montreal abundantly demonstrated their hospitality when the National Electric Light Association met in that city in the fall of 1891. That organization was fairly overwhelmed by the extreme cordiality of its reception at the hands of the untiring citizens of Montreal. The only danger will be that other cities will hesitate about entertaining the association after Montreal has made a record. The committee in Montreal must make plans for the satisfactory accommodation of visitors at hotels. Unless improvements have been made within the last year or two, proper provision cannot be made for the hosts that invariably gather at street railway conventions. The first question that is asked about a convention city is the character of its hotels, and we trust that the Montreal committee will be able to extend very soon satisfactory assurances on this point. The facilities for the exhibit of street railway apparatus will be ample, and the hall in which the exhibit will be located will undoubtedly be in close proximity to the hotel where the headquarters of the association will be established. This is a matter of the utmost importance. The exhibit we consider a feature of the highest interest and significance, and the members of the association are commencing to attach to it the importance that rightfully belongs to it. Heretofore the association has not apparently appreciated at their proper value the efforts that manufacturers make to show what is newest and most interesting in street railway supplies. Those who invariably participate

in these exhibits will at first be rather appalled at the possibility of annoyance, delay and expense attendant upon the activity of customs officials, but Mr. Cunningham, who extended the invitation on behalf of Montreal, confidently assured the association that no trouble on this score need be anticipated. He asserted that the difficulties would be in no wise greater than those that were incident to the shipping of freight to Atlanta. The attendance at the next convention should be unusually large, for no city on the continent is more attractive to the visitor than Montreal. Taking everything into consideration we confidently expect that the Montreal convention will be successful in every respect, for the enterprising citizens of that city will leave nothing undone to accomplish that result.

**Practical Papers at Three years ago at the street Atlanta.** railway convention in Buffalo the president, Mr. Thomas Lowry, made a prediction that was much commented upon at the time. He expressed his belief that the meeting then being held would be the last at which the operation of street railways by horses would be discussed. The prediction has been abundantly fulfilled. There has scarcely been a reference to horse railways in convention proceedings since that time, and at Atlanta the discussions were confined solely to electric lines; indeed President Payne made the significant assertion that the application of electricity to the operation of the street railways of the country generally could now be regarded as an accomplished fact; the period of transition from animal to mechanical traction has been passed. It was, therefore, natural, he said in substance, that street railway men should no longer discuss the mere application of electricity, but should now turn to topics related to the practical operation of their roads. This tendency was noticeable in the papers and reports presented at Atlanta. The number confined to strictly electrical topics was small; the list of those dealing with the broad practical questions that the active manager must study and decide was extensive. Among these topics discussed at the convention, for example, was one relating to the matter of dealing with accident cases, by Mr. P. M. Dyer, of Chicago. The paper was one of the greatest practical interest, and many a valuable suggestion can be gained from it and from the excellent discussion that followed it. Mr. John N. Beckley, of Rochester, presented a paper on transfers, containing the results of practical experience. Mr. Beckley recommends the liberal employment of transfers, and his advice counts for a great deal, for the company of which he is the president has been especially generous in this respect, and it has found the policy to be successful. Two practical papers on T-rail construction were submitted—one by Mr. Strathearn Headrie, of Detroit, and the other by Russell B. Harrison, of Terre Haute. It is not surprising that both these gentlemen favor the use of T-rail, but it seems curious to learn that the public, when once it becomes educated to this style of track construction, when it is well done, favors it enthusiastically, and will not even consider the laying of a girder rail. A vast deal can be said in favor of the T-rail, and we do not doubt that the admirable presentation of its merits and the announcement of its favorable reception by the public will lead to its more general adoption.



## ATLANTA CONVENTION.

### Thirteenth Annual Meeting of the American Street Railway Association.

#### Governor Northen's Welcome—Address of President Payne—Reports and Papers Relating to Accidents, Track Con- struction, Transfers—Exhibits and Souvenirs.

In the last issue of the STREET RAILWAY GAZETTE the opening exercises of the Atlanta Convention of the American Street Railway Association were briefly alluded to, and several of the papers and reports of committees were presented. In this issue a full report of the proceedings appears, and other papers are published. The convention was called to order on the morning of October 17, by President Henry C. Payne, who asked Hon. W. J. Northen, Governor of Georgia, to address the delegates. He welcomed the visitors in the following speech:

#### GOVERNOR NORTHEN'S ADDRESS.

Just as I was about to retire last night the president of the street railway company of this city called me up on the telephone and commanded me to appear upon this occasion to say some words of welcome to this convention. I reminded him that there were duties in my office of an imperative character which demanded my attention at the hour named for your assembling. He said that there were no duties connected with my office that could be compared with the importance of this convention to Georgia and the South, and that I must be on hand. It did not avail with him when I said that I had already spoken words of welcome through the *Electric Review*. You must know that the people of Atlanta have learned that when Joel Hurt touches the button we must do the rest. I am not here, however, gentlemen, to speak simply because of the invitation that now appears to be more of a command, but I am here to speak for the people of this great State and for the people of this great nation, to extend to you a most hearty and cordial greeting.

I suppose many of you have never visited Georgia, and possibly never the South before. We are glad to have you come down here and know personally of our delightful climate. The hottest day I have experienced in the past five years was not in Georgia, but was in Toronto, Canada, and the next hottest day was in Nebraska. I had the honor to make an address to the people of Nebraska, when the thermometer was 107 degrees, and under my vest it was 205; when in my own State on the same day the temperature was only 90 degrees. There is a mistaken idea of the intense heat of Georgia and the South. In Toronto they tell me that they had only the months of May, June, July and August in which they put the grain into the ground, for its development and its maturity. This is all done in four months; and therefore there must necessarily be a concentration of heat in northern sections, which is not necessary in the South, where we spread our summer from January to December. Our climate is balmy, delightful and sunny, and to-day is a representative one of the climate of our magnificent State.

We are delighted to have you here, furthermore, because we want to have you learn what are the productions and resources—agricultural, mineral, timber and industrial—of this section, and I am sure after having looked upon the developments now being made upon these grounds, and the prospect that awaits us in the development of our exposition, that you will not only return to Atlanta then to visit our exposition, but that you will bring your industries and settle in Georgia, and help us develop the great interests of this great State.

We want you to know that the financial conditions of Georgia and the South have been equal to, if not better than, any other sections in this great country of ours. In the last financial stress that came upon the people of this country there were fewer bank failures and business failures at the South than in any other section. The records show that the people of the South owe less money than any other section. Land mortgages for 14 Southern States amount to \$33,000,000 for each State, on an average; the average for 14 Northern States is \$44,000,000. The average annual interest paid by the 14 Southern States upon mortgages is \$2,600,000; for the 14 Northern States it is \$21,900,000.

The average per capita of mortgage indebtedness for the 14 Southern States is \$25; the 14 Northern States is \$129.

We are glad to welcome you for we honor you; and you know the people at the South are warm hearted, genial, social and hospitable, and in this respect are equal to any, not only on this continent, but in all the civilized world. We are glad to welcome you because you are business men. You are business men who consider questions of interest from the standpoint of men who have large interests at stake and who have capital to invest, and we invite you to Georgia for their investment. Why not make street car wheels out of pig iron at the South manufactured at the South? Why not make street railway rails out of pig iron at the South manufactured at the South? Why not remove your industries from more expensive sections down to this section, where you buy cheaper raw material, where you have better advantages of manufacturing and your business interests can be better developed?

You have developed your own business in the South to a very great extent. We have 1,611 miles of street railways in the South, and there is invested capital in this industry amounting to \$71,000,000. All that has been done at the South within the last six years. We welcome you again because you represent the greatest factor for civilization known to the northern world. You have enhanced the value of this great country of ours more than any other half dozen factors for producing wealth that have been in operation for the last quarter of a century. You broaden out cities, you scatter the density of population, you make it convenient for the professional man, for the business man and for the laboring man to go from his home to his work with the least expenditure of time.

How can we stand in the presence of such an organization, the members of which have for their object such high purposes, without bowing in the highest possible appreciation of their work, and saying that Georgia and the South give you a most cordial welcome?

After he had acknowledged Governor Northen's welcome, President Payne read his address as follows:

#### PRESIDENT PAYNE'S ADDRESS.

*Gentlemen of the Association:* For your partiality in electing me to the office of President of the Association, I desire to return my most heartfelt thanks.

It is hardly necessary for me to say that, since our last meeting, the street railway business has suffered, in common with all other enterprises, owing to the financial stringency and business depression which have prevailed in all parts of the country. These conditions, however, have not been without lasting benefit to the interests which we represent. I think we have all studied more thoroughly to bring about economies in operation, to limit the construction of new lines into unproductive territory, and in every way to bring our business to a more healthy basis; so that, from that point of view, there is compensation for the depression through which we have passed. I presume it is the common experience of all that we are on the up grade, and I confidently anticipate a slow, but gradual, return to normal business conditions. The resources and characteristics of the American people are such that they cannot long continue in a state of either mental or financial depression.

During the transition period from animal to electric power on the tramways of our country, it was but natural that the proceedings of the annual meetings of the association should be largely taken up with the consideration of the application of electricity to transportation purposes. Now that we may fairly consider such application as an accomplished fact, I think our attention should to a greater degree be turned to a comparison of views regarding the practical operation of our several roads. The substitution of electricity for animal power has elevated the business to a higher plane. Street railways have become as essential to the prosperity of our metropolitan cities as the steam railways to the country at large.

Having had practical experience in the management of both these methods of transportation, I can fairly say that the duties of the manager of a street railway equipped for rapid transit are more vexatious than and require quite as much ability, intelligence and application as those of one in charge of a steam railway. The steam railway manager makes his timetables, publishes them, and the people are expected to, and do, suit their convenience to the same. Not so with us. We are expected to make our timetables to conform to the convenience of each individual passenger who desires to be transported, and a car is expected to be at each and every corner at the identical moment when the passenger is ready to be carried.

Again the steam railway manager has to encounter legislatures and legislation but once in

two years, or at the most once in each year, and that during a small period of the winter only; while the life of the street railway manager is made unhappy, to say the least, by the legislative bodies in cities, which are practically in continuous session.

The American capitalist is quick to discover promising fields for the investment of capital, and I think it is safe to say that never in the history of our country has there been a more rapid development than has come from the application of electricity to transportation purposes. In the anxiety to secure franchises and to reconstruct street railways, very excessive valuations have been placed upon, and paid for the right to operate by electricity in our large cities. This has led the representatives of the people to believe that there is a present value attached to franchises far beyond that which the facts will sustain. Consequently, these conditions have led to a fruitful field for the legislator, as well as for the assessor, from whose tender solicitude for the welfare of the people the street railways, whose prosperity contributes so much to the general good, have suffered. The interest, as well as the inclination, of most managers tends toward giving as liberal and good service to the public as the patronage will justify.

Transfers and to what extent they should be granted, commutation and its effect upon earnings and the relative earnings of cars operated on long and short headway, furnish fruitful topics for discussion and comparison of views. These, and many other practical subjects which will occur to you, I think should receive our attention, and I believe their consideration will be not only of great interest, but of material advantage to us all.

Your executive committee has set apart one morning for executive session, at which time I trust we shall have full and free exchange of views bearing upon matters to which I have referred and many others affecting the practical operation of our roads.

The question of insurance has become a perplexing one. In many instances the larger systems find it very difficult to obtain insurance in sufficient amounts to cover their risks, and I think the common experience is that rates have increased to such an extent as to be so burdensome as to justify us in considering the propriety of organizing a mutual insurance association.

I cannot close without referring to the great loss which we have suffered from the removal by death since our last meeting of two of our most prominent and active members.

Mr. William Richardson, of Brooklyn, N. Y., had been identified with the association since its organization. All will recall the great interest which he took in our deliberations, and I am sure that we all feel a sense of personal sorrow that we shall no more have his wise counsel. His life's work, so far as business activities were concerned, was completed, and he was looking forward to that quiet and peaceful ending of his days to which a long and active life had entitled him.

Mr. William J. Stephenson, of Washington, D. C., first vice-president of the association, was, to my mind, an almost perfect type of an aggressive, forcible, intelligent business man. He had been for a considerable time engaged in maturing plans for the introduction of the underground trolley system upon his road. To this end he had succeeded in obtaining the necessary legislation from Congress, and his plans were very far matured toward the actual commencement of the work of reconstruction. We cannot but regret that he has not lived to consummate the plans which he had so ably matured. Mr. Stephenson was looking forward with the greatest interest to this meeting, and I am sure that I reflect the sentiment of every member in expressing my sorrow and regret at his untimely taking off.

#### EXECUTIVE COMMITTEE'S REPORT.

The Executive Committee, consisting of Henry C. Payne, Lewis Perrine, Jr., E. S. Goodrich and Thomas A. McLean, presented the following report:

*Membership.*—The hard times affect the street-railway business as surely as they do any other. The fare is so small—only a nickel—that one of the unthinking public is surprised when he learns for the first time that the business depression affects the receipts of the street-railway company. The fact is there is no more accurate test or measure of the state of the business of the country than the varying income of a street-railway company, showing with absolute accuracy the state of business activity or depression in the community. Business in general during the last year has been bad, and the street-railway business in particular has suffered, several of the member companies having gone into receivers' hands while consolidation still continues to be the trend of the times. While the year has been a hard one, the business outlook is encouraging, and we look forward with confidence to a successful year's business. At the opening of the meeting in the city of Milwaukee, there were 197 member companies.

[The committee stated 15 new members had



joined during the year and a number had withdrawn, so that at the present time 187 companies were members. The changes in names of companies that are members were noted. Reports of special meetings at which the details of the Atlanta meeting were arranged were presented.

**Special Reports and Papers.**—The special reports and papers that have been prepared cover a wide range of subjects and express the latest thought and practice in the business.

**Exposition.**—The exposition of street railway supplies will be found of unusual interest, the products there displayed being the latest expression as to the needs of a street railway, if the motive power be electricity.

**Street Railway Law.**—Judicial decisions and opinions have been issued during the year, and constitute parts of Volumes X. and XI. of "Street Railway Law," as follows: 1893.—November, George Rouser vs. North Park Street Railway Company. December, W. L. Allen vs. Birmingham Railway and Electric Company. 1894.—January, John C. Bleil vs. Detroit Street Railway Company. February, George A. Jennings vs. Tacoma Railway and Motor Company. March, Otto J. Lang vs. Houston, West Street & Pavonia Ferry Railroad Company. April, Catherine King vs. Second Avenue Railroad Company. May, James E. Johnson et al. vs. Reading City Passenger Railroad Company. June, James E. Morgan vs. Jersey City & Bergen Railroad Company. July, Mary Flanagan vs. People's Passenger Railway Company. August, Leva T. Cleveland vs. Bangor Street Railway Company. September, State of Minnesota vs. Frank S. Hoskios and Dow S. Smith. October, Youngstown Street Railway Company vs. Elmer Haverstick and 115 others.

**American Street-Railway Decisions.**—The second volume of the work started some years since, entitled "American Street-Railway Decisions," has been printed and is now in the binder's hands and will be issued to subscribers during November. The editors have copy in hand to push the work to a speedy conclusion, and they promise to bring the matter down to date as rapidly as possible, consistent with accuracy. Companies that have not already subscribed for the work are reminded to send in their subscriptions. The price is \$5 a volume net, delivered.

**The Technical Press.**—It is with unfeigned pride that we regard the journals devoted to the street railway business. We desire as a committee to acknowledge the services of their owners to this association, in their earnest endeavors to increase the membership; and hereby express our appreciation of their efforts to make their publications the peer of any other trade papers in the land. The souvenir editions, for fine character of typography, high grade of illustration and thoughtful care in composition, evidence the desire of their proprietors to set the best that is procurable before their readers. We heartily wish them all possible success in their earnest endeavors to excel.

While we do not desire to make any particular distinction in our reference to technical papers we feel called upon to express our thanks to Mr. C. B. Fairchild, editor of the *Street Railway Journal*, for his personal efforts in the interest of the association in his contact with the street-railway men of the country and for the benefit conferred upon the fraternity in the production of the book entitled "Street-Railways."

**Obituary.**—William Richardson departed this life Dec. 31, 1893, in the 71st year of his age. He was for many years the president of the Atlantic Avenue Railroad Company, of Brooklyn, from which position he retired the early part of last year. He began his street railway experience with the Dry Dock, East Broadway and Battery Railroad Company, of New York, and was acting president of that company at the time of his death. He was a regular attendant at the annual meetings of this association, and always took a lively interest in its welfare. He was an ideal companion in his home; of the strictest integrity in business, of untiring energy and high ambition to excel in all he undertook to do, and with a sincere friend. We shall miss his inspiring presence.

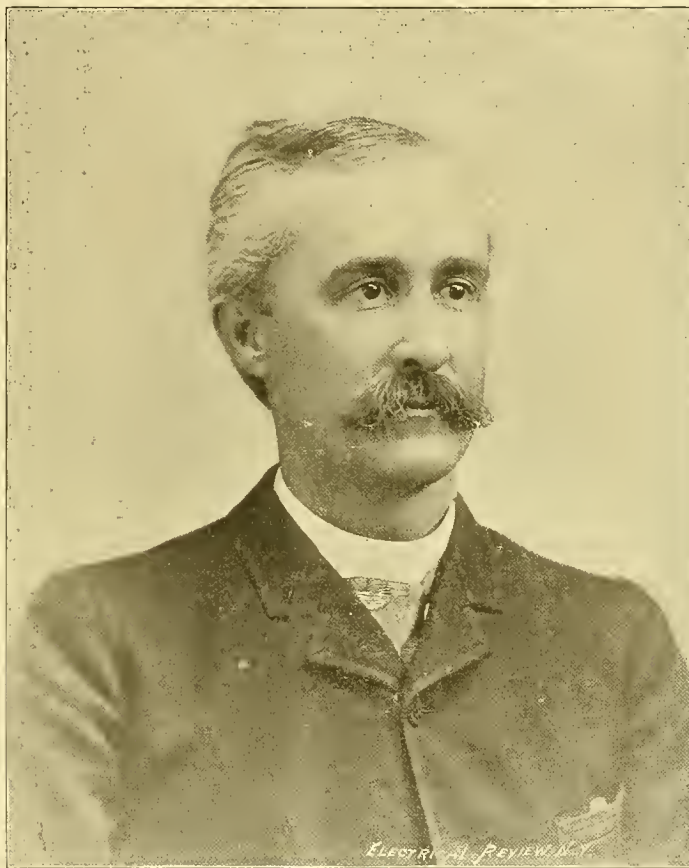
John H. Dalzell died May 29, 1894. He was the president of the Pittsburgh, Allegheny and Manchester Traction Company, and a man of large influence in the community in which he lived. He was blessed with exceptional foresight, and determined early to make a success in life; he succeeded by his indomitable pluck, energy and car-

nest purpose in attaining a position of large prominence. His loss is mourned by a large circle of friends.

Allen Tindolph died July 27, 1894, aged fifty-two years. He was president of the Vincennes Street Railway Company, and was prominent in other business enterprises in the place where he lived. He was a man who stood very high in the esteem of his fellow citizens, by reason of his sterling qualities of character. He was a Christian gentleman, a public-spirited citizen, and a model in his home life.

For the first time in the history of the Association, an officer has died during his incumbency. William J. Stephenson left the sphere of his earthly activities on August 31, 1894. He was the president of the Metropolitan Railroad Company, of Washington, having been previously connected with the Columbia Railway Company of the same city in a like capacity. He was energetic, enterprising, in short a typical progressive American. Always enjoying the best of health, with ruddy clear complexion, of commanding appearance, having convictions and the courage of them, a ready speaker, always with something to say, reinforced with deep interest in this association, his was a familiar figure and voice at the annual meetings.

The report of the treasurer was submitted, show-



JOEL HURT, PRESIDENT OF THE AMERICAN STREET RAILWAY ASSOCIATION.

ing that the receipts of the year were \$8,290.79; expenses, \$8,196.72; balance, \$94.07.

The report of the Committee on "The Best Methods of Treating Accidents and Complaints" was presented by P. M. Dyer, claim agent of the West Chicago Street Railroad Company. The paper and the discussion which followed it are presented elsewhere in this issue.

The report on "A Uniform System of Street Railway Accounts," by H. I. Bettis, was presented.

The secretary announced that upon the adjournment of the meeting the convention would inspect the exhibits; that at four o'clock a visit would be made to the carhouse of the Atlanta Consolidated Street Railway Company; and from six until nine o'clock a reception would take place at the Capital City Club. The session then adjourned.

#### THURSDAY'S SESSION.

An executive session was held on Thursday morning. The paper on "Transfers on Street Railways," by John N. Beckley, of the Rochester

Railway Company, was first considered. It seemed to be the general impression that the privileges should not be extended further than is absolutely necessary. The paper is presented elsewhere in this issue. The subject of the formation of a street railway mutual fire insurance company was also taken up, and on motion of Mr. Russell B. Harrison the incoming officers and executive committee were appointed a committee to report on the subject. On motion of Mr. Littell, of New Orleans, Messrs. Littell, Perrine and Connette were appointed a committee to wait upon the officers of the Underwriters' Association of the South, with a view to securing better conditions and rates for insurance of street railway properties, the office of the association being in Atlanta. The executive session was then adjourned.

Mr. Strathearn Hendrie, of Detroit, then presented his report on "Can the T-Rail Be Satisfactorily Used in Paved Streets?"

On motion of Mr. McLean, the following gentlemen were appointed a committee to nominate officers and select a place for the next meeting: Messrs. McLean, Connette, McNamara, Bunnhoff, Breg, Semmes and Rugg. Letters of invitation inviting the association to hold its meeting in their respective cities were presented in behalf of Cincinnati, O.; Philadelphia, Pa.; and Montreal, and were read by the secretary.

#### FRIDAY'S SESSION.

After the meeting had been called to order on Friday morning the report of the committee on "City and Suburban Electric Railways," by E. C. Foster, was presented. This paper appeared in the last issue of the *STREET RAILWAY GAZETTE*. Russell B. Harrison read a paper on "The T-Rail Construction of the Terre Haute Street Railway Company," which, with the discussion following it, is published elsewhere in this issue.

Telegrams were read from Thomas Lowry, president of the Twin City Rapid Transit Company, Minneapolis, and from the commercial clubs of Minneapolis and St. Paul, inviting the association to hold its next meeting in Minneapolis.

On motion of M. K. Bowen, superintendent of the Chicago City Railway, it was voted to appoint a committee to investigate the subject of the validity of patented articles used by street railways.

#### TWO AMENDMENTS.

The executive committee asked the convention to express by vote its opinion of two proposed amendments, one to the constitution and the other to the by-laws. While action could not be taken till the next

meeting the committee wished to ascertain the attitude of the members toward the proposed changes. The convention voted unanimously in favor of the amendments. The proposed amendment to the constitution is to provide for the admission of individuals and companies not street-railways, associate members, under certain conditions; such character of membership having been found conducive to the general welfare of kindred associations.

The proposed amendment to the by-laws has in view morning sessions only; providing for less exhaustive meetings; for more opportunity for social enjoyment, as well as to give more time to examine the display at the exposition, which has become so important a feature of the annual meeting.

#### INSURANCE.

The special committee appointed to interview the representative of the Underwriters' Association of the South reported that it had been unsuccessful in its efforts. Captain William Brophy, of



Boston, representing the Mutual Insurance Association of New England, spoke as follows on the subject of insurance:

I think it would be better for each State Association of Railways to make application to the board of underwriters of the mutual companies which control this territory. I think something might be done in that way to secure a reduction. Our company is not a stock company. We have no agents and pay no premiums, so that we can afford to carry the business at somewhat lower rates. Ours is the only company at the present time which is carrying electric light and railway properties. We have been insuring electric light stations and power houses for two years, and car houses for one year. We have at the present time \$7,000,000 of property of this class, and for the last ten or twelve months, ending October, our losses have been \$2,800,000 on those \$7,000,000. We have been able to pay a dividend of 7 per cent. on business written one year ago. We have been insuring this class of property for two years. I state this in order to show you that the electric business is not so hazardous as some people think it is. It can be insured at a profit. We have had some losses; at the same time we have paid to our policyholders 40 per cent. of the premiums paid. The premiums collected have paid losses and expenses and left a balance to be returned to the policyholders, so that the business is not so very bad. Our rates on electric light stations are one per cent., which equals for a station which is a model in every way. We do not ask for cement floors or iron floors, nor do we ask that the roof shall be 18 feet high; but we want a plant that is clean and has no oil on the floors, no flush on the walls, and no attics and no basements. If it has a basement or second floor, used for storage, they must be equipped with automatic sprinklers. Our experience with car-houses has been so far very fair. We do not know just what the losses will be; but our premiums so far have met all expenses. Our expenses for inspectors have amounted to 6 per cent. of premiums received, and the total expense, including losses, is 12 per cent. The stock company, of course, must necessarily pay commissions to its agents, and these commissions amount to about 33 per cent. of premium; losses, something like 63 per cent.

Mr. BATHURST: I would like to ask the gentleman in what cities his company carries insurance on the street railways; have you any district?

Mr. DEATHY: We have no special district. Of course the majority of our business is in New England, and the greater part of our insurance is on electric light properties. We have \$7,000,000 on the same class of property; and about \$500,000 of that is on railway property. Our loss rate on truck power houses is one per cent., frame one and one-quarter; car-houses and contents, including cars, trucks, one and one-quarter; frame, one and one-half per cent.

Mr. BATHURST: Are you limited as to the amount?

Mr. DEATHY: We cannot carry over \$50,000 on any one building and contents. We are somewhat handicapped; our company is not large enough to carry the insurance the large companies would be willing to give us. We had an offer from a railway company recently to place \$300,000—power houses, car-houses and shops; and as they are occasionally on fire they would not take it, although if they had insured three or four separate risks we might have done business. A mutual company will not take property exposed to a risk which it would not carry if it were offered. I think it might be well to appoint a committee to confer with some of the New England annuals and see what they will do.

Mr. HARRISON: I have had a satisfactory experience with one company. Mr. Deathy represents, and I agree with his suggestion that it would be of interest and profit to the association to have a committee appointed. I think that a committee of five members appointed to take the matter up with the New England companies.

As a result of my inquiry I am satisfied we can get the insurance we want from the company represented by Mr. Deathy. But larger companies would be willing to give us. They would not carry so much business as it would be necessary to deal with the New England companies.

Mr. DEATHY: In connection with insurance companies a Mutual Association of the National Electric Light Association has been organized. It is a very interesting matter and I believe the primary work of Mr. Deathy should be to see that we have no difficulty in securing railway properties covered by the Mutual Association. It is a very interesting matter and I believe the primary work of Mr. Deathy should be to see that we have no difficulty in securing railway properties covered by the Mutual Association. It is a very interesting matter and I believe the primary work of Mr. Deathy should be to see that we have no difficulty in securing railway properties covered by the Mutual Association.

The motion to appoint the committee on insurance was adopted, and the following gentlemen were named: Messrs. Harrison, Terre Haute; Dyer, Augusta; Perrine, Trenton; Lusher, Montreal; Baumhoff, St. Louis.

Mr. Perrine offered a resolution asking the executive committee to take under consideration the question of the enlargement of the field and scope of the association, and submit a plan suggesting ways and means therefor at the next meeting of the association.

OFFICERS FOR NEXT YEAR.

The nominating committee presented the following report:

President, Joel Hurt, Atlanta, Ga.; First Vice-President, W. Worth Bean, St. Joseph, Mich.; Second Vice-President, John M. Cunningham, Boston, Mass.; Third Vice-President, Russell B. Harrison, Terre Haute, Ind.; Secretary and Treasurer, William J. Richardson, Brooklyn, N. Y.; Executive Committee: Henry C. Payne, Milwaukee, Wis.; W. H. Jackson, Nashville, Tenn.; D. G. Hamilton, St. Louis, Mo.; G. C. Cunningham, Montreal, Can.; J. N. Partridge, Brooklyn, N. Y.

The committee recommended Montreal, Can., for the next meeting.

PLACE OF MEETING.

On motion of Mr. Penington, of Chicago, the secretary was instructed to cast the ballot of the association for the officers nominated. Mr. Penington moved that Philadelphia be substituted for Montreal as the place of meeting. The vote when taken stood as follows: Montreal, 38; Philadelphia, 17.

Mr. Cunningham, of Montreal, then spoke as follows:

I wish to say a few words to you, to show how very pleased, indeed, I am to know that next year Montreal will receive this large and important association. I can assure you that we will do everything in our power to remove any difficulties that may exist as to entering any supplies for the purposes of exhibition. I can confidently promise you that there will be no difficulty in bringing in supplies to Montreal, any more than there were in bringing them to Atlanta. We recognize in Montreal, as well as the residents of other places, that this exhibition, which is a part of the annual meetings, has become a very important feature, and should be maintained and improved, if possible. You will receive in Montreal a most warm and hearty welcome.

The report of the committee on "Mail, Express and Freight Service on Street Railway Cars," by Richard McCulloch, of the Citizens Street Railway Company of St. Louis, was read by title. The report appeared in the last issue of the STREET RAILWAY GAZETTE.

The report of the committee on "Transfers," by John N. Beckley, of the Rochester (N. Y.) Railway Company, was read by title. The paper appears elsewhere in this issue.

The report of the committee on "The Use of the Booster on Electric Railway Circuits," by J. H. Vail and H. S. Wynkoop, which appeared in the last issue of the STREET RAILWAY GAZETTE, was then read by title.

Joel Hurt, of Atlanta, the newly elected president of the association, was introduced and made a brief address.

On motion of Mr. Perrine a vote of thanks was passed to the retiring officers, the Atlanta Consolidated Street Railway Company, the Capital City Club, the local press and the citizens of the city of Atlanta generally, for the courteous, kindness and attention and generous hospitality which had been extended to the Association.

The report on "Destructive Arcing of Five-Hundred Volt Fuses," by W. S. Harrington, was read by title. The report appeared in the last issue of the STREET RAILWAY GAZETTE.

The paper on "Brake Shoes," by D. F. Henry and Powell Evans, was read by title. A synopsis appeared in the last issue of STREET RAILWAY GAZETTE.

Mr. Deathy moved that a committee be appointed, to consist of two members of the association and one manufacturer, to investigate the subject of the adoption of a standard style of brake-shoes, conduct experiments and to report the data col-

lected and its conclusions at the next meeting, without expense to the association. The motion was adopted.

POWER BRAKES VS. HAND BRAKES.

The report on "Power Brakes vs. Hand Brakes," by E. J. Wessels, which appeared in the last issue of the STREET RAILWAY GAZETTE, was read by title. Elmer A. Sperry spoke of the report as follows:

The paper just read by title contains a reference to a paper read by me before the American Institute of Electrical Engineers last month. The reference being somewhat unjust, I would like the opportunity of showing wherein some of such errors have occurred. My paper contained fourteen points of excellence, in which the electric brake was superior. Those points have been taken up by Mr. Wessels in their order, and remarks attached to each, embodying claims on behalf of the air-brake. For instance, I said that the use of the electric brake, which does not employ brake-shoes in the operation at all, would cause an entire saving in such brake-shoes, with a resultant saving of wheels from two to three fold. The author has attached to this the remark that a good air brake saves wheels. The air brake is used simply to increase the power of the application of the brake-shoes, which, while smeared with sand and dirt, attack the rims of the wheels, "drawing" the chills, and very soon grind off the face of the wheels to a point below the chills, when the wheels will have to be pressed off and others substituted. The air-brake, instead of saving wheels, simply tends to grind them down sooner by the superior pressure of the shoes upon the wheels, over and above that readily obtainable by hand. With the electric brake the wheels are retarded and brought to rest without the application of brake-shoes, and the rolling contact between the wheel and rail being the only point of wear, the grinding and ruining of the chill is entirely avoided.

Another point referred to by the author is that of the air brake not causing flat wheels. It will be readily understood that with the electric brake this cannot occur, from the fact that when the wheels stop momentarily the motor, which has been converted into a dynamo, also stops, and therefore it cannot generate current with which to further and continuously hold such wheels, and they simply start again to roll slowly, while giving far better retardation than while sliding, and cannot, therefore, be ground flat. The comment from this point is that a good air brake prevents flat wheels. It is not clear why the statement is made, no reasons being assigned.

With the air brake a constant demand for energy is made at moneyed cost from the power station, which at the same time may be already well taxed and running up to its capacity. With the electric brake, on the other hand, we use nothing but the momentum or power stored up in the moving mass, and which in any case we wish to get rid of, the brake simply being a device whereby a part of this energy of motion is used to apply the brakes and stop the car.

In answer to most of the points raised, the paragraphs quoted from my paper, above referred to, are self-explanatory, and need not receive comment here. One, however, is an important one, which should receive explanation, merely that of holding a car on a grade after it has been brought to rest. On the car in operation at this convention, you have nearly all seen a portion of the apparatus which is used to hold the car on grades; but which, on advice of counsel, has been removed from the wheels, and cannot be shown publicly until Dec. 15. I might say that by means of this device the single controller handle by which the car is first started may, by swinging around, bring the car to rest by use of the electric brake; by the simple act of holding this handle in the position where the brake is fully applied or fully on, the motorman is enabled to hold a heavily loaded car on an eight per cent. grade. The holding is perfect, and remains so as long as the handle is in this position. We find one fact which greatly aids this process, namely, the friction of grease, which is the natural resistance of any mass starting to move when after being brought to rest.

I most heartily agree with the author as to the necessity of power brakes, but think that the highest order of engineering should be employed; and inasmuch as we have ample power stored up in the mass, this power should be used rather than to employ an additional draught of power from the central station at moneyed cost, and additional and otherwise unnecessary devices, which in some cases are liable to derangement, and also liable to give unnecessary and disagreeable noise in its operation. If the same controller handle can be used to start and stop the car by reverse motions, it is in the cause of simplicity to adopt it, and avoid a multiplicity of handles, whereby a motorman in case of emergency may become confused.



In the electric brake a single handle is used for all purposes, to run the motor, apply the brakes, and hold the car upon a grade.

The special paper by Allen R. Foote, on "Taxation," was then read by title.

The convention then adjourned.

### THE BEST METHOD OF TREATING ACCIDENTS.\*

BY P. M. DYER.

Among the subjects coming to the attention of the general manager none is more replete with perplexity and difficulties than the disposition of personal injury claims. Expense of operation can be approximated, cost of construction estimated by the engineer or architect; but when and where accidents will happen, and what they will cost the company, can never be predicted. By the aid of modern inventions the cost of operation has been lessened; but this gain is threatened by the additional expense incident to the increased number of accidents on street railroads operated in the crowded thoroughfares of our large cities.

It is my purpose to explain to you in what manner the North and West Chicago Street Railway Companies attend to personal injury cases, commencing with the accident and following the theme to the final disposition of the claim. These two corporations carried 167,000,000 passengers during the year ending Dec. 31, 1893, and upon the claim department devolves the duty of investigating all accidents and the making of settlements, or preparation of the defence, in all claims that spring from this great traffic. One claim department does this work for both roads.

The working force consists of a medical staff and a sufficient number of investigators, all under the direction of the chief adjuster, who reports to the general counsel of the two companies. For the purpose of this article the work of the claim department may be divided into three periods, each separate and distinct from the others as follows: First, investigation; second, negotiation; third, litigation.

First, as to investigation. The work of this period begins immediately after the accident and continues until there has been secured a full and accurate account of the accident, with reliable information as to the nature and extent of the injuries to person. Employees have been instructed to notify the claim department of the occurrence of an accident on car or train, giving circumstances of the same, nature of injuries to, and residence of the injured, and as far as possible to secure the names of the witnesses. When this has been accomplished and the injured one has been placed in the charge of a physician or the police, the car or train may continue its journey. In the meantime a representative of the claim department will proceed with all possible dispatch to the scene of the accident. If the injured person has not yet been removed, he must see that conveyance is provided to the hospital or to the home.

These companies usually bear the expense of temporary medical care and transportation, without regard to liability, believing such attention is appreciated by the injured and the community at large. In all cases of personal injuries it is the duty of the medical staff to secure the privilege of an examination; the physician making the same to avoid any assumption of responsibility for the treatment, but to fully ascertain the nature and extent of the injuries, and to obtain if possible a concurrence in his report by the attending physician.

All employees witnessing accidents are required to make written statements of the circumstances of the same on printed forms provided for that purpose, attaching the names and places of residence of all witnesses. This report must be completed and given to the foreman before the employee finishes his day's duties. These reports are forwarded to the claim department without delay, and, when received, circular letters containing printed interrogatories are sent to each witness. If the seriousness of the accident demands it, interviews are had with the witnesses. That the claim department may be kept fully advised from time to time as to the condition of persons injured on these roads, they are occasionally visited during the period of recovery by the investigators assigned to those cases. In Chicago, all hearings before the coroner are had immediately after the accident, and the verdict of the coroner's jury is usually rendered on the day following the death. It is the policy of these companies to secure the presence of their witnesses at the hearing before the coroner, and obtain stenographic minutes of the proceedings. Thus, in a comparatively short time, the claim department will have collected much information as to the condition of the injured, and the circumstances of the accident. We may now consider the work of the first period completed.

The reports relating to an accident could now be filed away, perhaps forever, if it were not for the industry of some claim lawyer or other hustler who persuades the injured to make a demand on the company for compensation. The making of a claim leads us to a consideration of the second period, that of negotiation. Demand being made for compensation, it becomes the duty of the chief adjuster to place before the general manager or general counsel all facts within his knowledge bearing on the claim, for a decision as to liability, and the naming of the maximum sum to be paid, if a settlement is deemed advisable, the claimant being promptly informed of the decision. As to the negotiations preceding a settlement, I need say but little. They are usually conducted by the chief adjuster on the part of the company. If not successful the period of negotiation will end, usually to be followed by litigation, the third and last.

After the commencement of suit all witnesses are again located by the claim department, and thereafter located at stated intervals until the time of the trial, and if possible additional witnesses are found to strengthen the defense. Success in defending suits arising from personal injuries largely depends on the character of the work done during the period of investigation. The officers of these companies believe in the thorough investigation of all accidents, if possible the settlement on a reasonable basis of all valid claims, in vigorously contesting fraudulent demands, and that prompt settlements are for the best interests of their companies.

In conclusion, I will say that the time is at hand when all railroad corporations must be prepared to resist claims in a large percentage of their accidents. To promptly prepare to do this is the part of wisdom, when considered from a financial standpoint, usually the determining consideration in corporate management.

#### DISCUSSION.

Mr. PAYNE: The course pursued by the Chicago companies is practically that followed by the company which I represent; and I presume our experience is the same as all of you, that we have very little chance before a jury, and the sooner we settle a case the better it is for the company. It does not seem to make much difference what the merits of the case are; if we go before a jury we are almost sure a case will go against us. It is only in cases where the points of law are in our favor that we stand any chance of success.

Mr. LITTELL, of New Orleans: I would like to ask Mr. Dyer when he gets his statement from his employees if it is sworn to before a notary public?

Mr. DYER: Sometimes, but not always.

Mr. LITTELL: Where a motorman is responsible for an accident, either to a vehicle or a person, and you know he is responsible, what do you do with him?

Mr. DYER: It depends upon the frequency of his accidents; what record he has. Sometimes we assess it against him.

Mr. LITTELL: Suppose that you had evidence that the car was going down the street eight or ten miles an hour, and the motorman had his head turned away and ran over a person and cut off his legs, what would you do with your man?

Mr. DYER: He would be discharged.

Mr. LITTELL: Discharged immediately?

Mr. DYER: He would be suspended pending an investigation, and then he would be discharged.

Mr. LITTELL: You would discharge him as soon as you got his statement?

Mr. DYER: Yes; because if we did not do that, and retained him in our employ, we would be criticised for having kept such a man in our employ, and it would get before the jury.

Mr. SHAW, of Newburyport: Would the reason that caused him to look away make any difference? I ask the question because I want to state a case.

Mr. DYER: I do not think we would accept any excuse if he did not have his car under control.

Mr. SHAW: In a road I am interested in the motorman had his attention attracted by a bicycle alongside of his car at the time that he should have been attending to his duty. There was a car ahead of him that was grounded. He had, however, no reason to suppose that this car would stop or ground in a locality where there were no houses, but in the moment that he was looking at the bicycle he ran up on the other car and caused an accident. What would you do in that case?

Mr. DYER: I think that would be a matter entirely for the discretion of the superintendent.

Mr. SHAW: We decided to let that man go, although I thought it was a hardship to do so.

Mr. FULLER, of Chicago: I will say for the information of the gentlemen that it is a rule of the West Chicago Railway Company that one car approaching another car must slow down or stop before getting to it, and if the motorman does not do so he is discharged.

Mr. SHAW: Our rule is to keep cars 500 feet apart. In this case, where we discharged the man, he was within 175 feet of the other car. If he had been 500 feet away we would have felt differently

about it. That is the second instance where we have had a ground without apparent cause. We found the trouble was with the rheostat; that the cable had broken and made a contact.

Mr. LITTELL: Has Mr. Dyer brought with him the various blank forms used for accident reports and interrogatories sent out?

Mr. DYER: I have not. The West Chicago Street Railway Company uses a report without any special interrogatories. The statement which is sent from the office is made up with a view of interrogating the witness as to the occurrence in a general way, touching upon the more important points, and then leaving it for the witness to explain further if desired.

Mr. SHAW: I think the report said something about temporary relief—to what extent do you carry that?

Mr. DYER: That is carried to the extent of providing transportation to the home or hospital. A physician is also called in while the person is lying in the drug store, and we pay that expense.

Mr. SHAW: That is the end of it?

Mr. DYER: Yes, sir.

Mr. SHAW: What would you do in a case like this? We had a man who was fixing a belt, and by some means he got in the shafting and was severely injured about the head. The man was taken to the hotel by some of our men—no hospital in the place—and they have sent us in quite a bill; physician \$60 and hotel \$75. The man is recovering and will eventually get well. We had an assistant engineer who did not wait until his engine had turned over the last time and had his hand jammed, the wheel making only one part of a revolution, so that it nearly stopped. He had three fingers amputated, and they want to know who is going to pay the expense of his medical care. We claimed that it was no fault of the company and there is no liability on our part. I had a talk with the representatives of the man and also with a physician and hotel keepers, and told them that we could not assume liability, as it might lead to further trouble.

Mr. DYER: I should think the first thing to do would be to ascertain the law, whether or not there was any liability, before paying any charges. Of course even if it was a case where we did not feel that we were legally responsible there would often come up the question of charity; whether we should not give the man something, at the same time exacting a release to free us from further liability. I would say that there is a great deal of money paid out year after year which we charge up to donations. For instance a person not connected with the company who lost his leg came into the office and said: I have had this accident, and you are not in any way to blame, but I want a wooden leg. I am willing to make an affidavit that you are not to blame. It was an unusual thing for a man to do, and we gave him \$100 to get his wooden leg, although there was no liability. These cases are disposed of on their merits—each case by itself.

Mr. SHAW: Is your company insured?

Mr. DYER: We were from 1890 to 1891; since then we have taken our own risks.

Mr. LITTELL: Did you carry it for a full year, or did you abandon it?

Mr. DYER: We carried the contract for one year.

Mr. PAYNE: Bearing upon the question of the gentleman in regard to the propriety of paying expenses of taking care of people, we had an experience in our company in that direction, where the evidence seemed to point to the conclusion that the company was not liable. Our attorneys so advised us, and friends of the injured party admitted that there was no liability, and upon their admissions and representations we sent the injured person to the hospital and cared for him for several months. I think we spent nearly \$1,000 in the case. When we went to get a release, and offered to throw in as a gratuity a few hundred dollars, they refused to settle with us. We litigated, because we were assured we had a perfect defense. Judgment was rendered against us for \$7,800, and the fact that we had done something to alleviate the distress of the injured person was used against us in the trial, upon the ground that we must have believed that we were guilty of negligence or we would not have expended so much money. That seems pretty hard—to help poor people out when they get injured and then have a jury render a verdict entirely against the weight of the evidence. The trouble about insurance companies is that they do not insure more than half the accidents. We think it a wise policy, as the gentleman from Chicago says, to settle our own cases.

Mr. CONNETTE, of Nashville: We pursue about the same method outlined in the paper read. After the accident has occurred we investigate it immediately. If we find upon investigation that the company is liable, we then go ahead and take care of the parties the very best we can. If we find that the company is not liable, we then cease all expense in the case. Frequently where we have the most trouble is with lawyers. They will hunt up a case and institute suit immediately

\* Read at the Convention of the American Street Railway Association, Atlanta, Oct. 17-19, 1894.



without making any effort toward a compromise. The only method I have found satisfactory in an instance of that kind is to endeavor to settle the case outside of a lawyer, which I have done in a number of instances, and cut him out of his fee. Where we cannot settle the case, I have found about the best way is to keep the matter in court as long as we can, because as long as it remains in court the more easy it is to effect a compromise. After a case has been in court two or three years it is easier to effect a compromise than it is at the time of the accident. I find another thing of importance, that is to pursue these cases after they get into court. We should endeavor to use our influence to get such men on a jury as will give a corporation justice. I believe it is just as essential to keep up the political end of street railway management as it is in any other part; and if you will endeavor to stand in with the powers that be, and with those who have influence, and with the authorities who have the appointment of these jurors, it is likely that you will secure better results. That has been our experience, and very few judgments have been rendered against us; the largest being \$1,500.

Mr. LITTLE: I suggest that Mr Dyer furnish the secretary with a complete set of the blanks used on his road, and that they be published in conjunction with the report.

Mr. COLE, of Elmira: It has been our experience that the sympathy of the average juror is usually with the plaintiff, and that the testimony of the witness is also apt to be warped in their favor; and I have been able to obtain favorable evidence from the witness by promising the motorman that if he can obtain such evidence as will exonerate him from blame he will be reinstated in his position. He will go to this witness and get a written statement of his views of the accident, and in a great many instances where he represents that he is liable to lose his position, he will get fair and favorable evidence; and then the witness will keep to this before the jury when the trial comes off.

Mr. MINARY, of Louisville: I understand you suspend the motorman?

Mr. COLE: Yes, until he gets such evidence from the witness as will exonerate him from any blame, and we have been able to get good evidence in that way. If we cannot obtain the evidence we will let him go on, but I think it is well to suspend him for a time.

Mr. MINARY: As soon as you let him go you acknowledge your responsibility for the accident.

Mr. COLE: We do not let him go until after the matter is disposed of.

Mr. SEMMES, of Memphis: Is the evidence which the motorman gets reduced to writing?

Mr. COLE: Yes, we do this as far as possible.

Mr. SEMMES: As I understand you, you simply suspend him during the investigation; and if you find he does not bring this testimony, then you discharge him?

Mr. COLE: Not at that time; that would be hard against us in court. He is not discharged entirely from the company until the case is disposed of.

Mr. SEMMES: What would you do in a case of that kind—put him on the "extra list" and pay him for his time?

Mr. COLE: No sir, we give him some other work—in the shops.

Mr. PAYNE: I take it in case you settle at the time, then you do not hold the motorman responsible?

Mr. COLE: We do not.

Bay City, Mich.—H. A. Snow, of Detroit, president of the Union Street Railway Company, of Saginaw, and Manager W. J. Hart, of the Union company, recently held a consultation with President W. B. McKinley and Manager C. C. Rush, of the Consolidated Street Railway Company, in relation to the two companies uniting in the Bay City-Saginaw Electric Company. The Union company has secured the right of way to a point near the southern limits of West Bay City. It would like to have the Bay City company extend its Salzburg line to that point, where a connection could be made. In this way every point of all the valley cities would have connection with the road. It would also avoid the necessity of bridging the river, as Third street bridge could be used.

New York, N. Y.—Work is to be begun at once on the street-car house of the Metropolitan Traction Company, which is to be built at Fiftieth street and Seventh avenue. The terms of the contract call for the completion of the carhouse within 12 months, and part of it will be in readiness to receive cars within six months. The building alone, without the land it will occupy, will cost \$1,000,000. It will be fireproof, five stories in height, and will be constructed of steel, brick, granite and terra cotta.

## TRANSFERS ON STREET RAILWAYS.\*

BY J. N. BECKLEY.

The carrying of a passenger from any part of a city, reached by the lines of a street railway, to any other part of such city, reached by the lines of the same railway, for a single fare, is, speaking broadly, a new thing in street railway operation. Ten years, even five years, ago the manager who had the temerity to advise his board of directors to establish a liberal transfer system would have, probably, been regarded as unfit for his position. To-day the most successful companies have come to realize that in this matter of transfers, as well as in other matters, it pays to treat the riding public liberally.

One of the most important things to do, and to do promptly, is to educate the average man and woman to ride. That this is largely a matter of education every street railway manager knows. When a new line is opened, even through a thickly settled district, the people for some time continue to walk. Bad weather, the necessity of haste or some other thing induces a person to ride once. The next time he rides with less inducement, especially if the cars are clean, the service prompt, and if he does not have to pay more than five cents to get to his destination. So the habit grows, and soon the rule is to ride, when, before, it was the exception. A liberal transfer system, properly guarded to prevent fraud, pays. This, I think, is now generally recognized. Local conditions and arrangements of lines must be considered in determining the regulations to be adopted. The rules intended to safeguard the company are important. Perhaps equally important is the making of rules broad enough to encourage riding.

If a transfer system is adopted, it is best not to hedge it in too much by narrow restrictions or to so complicate its details as to involve labor and expend money unnecessarily. It is expedient also to appear to be making most liberal concessions to the public, especially as such concessions—presumptive or real—conduce to our own benefit. The punching "to and from"—the limit of privilege to use at absolute junctions as fixed spots—different forms, and even different colors for different issuing lines, may in most cases be avoided. If we secure a proper form of ticket, we can be protected in less complicated ways, and it is usually possible with careful arrangement to cover all requirements in one form. If series and consecutive numbers be employed, we can easily trace all issues by them instead of by old methods. If we use the series and consecutive numbers, we allot a certain quantity of tickets to each conductor, and follow him by them and should avoid minor details that interfere with or complicate the more important ones.

The ticket should be of liberal size to permit legible type and prevent crowded matter.

It should be bound in pads of 100, and the pad be so exactly arranged as to permit punching ten or more in one action of the punch. This feature permits canceling the month and day, and often the time, ten or more at once and accurately, and frequently several of the same destination. It is of great advantage to secure full "month," "days" and "time" space on each ticket—that can be accurately and quickly punched, and it forestalls the waste, expense and detail consequent upon daily dated tickets, while it gives equal protection without delay anywhere.

The subject matter ingeniously arranged can and should comprehend in one form all needed rules. "Good for this current trip—at point of change—on next car after time canceled—to destination punched" illustrates this. "Subject to rules of company" covers several dozen words of the old form with equal rigidity. Special conditions may vary this, but in most cases it is restriction enough.

"A series number"—"conductor's number"—"run," or "car" number, or some such designation of each ticket will identify the issuer perfectly, and the consecutive number will trace the issue, hold it to sequence in use, and prevent tampering and fraud. We have some 200 conductors. Each has a stock of 25,000 tickets to begin with, renewed as used. One transfer department has 250 compartments on the wall of the room to hold these tickets (thus providing for increase in conductors), each of 25,000 capacity, so they are all systematically arranged in simple order, one compartment for the tickets of each conductor. The conductor turns in his unused transfers at the end of the day's work, and they are put in his compartment and given out again to him on beginning work next day. A simple record book keeps this account; one double page for each conductor covers his transactions for the whole year, and shows at a glance each individual transfer account, for comparison or aggregating statistics.

Forenoon and afternoon are distinguished by light and black print in the destination blocks,

and by the system we use we get month and day one punching each (but always preliminary, the conductor keeping these punched ahead in readiness), and one punch for time (even hour or ten-minute interval) and one for destination. I need not explain that such a ticket supplants the expensive duplex form—for it is equally protective—nor enter upon any argument in favor of the absolute need of a short time limit. The day limit, A. M. or P. M. limit, or even the hour limit is of a by gone day, too leaky to be considered, and very few companies now use it.

It is important, in my judgment to arrange the form clearly; each section, name, rules, time, days, months, destination, series and consecutive number to have a distinct and spacious position and be clearly defined by itself, not scattered about. It is also very important, in order to foster accuracy with rapidity, to so arrange the reading matter that the ticket shall be punched and read as punched, all one way, being held by thumb and finger of the left hand and punched with the right. Inverting and twisting the ticket not only takes time, delaying traffic, but increases inaccuracy. The ticket should be arranged in every detail so as to be within the mental grasp of the average conductor, and so as to make it easier for him to go right than to go wrong, easier to be quick than compelled to be slow. Regular horizontal and vertical lines soon fix themselves on the duller intellect, but scattered details hopping about a ticket often puzzle the brighter ones.

In order that all punching may be done before tearing off the ticket from the stub, and that all possible advantage of the pad form and multiple punching can be secured, all sections to be punched should be arranged on the lower side and right-hand end if possible.

The pad form saves counting the 100s, while the consecutive number counts the broken pads. The pad form is most convenient in handling in the office or on the cars, and saves time wherever used in giving out, in issuing or receiving, or in taking stock. The use of the months is not important. If there be room for them there is no objection, as with the pad form they are no obstacle to quick service, as they can be punched in advance of use. Many companies omit them, as the other restrictions practically give little opportunity for fraudulent use after 30 days. By beginning the consecutive number of each pad at 10,00, 200, etc., we save complication in subtracting, as then the consecutive number on the upper remaining ticket instantly shows how many tickets have been removed.

The consecutive number is not only useful in counting, but compels proper use of the tickets. In conjunction with the timetable each ticket must show when turned in that it was issued in sequence of number and in sequence of time. No. 6,230, say, is issued at 9:30 A. M. Nos. 6,231 and 6,232 may not be returned at all, but if they are they must show issue in direct sequence of time. If not so, the series number tells us instantly who issued the ticket, and the man is spotted and the wrong exposed, for tickets cannot be abstracted and punched for future use as they will not fall within proper time limit and in proper sequence. We make conductors note on the daily car report the consecutive number of the transfer with which the day's work begins and the consecutive number with which it ends. At the close of each trip each conductor turns in the transfers taken in on such trip in a special trip envelope, dropping them in a box prepared for that peculiar purpose. This box is placed at our grand junction which all cars pass, but a number of such boxes could be used where different conditions obtain. We know at once who wrongly issued a transfer, and who received it and when it was done. A notice in our cars requires the passenger to ask for a transfer when fare is paid. This rule enables the conductor to issue transfers at his convenience, and distributes the labor of so doing instead of massing it at certain junctions, with confusion and delay.

Nor is it necessary to resort to tickets on a roll or in metal clasps or such devices for protection. The roll method necessitates single issues, singly punched, and loses the advantage of multiple punching, while it delays traffic and increases chances of error. The metal bound tickets add expense, but do not increase protection. Tickets may be just as easily abstracted in advance of proper use as in the pad form—so they may in the roll, for that matter. Real protection lies only in the system, not in the binding. Conductors cannot sell, trade or exchange transfers with series, consecutive numbers and timetable, without detection, and if the transfers be turned in on every trip detection is a very simple process, requiring no elaborate and costly inspection.

A special register for transfers, and so eliminating their cash value, doesn't help us. It confuses the conductor and paralyzes the spotter, and without a protected form of ticket conductors can collect fares and ring them up on the register, and turn in each other's transfers to balance the account.

\* Read at the Convention of the American Street Railway Association in Atlanta, October 17-19, 1894.



By putting the transfer business into the hands of the conductors, we cater to the convenience of passengers, and we obviate delays in traffic, consequent upon stopping cars to transfer. We save the large expense of transfer agents, and, in my judgment, do not increase leakage, for it is as easy for transfer agents to stand in with conductors to defraud the company, as it is for conductors to combine with each other. The numerous and continual frauds perpetrated upon transfer agents, by people who get transfers without having paid any fare, is too well understood to require discussion.

We have adopted a system of "faces identification" for moral effect, and especially for use at the noon hour, when abuse in transfers is most frequent. As soon as we have converted our stock of tickets to the new form, we shall put them into effect. They are, I understand, now in use in Minneapolis, St. Paul, New Haven, Binghamton and Scranton.

In conclusion I need only add that our liberal system of transfer has proved a good investment, and that our form of ticket is efficient and protective. Simple, convenient and safe, yet systematic, distinct and business-like, it protects our interests, while it saves us all former waste and a vast amount of useless labor.

### THE T-RAIL TRACK CONSTRUCTION OF THE TERRE HAUTE ELECTRIC RAILWAY.\*

BY RUSSELL B. HARRISON.

It gives me pleasure to respond to the request and invitation of the American Street Railway Association, extended last year at the Milwaukee convention, to make a report, at the Atlanta convention, on "The T-Rail Track Construction of the Terre Haute Electric Railway." This is not alone from the fact that it is very gratifying to have so influential a body as the American Street Railway Association thus recognize the pioneer and successful work of the Terre Haute road in the important field of track construction, but more especially from the standpoint that having given several years' study to street railway track construction—not following as others lead—but working on the problem with new and original ideas, I believe the presentation of the results that have been secured will not only prove of great value and interest to the members of the association in showing how T-rail track construction may be successfully laid in paved streets, with the hearty approval of the public, but will give the members a standard to follow that will enable them to save the thousands of dollars in expensive experience and in costly experiments. If but a small part of my expectations in this respect shall be immediately realized, the seed will be sown and will produce a great harvest, bringing ample reward for our efforts and work on the problem.

The present standard of "all steel" T-rail track construction of the Terre Haute Electric Railway not only has no equal in this country, but is so far in advance of anything yet attempted in the way of street railway track construction that I feel a brief outline of our work on the problem, prior to reaching the present standard, will not only be out of place, but will prove of real interest. I am aware, gentlemen, that these are strong words to be used in connection with our present track construction, and that my opinion may not be immediately shared by many members of the association, but I am confident that all members making an actual inspection of the track will share my opinion as to its smoothness, solidity, durability, permanency and general merits, and the great advantages and public popularity of the smoothly finished asphalt and brick paving laid in connection with it.

Terre Haute is an anomaly, among the cities of this country, on the subject of street railway track construction. It is the only city that would not permit girder or grooved rail in its streets, and would make as great a fuss now on the subject as the average city would do if an attempt were made to lay T-rail track. This will seem a strange condition, but to the company it is a very pleasant one, making its relation with the city on the subject harmonious, and permitting the road to secure, with popular approval, the best and most durable form of rail, at the least cost. This feeling—the approval by the public of a T-rail—did not exist at the start, but was wrought about gradually, assisted by the greatest of all teachers—experience. It could not be in existence to-day if the management of the road had not at all times realized that public opinion and the approval of the public were valuable assets to a street-railway company, and worth every earnest effort to hold and maintain. Our motto has been, not how cheaply, but how well we could construct our tracks in the streets. The public have appreciated our efforts and sustained us loyally.

There has been in the past too much attention

paid to motors, generators, cars, power-houses, etc., and too little to the foundation for successful and economical operation—a perfect track. The development of electricity as a motive power for street railway service was very rapid, and it is only natural that the inexperienced should be misled in their hurry to change power and have an electric road that would make them very rich in a year or two. Is it any wonder then that many roads should find after a year or two of experience that the track was too light for the cars and motors, and the cars and motors were too heavy for the track, and that both were worn out and required rebuilding, at time when the great panic had reduced traffic to its lowest point? Light and abused track and worn-out cars and motors, coupled with reduced traffic, have brought to too many roads the unwelcome guest—the receiver.

It seems strange that street railway track construction should drift so far away, in theory and practice, from steam railway track construction. One had but to study the wonderful display showing the development of track construction in the Transportation Building at the World's Fair to acquire a liberal education on the subject. The Terre Haute road has indeed had a fortunate experience. Its management early realized that successful track construction should approach as far as possible, and not deviate from, further than necessary, the best steam railway track construction. So to-day the Terre Haute road is an all T-rail road and every block of track in paved streets of so durable a character that it will last for years, with a minimum of repairs.

Terre Haute, although a small town at the close of the great civil war, was very enterprising and determined to have a street railway. A company was incorporated for this purpose in 1866, with ample capital, and commenced to lay track early the following year. It is an interesting fact, in connection with the present low price of steel, that the side bearing, flat iron rails purchased by the company in 1867 cost \$108 per ton. These rails were used about 20 years, and then 38-pound girder rails were substituted. The franchise of the company does not contain any requirements as to the style, character or weight of the rails. While there has been no expression from the public on the subject, the management feared that the general and popular prejudice against the use of T-rails in the streets would appear in Terre Haute. They, therefore, hesitated about so radical a change, but, appreciating the good results that would come from the use of such a rail, they decided to place a trial order. No publication was made of the fact that it intended to use T-rail. The first T-rail laid by the company was on South Third Street, in the fall of 1890. This rail was laid preparatory to changing the motive power from horse to electricity. The old girder rail on Third Street was taken up, new ties distributed, and when everything was ready the T-rail was distributed in a matter-of-fact way, as if it were the only rail that could be used, and a force of men put to work in laying them. The mayor of the city came around shortly, reports having reached him as to the company laying a steam railway track, and, when he saw the reports were true, said with some excitement, "What are you doing here—putting a steam road in our streets?" The superintendent, who was on the spot, was equal to the emergency, and replied pleasantly, but earnestly, that the track was being built for an electric railway. The mayor replied that that could not be the case, as the rails were steam road rails. The superintendent then informed him that these T-rails were the only rail adapted for the successful operation of electric railways, and, while it appeared to be the steam road rail, it was in reality very much lighter (the section being 40-pound T) than a steam road rail. Further explanations satisfied the mayor and convinced him as to the merits of the T-rail. In a short time he not only became interested, but enthusiastic, and brought councilmen to see the rail, and explained to them its advantages for electric street railway service. They in turn brought prominent citizens and others to look at it, and thus by tact and good management the T-rail was introduced.

A description of the laying of this first T-rail track will prove of interest. It was a 40-pound T-rail, laid on oak ties  $5 \times 7 \times 7$ , with 3 feet space from center to center. The rails were laid without proper regard to having the end of the rail rest on a tie. Planks  $2 \times 6 \times 12$  were laid on both sides of the rail. On the inside, the planks were nailed to the ties, and on the outside blocks were nailed to the ties to raise the plank to a level with the rail, to provide vehicles an easy crossing. Ordinary flat splice bars were used with the rails. The rails were bonded with  $\frac{3}{8}$ -inch galvanized bond wire, with a single bond to the joint. They, in turn, were wired and soldered to a supplementary wire of  $\frac{1}{4}$ -inch galvanized stranded iron wire, each alternate joint being soldered and wired from both rails of the track. In the single track the supplementary wire was in the center of the track, and in the double track between the tracks. The track was covered in with good gravel.

One year's experience demonstrated that planking was unnecessary; that gravel, which is found in great abundance under and about Terre Haute, made—with a little clay that is found above it—a superior substitute for the plank, and protected the rails better, in enabling vehicles to pass along, and to cross the track easily and without injury. This substitute only required occasional attention in filling up low spots to maintain a level roadway. In two years the planks were badly decayed and warped up at the end, and as the track was thoroughly overhauled at that time, the planking was taken up, and gravel substituted.

At the end of two years' service of the track it was found, in making repairs, that the galvanized iron supplementary ground wire was rusted out and gone for various distances, making a return circuit an impossibility, and as we only had the rails to depend upon, which, in themselves, for this purpose, are not sufficient, this trouble not only reduced the efficiency of the circuit, but caused frequent burn-outs of the armatures and fields. It grew to such an extent that it was found necessary to rebond this track, and it was decided at the same time, to dig up and repair the entire track, and increase the number of ties by one-third, and, at the same time, give careful attention to having the ties under and properly supporting the rail joints. Tinned No. 00 copper wire was substituted for iron, as the bond and supplementary wire. Good gravel with a little clay was substituted for the plank along the rail, and the substitute has given very much better service than the planks have ever done. This section of the road, as rebuilt, is in daily use now, and giving good service.

The era of street paving did not set in in Terre Haute until 1892. This was not because Terre Haute lacked in enterprise and progressiveness, but was because the town was situated on a high bluff fronting the Wabash River, and had, with the gravel subsoil, good drainage and good streets. When it was decided to pave Wabash avenue and Main street with brick for 15 blocks, it became necessary for the company to take up its girder rail. Our experience thus far with T-rail had been so satisfactory that it was decided to continue its use on the following method:

**Rail.**—About this time the Illinois Steel Company brought out its 60 pound Shanghai T-rail, and as it was  $5\frac{1}{2}$  inches high, permitting paving without chairs and direct spiking of the rail to the ties, it was very promptly adopted and ordered.

**Ties.**—Carefully selected oak ties  $5 \times 7 \times 7$  were used.

**Foundation.**—After excavating for the track, the ground was rolled by a heavy 14-ton steam road roller. Then 6 inches of broken stone was placed in position as a bed and rolled by the 14-ton steam road roller.

**Track.**—Then the ties and rails were placed in position and raised to grade by tamping screened broken stone underneath; spaces between ties were filled with broken stone and rammed to position.

**Bonding.**—Single bonds were used of  $\frac{3}{8}$ -inch galvanized iron wire, and a supplementary wire of No. 00 tinned copper wire.

**Paving.**—On top of the broken stone, screened sharp sand was packed, and with one-inch hose this sand was washed into the interstices of the stone. After drying, the sand was brought up to an even surface by a fresh deposit, and it was then smoothed to even surface and the desired thickness by a mold-board. Then vitrified bricks were placed in position, leaving them somewhat higher than the rail. They were driven into the cushion of sand by means of hand hammers, with a square piece of boiler plate placed on top of them, to force all to the proper level. The sand cushion permitted the bricks to crown evenly from center toward each rail to afford proper drainage. A special brick with one corner cut off, with sloping angle to give space for flange of wheel to run in, was laid next to the rail. These bricks were not of the shape of the special nose brick now used, and only set against the lower edge of inside of head of rail. The space between the brick and web of rail was filled with grouting. Bricks of regular size were laid between. After the bricks had been rammed and rolled to proper position, a grout of best screened sharp sand, and Portland cement with water, made to such flowing consistency as to percolate all the crevices, was poured over them, and by brooms pushed into the openings. When thus wet, the bricks were solidly united, and they cannot be separated except with great difficulty. A finishing coat of sand was thrown over the entire surface and traffic kept off for one week. After thoroughly setting, the sand was swept off and the street opened for traffic. The street between the tracks and curbstone, as well as between the tracks, is one solid mass of concrete and brick from center of street to curb and will sustain great pressure. Since this track was laid our experience with it has demonstrated that it could have been improved in one particular, viz., the sand and broken stone should have been united with cement into regular concrete. For we have found since the paving was completed that the rise of the water on

\* Read at the Convention of the American Street Railway Association, Atlanta, October 17-19, 1894.



the sand did not wash it thoroughly into interstices of the broken stone. In time the sand dried and settled down into the spaces, and, while the ties and the paving immediately over them have remained firm and solid, the paving between the ties has settled slightly, without breaking or disturbing the concrete holding them together. This track laid in Wabash avenue, the principal street of the city, has had two years' severe service, and has been thoroughly tested in every particular, and thus practically demonstrated its great success and merit. Vehicles, carriages and wagons can pass along the rail, and turn in or out at will, without jolt or wrenching. It can be crossed at right angles, or at any angle with equal ease and comfort. A continuous traffic over it has caused no perceptible wear, and the cars glide over it without oscillation, as smoothly as when first laid.

Our next experience with T-rail construction was in a street paved with asphalt, where a half mile was laid in the fall of 1892, and a mile more in the spring of 1893.

While asphalt presented some new problems, the T-rails, ties, joint plates, bonding and supplementary wires were the same as on Wabash avenue, the foundation was improved by making it of concrete, 6 in. below the ties. This broken stone concrete was also placed between the ties, and up to a point to allow space for 4 in. of asphalt packed into position.

The asphalt was brought up to and in contact with the rail on the outside for the entire distance of half a mile. On the inside of the rail for the first half mile the vitrified brick used on Wabash Avenue, with corner cut off on a sloping angle, was used to give flange-space, and between the two ends of the brick asphalt was used in the regular way. On the last mile the merits of the Haydenville blocks having been brought to our "attention" it was decided to use them both inside and outside of the rail, and, while it makes a smoother finish to the rail than the brick or asphalt, our experience proves that these blocks do not have the wearing qualities of the brick. This track and asphalt paving are beautiful in finish, and of unusual strength and smoothness. It is a genuine pleasure for passengers to ride over this track, for there is no motion perceptible except the forward motion.

Our next experience with T-rail construction was during the year 1893, in several streets paved with brick. The rail was 60-pound Shanghai; and rail plates, bond wire and supplementary wire were the same as in the street laid in asphalt. The foundation was 6 inches broken stone concrete below these ties, and about 5½ inches additional concrete between the ties. It also covered slightly the top of the ties. The foundation for this brick track was further improved by pouring a thin wash of sand and cement over the top of the foundation before placing the sand cushion thereon. This gave the foundation, track, ties and concrete a solid union. The brick paving was laid in a manner similar to that on Main street. Instead of angle cut brick for flange space Haydenville blocks were placed on the inside of the rails, 1½ inches distance therefrom. The lower part of the space between the Haydenville block and rail was filled with sand concrete, rammed down tight. On top of this an inch of tar was placed. The hollow spaces in the Haydenville block were filled with sand concrete before placing in position, and the space in the center of the track between blocks was laid with vitrified brick in the regular way. This track is perfect in strength, smoothness and durability. A year's experience with the Haydenville blocks on these business streets shows that the glazed upper surface wears too rapidly, and their use has been entirely discontinued.

While this track just described was in every way superior, I gave further study to where additional improvements could be made, causing the following changes: 1st. To use a heavier rail with wider head; 2d. To substitute metal glass ties for wood; 3d. To secure greater rigidity and evenness in rail ends; 4th. A firm and permanent hold on the rails without the use of nuts and bolts; 5th. In paving, a better brick, and of such shape as would provide better flange room and contact with the web of the rail. These changes brought us to an all steel T-rail track.

**Rail.**—When the Illinois Steel Company brought out the 72-pound Shanghai T-rail, which was an improvement both in weight, strength and in the width of the head of the rail over 60 Shanghai T of same make, it was immediately adopted as the company's standard and was used in our latest and best T-rail track construction. The rail is 6 inches high, the base is 5 inches wide, the top or head is 2½ inches in width. The web from where the turns begin is 2½ inches. The long web permits the rail to rest on the ties and brings the top of rail to proper level for paving with brick, asphalt or granite blocks. In this track the rails are laid broken-jointed. The 72-pound rail has a wider head which gives better contact and wider bearing surface for the wheels. The edges of the

wheels do not nick or chip out as with the lighter rails with narrower heads.

Experience with the narrow head rails demonstrates that by wear an outer flange is formed on the wheel, and that this outer flange is very destructive to the life of special work and the wheel. The wider rail head is also better for gravel or macadamized streets, as it gives no opportunity for the stones lying adjacent to the rail to nick the outer edge of the tread of the wheel.

**Foundation.**—The foundation of a track is to a larger degree than any other part responsible for its wearing qualities, and this fact has not been lost sight of in our work. Good rails, ties and joints cannot alone make a track or properly sustain it so as to keep it level and give good wearing qualities; therefore under the all-steel track it was determined to place a heavy foundation of the best material. After the necessary excavation the ground was rolled with a heavy 14 ton steam road roller. Then eight inches of broken stone concrete was placed in position and allowed to set. Then the rails, ties and joints were distributed and connected together; and when the track is completed it is brought to the required grade or level by putting blocks under the rails at intervals to bring track to proper grade. Then four inches of broken stone concrete is tamped under the ties and under the rails; after the tamping process is completed the inequalities of the surface are filled with concrete and the whole leveled up with concrete over the top of the ties and pounded to a level surface with a wooden rammer and allowed to set.

**Ties.**—The ties are steel and double corrugated and heavily coated with tar while hot, and are 2 inches high, 7 inches wide and 7 feet long for straight line work, and were laid 15 inches between centers. For special work the ties vary in length as the necessities require up to 20 feet or more. The metal of the tie is ½ inch thick. These ties were manufactured by the Daniel Steel Tie Company, of Youngstown, O. The rails rest on and are fastened to the ties by clamps with off-sets to fit the base of rail. These clamps are secured and adjusted to the top of the tie by special made bolts with oval shoulder, and inserted from bottom of tie with the head below and the nut on top, which permits a powerful box wrench being used to draw the nuts on bolts to a permanent position.

In using these steel ties in connection with the Wheeler rail joint a mechanical difficulty arose, but was overcome in the following way, after some study: The Wheeler joint has a thickness of three inches below the rail base, and in laying track with broken rail joints a straight tie would not answer. At first we thought it would be necessary to use a wooden tie under rail joints, but by devising a special tie we were able to have them all of metal. The special steel tie for use under joints was adjusted to the necessary levels, by bending it down in the center three inches by an easy off-set. In laying the track these special ties were easily placed in position and gave perfect satisfaction. The clamps and bolts were the same as on straight line work.

**Joints.**—A great deal of attention was given to the subject of securing a good rail joint for this all-steel track, and after examining many devices selected the Wheeler rail joint made at Marion, Ind., as it did away with the bolts and nuts and embodied the best of all mechanical principles—that of the wedge. These joints at that time had not been made for Shanghai rails or for steel ties, but I overcame these difficulties by designing a new joint to be used with these rails and ties, and secured in this new pattern more bearing surface on the tie, by having the bottom of the joint made to fit the corrugations of the tie. The joint consists of two parts, one of which is keyed onto the other. The larger or heavier part used on the outside of rail has two lugs that fit in the angle-joint holes nearest the ends of rails. After it is placed in position the lighter part is keyed on with a large maul and it holds the rails rigid. Then the tie is placed under joint and is fastened to it in the regular way, with the exception that the clamps have longer off-sets, the holes in the ties for the bolts are also wider apart on account of the width of the base of the joint. The joint has corrugations on each side at right angles to the rail, which gives it great strength. The joint is made of the best malleable iron and weighs 3½ pounds complete.

**Bond and Supplementary Wire.**—Iron wire having proved unserviceable and unsatisfactory, the heaviest copper wire was used in connection with this steel track. Double bonds of No. 0000 copper wire were used at each rail joint, one in the upper and one in the lower part of the web of rail. These bonds were soldered and connected to the No. 00 tinned copper supplementary wire, that has been adopted as standard.

**Paving.**—When the foundation is completed and the track set in it, as just described, nothing remains but the paving to complete the track and street for use. The all-steel track was laid on Ninth street, a business street leading from

Wabash avenue or Main street to the Union Depot, and brick was, therefore, selected for the paving material. This brick pavement was laid as previously described, and needs no further description.

As the use of Haydenville block has been abandoned and the angle nose-cut brick did not touch the web of the rail, I designed a special shaped brick that has many advantages, combined with the same wearing qualities as the brick on each side of the tracks. A sample pattern of brick which I have with me will give a clear understanding as to its shape.

**Drainage.**—In the earlier laid track in paved streets, rapid and proper drainage of the tracks was not provided for. The paving was crowned to the center of the track and followed the slope of the streets, but when the lowest point in the street was reached, no provision was made to carry the water quickly to the sewer. In this new track, proper provision is made to get rid of the water from rain, snow and street sprinkling, quickly and effectively. In the center of each track, at the lowest point in the grade of each street, an eight-inch sewer pipe was laid to the sewer. Over the top or opening of this pipe, in the center of the street, is placed a small catch basin surmounted by a special made iron grating. The water flowing down the track and along the side of the rails is thus rapidly removed and a simple and effective drainage secured.

**Injury to Track by Vehicles and Heavy Teaming.**—On our track, which is standard gauge, 4 feet 8½ inches wide, heavily loaded vehicles cannot drive along it and get the benefit of the smooth metallic surface as in the case with girder rails. This condition is a great improvement, and makes a saving in many ways.

First. It saves an immense amount of money in repairing the injury and wrenching to track, and rapid wear and tear thereto caused by vehicles, and particularly heavily loaded wagons turning in and out and driving along the track.

Second. It permits a quicker and more frequent car service—which all street-railway men know means time and money by giving the cars a clear track.

These are great advantages, and will be best appreciated by the managers of the lines in large cities. They can also bear testimony to the large savings effected in the wear and tear.

To further prevent heavy teaming along the flange spaces of our track, and at the same time make the wear and tear on the street paving, which we are required to maintain, a minimum, the following ordinance was passed by our City Council, Oct. 4, 1892:

"An Ordinance Regulating Heavy Hauling Over and Through the Improved Streets of the City of Terre Haute.

"Be it ordained by the Common Council of the city of Terre Haute that it shall be unlawful for any person to drive or cause to be driven, or permit his or her servant, to drive, upon any street or alley paved with wood, stone, brick or asphalt, any wagon or other vehicle having upon it weight which, together with the weight of the wagon or vehicle, shall exceed four thousand (4,000) pounds and less than seven thousand (7,000) pounds unless the tires upon such wagon or vehicle shall be at least three inches in width; nor shall any such wagon or vehicle having upon it a weight which, together with the weight of the wagon or vehicle, shall exceed seven thousand (7,000) pounds, be so driven in or upon any such paved street or alley, unless the tires on such wagon or vehicle shall be at least three and one-half (3½) inches in width.

"Section 2. Any person who shall violate any of the provisions of this ordinance shall, upon conviction therefor, be fined, and forfeit and pay not less than five dollars (\$5) nor more than fifty dollars (\$50).

"Section 3. This ordinance shall take effect and be in full force and effect on and after Dec. 1, 1892."

In closing this report, gentlemen, I wish to thank you for your attention, and at the same time express the hope that it will prove, as it was intended, a good guide to you in securing that very necessary condition for successful and economical operation—perfect track.

Before closing I wish to call your attention to the fact that through the kindness of The Paige Iron Works Company, I am enabled to show you in the Exhibition Hall a sample of our special track work made of 72 pound Shanghai steel rail and laid on the Daniels steel ties, as we lay it. Also samples of Wheeler rail joints, attached and unattached to rails. Also a crude sample of our brick paving. This sample is not as correctly or as smoothly laid as we lay it in Terre Haute, but as I did not reach Atlanta in time to supervise the laying, it would be unreasonable to expect unskilled hands, without guidance, to lay it as our experienced employes do.

#### THE DISCUSSION.

Mr. SEELY: I would like to ask Mr. Harrison what is the cost of the T-rail construction, as compared with girder rail construction of the same weight?



Mr. HARRISON: I could not give any comparison as to the same weight of rail, because I never laid girder rail of that dimension. Our experience was with 38 and 45 pound girder rail, and that was all taken up long ago.

Mr. SEELY: Have you had any experience with the T-rail outside of the brick and asphalt pavement—have you had any experience with granite blocks?

Mr. HARRISON: No, sir; the brick pavement was much superior for smoothness and durability than the granite blocks. But I am confident we can lay the rail as well and as successfully with the granite blocks as with the brick or asphalt pavement.

Mr. SEELY: Do you not find that the concrete foundations are extremely rigid for the cars; that the wear takes place in the cars instead of in the rails?

Mr. HARRISON: The track is perfectly smooth and there is no jolting or jar; no oscillation with our cars. When the car comes to a rail joint, you cannot tell that you are passing over it. Our track foreman has had long experience in steam railroad practice, and he is instructed to spare no pains or expense in making the joints as solid and rigid as possible. I do that because I believe that after you once put a track in a paved street you do not want to repair the rail joint; you want to have it so that it will not give you any trouble, and for that reason there is no money spared in laying the joints. The joints are laid as close as the natural expansion and contraction will permit.

Mr. SEELY: The reason I bring up that point is that at the present time a great many railroads are being constructed where they are not allowing any space for contraction and expansion.

Mr. HARRISON: My experience on that point is that there is so much of the metal down below the surface, where it is cool, and so little of it exposed to the heat, just the head—we have no grooved rail or girder in our town—and just a little on one side exposed, that we do not suffer from contraction and expansion, as in the case of a girder rail. The joints are the Wheeler joints and rest on the tie, and we tamp the rail up with concrete. Not only are the ties supported by concrete, but there is concrete under the rail also, and the concrete comes up over the tie so that the rail and tie both rest on solid concrete with a heavy bed below, and when this brick paving is put on and all concreted together there are practically no joints, and you cannot feel them in passing over the rail. It gets no wear at all, and that is why, in economy of operation, it is superior, because there are no joints to rattle a car in passing over them. Our motes and cars last longer, and we have better service.

### EXHIBITS AND CONVENTION NOTES.

The United States Car Fender Company of New York interested many of the delegates and visitors at Atlanta in the M-demann car fender, which was fully described and illustrated in the STREET RAILWAY GAZETTE two weeks ago. This tender made a most favorable impression and one of its strong points is that it collapses when it strikes a body of 40 pounds or more weight and invariably picks up the object. As it is covered with elastic wire netting, a person falling into it is not injured, and having an oscillatory motion, it slips up and down on its frame according to the inequalities of the ground or track whenever the bottom of the tender touches. At no time is the bottom of the fender more than three inches from the ground and when it strikes a body and collapses, it rises to at least 18 inches above the ground so as to clear the drawbar on the car; and the opening of the wings on either side of the fender—and which are a part of it—prevents a body from rolling over the side of the fender and thereby getting under the car.

The Norfolk & Western Railway in connection with the Royal Blue Line ran an elegantly appointed train from New York to Atlanta and return, which proved to be a most delightful excursion. On the return trip a stop was made at Chattanooga from which point a visit was made to the historically famous Lookout Mountain, where an appetizing lunch was enjoyed. The party then proceeded to the Natural Bridge in Virginia and thence to the celebrated caverns of Luray, the beauties of which were a revelation to many. From Luray the train ran direct to New York, arriving on schedule time Monday morning. Mr. L. J. Ellis, the Eastern passenger agent of the Norfolk & Western Railroad, was untiring in his efforts to entertain his guests, and received much praise for the perfect manner in which the trip was conducted.

The Genett Airbrake Company, of New York, gave a practical exhibition of the Genett air-brake for use on street cars, and this attracted special investigation by many prominent street railway men. The facility with which a car can be hauled when thus equipped was generally remarked upon, and the different motions which operated the cars with the Genett air-brake were particularly pleased with this labor-saving device. The brake was

given a severe test on several of the heaviest cars in Atlanta, with most satisfactory results. This exhibition in connection with the able paper which was presented by Mr. E. J. Wessels, general manager of the company, brought the Genett air-brake prominently before every one interested in such matters.

The Jewell Belting Company, of Hartford, Conn., distributed souvenirs which suggested that more prosperous times are at hand. The gentlemen were given pocketbooks for carrying bills, and the ladies were given, as souvenirs, an exceedingly handsome card case and pocketbook made of lizard skin. The Jewell Belting Company is always very happy in its choice of souvenirs, and is careful to avoid disfiguring them by too much printed matter. The result is that the Jewell souvenirs are kept long after all other reminders of conventions have been thrown away. The card cases which the company distributed to its friends over a year ago at the Milwaukee Convention were to be found in the pockets of many of the visitors in Atlanta.

The McGuire Manufacturing Company, of Chicago, well known to all street railway men throughout the country, made an exhibit of its different specialties. The McGuire electric sweeper, car heaters, trucks, etc., are so well known that no attempt will be made to make an extended mention of them at this time. A neat souvenir in the form of a pen-wiper was distributed to the visitors. An interesting exhibit made by this company was the Christensen air-brake, which was shown in practical operation on the Consolidated company's lines. Had it not been for the slowness of the freight lines in delivering goods, the McGuire exhibit would have been second to none.

The New Haven Car Register Company had a well-arranged and very striking exhibit of its fare registers, and showed a novelty in the way of a new register which records several fares of different amounts and a transfer. This instrument attracted much attention and was very favorably commented upon. The souvenirs presented by this company were of a useful and permanent kind, and consisted of a paper-weight, with a handsome illustration of a register on one side and on the reverse side was a mirror. The company also presented a beautiful inkstand for desk use, which contained two bottles and a rack for pens and pencils, and a handsome calendar.

The J. G. Brill Company, of Philadelphia, made a characteristic and most excellent exhibit which was in keeping with its reputation for enterprise and good taste. In addition to a number of handsome cars which were in operation on the several street railway lines, it exhibited a section of a car showing a new design of movable vestibule which can easily be adapted to open cars. This and the new design of brake mechanism interested many practical street railway men. The company also showed a completely equipped snow-plow and a number of special features of construction which have made the Brill cars famous throughout the world.

The Berlin Iron Bridge Company, of East Berlin, Conn., had the only structural display in the building. This company is so well known in the street railway and electric light industries by reason of its handsome and tasteful advertising matter which has been issued from time to time, that no extensive mention in this connection would materially add to its universal reputation for reliable and perfect construction. The exhibit showed the method of constructing a thoroughly fire-proof and almost indestructible roof, which was made of galvanized corrugated iron lined with the Berlin patent roof lining.

The General Electric Company had a comprehensive exhibit of its various street railway specialties which included about everything the company manufactures for street railway service. The General Electric Company has a number of "G. E. 800" motors in use on the Consolidated roads in Atlanta, which fact was made known by prominent signs on the cars. In addition to the exhibit in Machinery Hall, the General Electric Company had headquarters at the Aragon Hotel and also at the Kimball House, and at both these places the hospitality of the company was liberally bestowed on its friends and visitors.

The Michigan Electric Company, of Detroit, Mich., appeared for the first time with an exceedingly fine exhibit of new line material, which met with general approval from practical men. The exhibit included everything used in overhead construction; and the new method of displaying a signal light at the trolley pole base won much favor. Nearly all the material displayed in this exhibit possessed special features of merit, and the circulars and catalogues distributed by the company will certainly be preserved for future reference by street railway men.

The ladies and gentlemen who occupied a special train to Atlanta over the Pennsylvania and Southern railways adopted resolutions thanking these two

companies for the kindness and courtesy that had been shown them. Special thanks were given to W. A. Turk, of Washington, D. C., general passenger agent of the Southern Railway; S. H. Hardwicke, Atlanta, assistant general passenger agent; A. S. Thweatt, Eastern passenger agent; and George C. Daniels, New England traveling passenger agent of the Southern Railway.

One of the most interesting exhibits was that made by the Consolidated Car Heating Company, of Albany. Sections of car seats which were located in the space were fitted with the company's electric heaters. The various styles of electric heaters for different kinds of cars were also shown, as well as the new style of controlling switch which has recently been introduced. This exhibit was found to be one of the most interesting to street railway companies.

The H. W. Johns Manufacturing Company, of New York, made an interesting exhibit of overhead material of every description, including switches and frogs and other devices. In addition to these an extensive show was made of samples of various manufactures of Vulcanobeston, including pipe coverings and other fire-proof goods. The unique souvenir buttons distributed by the Johns company were to be found on the coats of many delegates and visitors.

The R. D. Nuttall Company of Allegheny, Pa., had a very fine exhibit of supplies and specialties. It may be questioned whether any concern has of late years done more than this company to advance the standard of this important class of work. The exhibit told of careful study and successful treatment of the many problems involved. There were shown the Nuttall trolleys, wheels, gears, pinions, harps, etc., in steel, iron and malleable iron, and other specialties.

The Arbell establishment, manufacturers of wrought iron forged wheel centers for street railway service, whose works are at Rives-de-gier, France, represented by their American representative, Mr. William Hazleton, 3d, had on exhibition a very neat model in the reception parlor of the Aragon Hotel. Mr. Hazleton distributed a handsome set of catalogues neatly done up in fancy papers tied with red, white and blue ribbon.

The Johnson Company, Johnstown, Pa., made an interesting exhibit of special track construction in its new style of special work. Another feature of this exhibit was the Dupont track, which is owned and manufactured by the Johnson company. In addition were shown a large number of models of different types of girder rail and standard girder joints as well as miscellaneous manufactures of the Johnson company.

The Sterling Supply & Manufacturing Company, of New York, had a complete exhibit of the several styles of the Sterling fare registers. The exhibit was neatly arranged and was very interesting. It included a number of models of old machines, showing the progress and development in this line that have been made in the last few years. The souvenirs presented by this company were unique and much sought after.

Lioburg, Sichel & Company, of Trenton, N. J., made a good exhibit of their Trenton trolley wagon. The wagon and tower are solidly yet handsomely built, and at the top is a swinging or revolving platform. The tower is fitted with gear which enables it to be quickly raised and lowered to any height. There are also a couple of light ladders, toolboxes, etc., and there is no interruption of car service while it is in use.

The R. A. Crawford Manufacturing Company, of Pittsburgh, exhibited a full line of its fender equipments, so that they might be inspected in the different positions that they assume in actual service. These well-known fenders are now in use in a great many different places, and seem to be giving excellent satisfaction. The wheel guard that the company makes for electric cars was also on exhibition.

The Fulton Truck and Foundry Company, of Mansfield, O., had a good exhibit, which included their Imperial trucks, Troy sandboxes, hydraulic motor-lift, Haycox patent door fastener, Robinson patent drawbar, standard transfer table and numerous other specialties. One novel piece was a machine run by a small Elliot-Lincoln motor, destroying used tickets at the rate of 2,000 per minute.

The Westinghouse Electric & Manufacturing Company made a display of special apparatus in parlors at the Aragon Hotel, and also took great pride in exhibiting the great Westinghouse generator in the power-house of the Consolidated Street Railway Company in Atlanta. The company received many compliments on this beautiful generator and a large number of the delegates paid it a visit.

The Lewis & Fowler Manufacturing Company, of Brooklyn, N. Y., was well represented, but did not make as large an exhibit as usual. The company displayed a number of its specialties and a number of samples of street railway supplies,



which included registers, car trimmings of various kinds, stoves, etc., also a lifting jack which was recently illustrated in these columns.

The Walker Manufacturing Company, of Cleveland, made a large and interesting display of its flexibly mounted steel motors on a solid forged motor truck manufactured by the Dorner & Dutton Company, of Cleveland. This exhibit attracted many visitors. The company also showed a large railway generator in operation and various appliances for use in street railway work.

The Sterling Supply and Manufacturing Company, of New York City, distributed among its friends a unique roller blotter which will be found of service on many a street railway man's desk. This souvenir was covered with printed matter, which called attention to the fare registers, gates, fenders and other railway supplies, manufactured by the company.

The E. T. Burrows Company, of Portland, Me., made a very nice show of their rolling curtains for railway and street cars, and distributed samples of "Oak-rite," which they claim is a waterproof dust-proof and smokeproof material that will not fade and is not injured by washing with soap and sponge. The company also gave away a very neat blotter.

The Card Electric Company, of Mansfield, O., made an interesting exhibit of a large truck equipped with a 35 H. P. Card motor. It also showed a series multiple controller, a device for turning commutators on the motor without unshipping it, and a number of other street railway specialties which attracted more than ordinary attention.

Those who traveled to Atlanta over the Shenandoah route adopted resolutions thanking Leroy J. Ellis, Eastern passenger agent of the Norfolk & Western Railway, for his attention to their comfort, and congratulating him on the excellence of the train service. Mr. Ellis has been presented a suitable testimonial as a reminder of the trip.

The Security registers which are now so well known were exhibited by the St. Louis Register Company, of St. Louis. The company showed a novel combination register, which is designed for use on cars that have two separate compartments, similar to those that are in service in San Francisco. A transfer register was also shown.

The Peckham Motor Truck and Wheel Company, of Kingston, N. Y., had a very conspicuous exhibit of its standard cantilever extension truck and several beautiful models of trucks. Both of this company's trucks on exhibition carried a complete equipment of motors, and the handsome catalogue distributed was in great demand.

The St. Jwell-Bierce & Smith-Vaile Company, of Dayton, O., made a fine exhibit which included the St. Jwell heater, Smith-Vaile pumps, railroad track jacks, Victor turbines and friction clutches. This company recently installed 1,000 horse power of air pumps and condensers in the plant of the Consolidated company of Atlanta.

The Paige Iron Works, of Chicago, made a very interesting exhibit of trackwork, showing switches and crossings in both girder and T-rails. The T-rails were laid on steel ties and a portion of the exhibit was an illustration of the work done by this company for the Terre Haute Street Railway Company of Terre Haute, Ind.

The St. Louis Car Company gave away one of the most attractive souvenirs that was seen in Atlanta. This was a book containing views of the World's Fair. The views were nicely bound, and the souvenir was eagerly called for by those who have not forgotten that there ever was such a thing as the World's Fair.

The Hartford Woven Wire Mattress Company of Hartford, Conn., had on exhibition its reversible armless car seats for all styles of cars, the seat and back of which are made of the Roberts patent open-base woven wire which has been long in use and is well known to the different car builders throughout the country.

The Pennsylvania Steel Company, of Steelton, Pa., as usual, made an interesting exhibition of railwork, which included the different specialties manufactured by this company. Much interest was manifested in this exhibit by street railway men, who were entertained by the company's able representatives.

The Graham Equipment Company, of Providence, R. I., exhibited the Graham truck, which is already well known to street railway men, and is winning its way into popular favor. A number of these trucks is in use on the lines of the Atlanta Traction Company, and is being operated very successfully.

The Brooklyn Car Seat & Veneer Works, made an exhibition showing the various styles of veneering and woods which they make for use in the manufacture of cars. The Street Railway Advertising Company of New York and Philadelphia

displayed its mode of street car advertising in the same space.

The Safety Clutch Brake Company, of Philadelphia, showed a new clutch brake for electric cars. Its peculiar ratchet feature, assisted by the strong coupled clutch bearings, gives the operator control of the car all the time, the dog on the platform holding the teeth of the sprocket wheel at every turn.

All visitors at the convention had the opportunity of riding on the electric cars in Atlanta to their heart's content, without paying anything for the privilege. Packages of tickets good on all the local lines during the three days of the convention were distributed among the delegates and supply men.

The Storm Manufacturing Company, of Newark, N. J., and J. H. Graham, of New York, made a neat exhibit of the "H. & C." sleet-cutting trolley wheel. This wheel has already found a large market and is undoubtedly a great help in the operation of cars during the winter season especially.

The Charles Munson Belting Company, of Chicago, was well represented, as it had an excellent showing of its well known Eagle belting for railway and lighting work. One of the much looked for features of this exhibit was missing this year. We allude to the energetic Colonel Shay.

The Davis Car Shade Company, of Portland, Me., which is always on hand at conventions, had on exhibition a side section of a closed car and a section of an open car fitted with the admirable shades that are made by the company. Several styles were shown as well as improved fixtures.

The Eddy Electric Manufacturing Company, of Windsor, Conn., had its exhibit in the station of the Atlanta Traction Company, where two large Eddy generators have been in successful operation for nearly a year. There is also a number of stationary Eddy motors in operation in Atlanta.

The Weston Electrical Instrument Company, of Newark, N. J., were represented by R. O. Heinrich, who very ably set forth the merits of the Weston instruments, of which there was a very handsome exhibit on the switchboard of the General Electric Company in Machinery Hall.

The Craghead Engineering Company, of Cincinnati, had an admirable exhibit of its electric railway line material, including its double flexible pole bracket, single bracket, etc., for wooden or iron poles. The bracket is ingeniously contrived and of neat and solid workmanship.

The Morris & Tasker Company, of Philadelphia, one of the oldest and largest manufacturers of electric railway and light poles in the country, was ably represented, and there was no mistaking Mr. S. B. Wheeler, who towered head and shoulders over every one at the convention.

W. R. Brixey, New York, distributed among the delegates and visitors memorandum books of a convenient size. On each leaf attention is called to the merits of Kerite products, by the motto, "An Ounce of Prevention is Worth a Pound of Cure." Use Kerite Insulation.

The Young Nut Lock Company of New York exhibited the Young nut lock, which is well known for its simplicity, efficiency and economy, and also showed the Brownley injector, which the company claim is very easily operated and makes a considerable saving in fuel.

The Standard Underground Cable Company, of Pittsburgh, Pa., made its presence known through its able representative, F. E. Degenhardt, who distributed No. 1, Vol. 1., of "Infinity." Copies of this publication will be mailed to any address upon application to the company.

The Safety Car Heating and Lighting Company, of New York, interested a great many of the railway men in the Pintsch system of lighting cars. This system has been adopted in a number of cities, and has given particular satisfaction on the Broadway road in New York.

The Taylor Electric Truck Company, of Troy, N. Y., made an interesting exhibit of the Taylor improved electric truck, and its special features were made known to street railway men by a liberal distribution of printed matter and also by Mr. Taylor himself.

The Georgia Equipment Company made a very pretty exhibit of miscellaneous goods, which included a complete assortment of street railway supplies, for which it is agent in Atlanta. This company can furnish anything desired in the street railway line.

The Cutter Electrical Manufacturing Company, of Philadelphia, had an operative exhibit of the "C.-S." automatic magnetic cut-out, which as a check on care-less motormen is invaluable and is rapidly finding its way on all the roads throughout the country.

The Niles Tool Works, of Hamilton, O., showed several tools for use in street-car shops. These

consisted of a wheel-boring machine with crane attachment and a powerful hydrostatic press for pressing car wheels on axles, etc., and a compact lathe.

Messrs. Carlton & Kissam, the well known street railway advertising firm, remembered their many friends with a handsome pocket knife, on one side of which the firm's name and business were very neatly inscribed. This was also one of the choice souvenirs.

The Western Telephone Construction Company, of Chicago, exhibited its magneto telephone and compact exchange switchboard. Visitors were allowed to test the efficiency of the apparatus, and many testimonials were offered as to its satisfactory operation.

The Sperry Electric Company, of Cleveland, O., made a prominent exhibit with a special car it had in operation, which was equipped with Sperry apparatus and the Sperry magnetic brakes, which have recently come into considerable prominence.

The Abendroth and Root Manufacturing Company, of New York, was represented by Mr. P. M. McLaren, who was conspicuous in all parts of the building, and took great pains to acquaint the delegates with the merits of the A. & R. boilers.

The Guarantors' Liability Indemnity Company, of Philadelphia, distributed a souvenir in the shape of a leather card-case inside of which they took occasion to call attention to the financial points of the company and the location of its offices.

"Smith," of New York, a house well known to street railway men throughout the country, made an excellent display of street railway lamps of all descriptions, and also a very pretty design of a cluster center lamp with reflector.

The Bushnell Manufacturing Company, of Easton, Pa., had a very neat exhibit of car seats in plush, rattan and leather, also the Bushnell springs. The spring seats and backs made by this company are certainly very comfortable.

The Hughes Fare Register Co., of New York, made its initial bow at the Atlanta convention, and the register attracted no little attention. It was shown by Mr. Packer, whose name is familiar to many street railway men.

The Peckham Motor Truck and Wheel Company distributed among the delegates a pocket billbook on the inside of which appeared a clear and distinct cut of the well-known Peckham cantilever extension truck.

The National Lock Washer Company of Newark, N. J., made an excellent display of its specialties. The lock washers are already in use on a great many railways throughout the country and on motors, trucks and cars.

A number of the delegates made the trip from New York to Atlanta via the Pennsylvania Railroad and Sea Board Air Line, and had a pleasant ride, everything being done for their comfort and convenience.

The Meaker Manufacturing Company, of Chicago, made an exhibit of its registers which are so well known to street railway companies. Samples of the new style of hanger and mechanical clip were shown.

The Stirling Company, of Chicago, made a very pretty exhibit, showing a model of the Stirling boiler in active operation, illustrating its rapid circulation, accessibility to working parts and other features.

The Wallace Electric Company, of Chicago, distributed a large volume of literature devoted to its railway specialties, and otherwise made an impression that must redound to its credit in the near future.

The Wadhams Oil and Grease Company, of Milwaukee, Wis., distributed an aluminum match and stamp box, on which appeared lettering calling attention to the Wadhams graphite axle grease.

The Jackson & Sharp Company, of Wilmington, Del., had on exhibition a very handsome car, which was operated on the streets of Atlanta. This car has been sold to the Hartford, Conn., road.

Mr. C. L. Cornell, of Hamilton, O., exhibited a number of specialties, one of which was a small arc lamp to be operated as a headlight on street cars and fed from the trolley circuit.

The Fitzgerald-Van Dora Company, of Lincoln, Neb., showed a patent automatic coupler which is now in successful operation on a number of street railways throughout the country.

The Price Railway Appliance Company, of Philadelphia, had on exhibition its joints and rail bends which are very well known to street railway men throughout the country.

The Jewell Belting Company, of Hartford, Conn., was on hand as usual with a display of railway dynamo belting of various sizes, also samples of belt cement and belt dressing.

The Rochester Car Wheel Works, of Rochester, N. Y., displayed an assortment of its well known street car wheels, and the process of manufacture in the Barr contracting chill.



The John Stephenson Company, of New York, presented one of the most useful souvenirs in the shape of a steel measuring tape, neatly inclosed in a highly polished nickel case.

The Bass Foundry & Machine Works of Fort Wayne, Ind., exhibited a very nice display of street car wheels in chilled cast iron and steel tired, also axles in iron and steel.

The Columbia Lamp Company, of St. Louis, made a nice display of street railway lamps, and was represented by Mr. J. H. Rhotenhamel, the president of the company.

The Flood & Conklin Company, of Newark, N. J., made a display of fine varnishes for street car work, and presented every caller with a hard rubber postage stamp box.

The Leonhardt Pneumatic Fender Company of Baltimore, had on exhibition its fender, and the inventor, Mr. William Leonhardt, explained the merits of the invention.

Messrs A. Whitney & Sons, of Philadelphia, had their interests looked out for by Mr. F. E. Lex, who has a host of friends who are always glad to see him.

The Okonite Company, of New York, in lieu of an exhibit in Machinery Hall, called particular attention to its underground material now in use in Atlanta.

Charles A. Schieren & Co. gave the visitors a handsome memorandum book on which appeared a view of the firm's Dixie tannery at Bristol, Tenn.

The Chapman Valve Company's exhibit comprised various styles and sizes of high pressure steam valves that are used in power stations.

The Ohio Brass Company distributed a very neat pamphlet containing illustrations of some of its best known devices for street railway work.

E. F. De Witt & Co., of Lansingburgh, N. Y., showed their Coum-on-cuse sardbox, which is now familiar to many street railway men.

The New York Insulated Wire Company was represented by Mr. J. W. Godfrey. Few men in the business are better known than he.

The Pennsylvania Steel Company, of Steelton,

Pa., regaled its friends with a fine grade of cigar, which was inclosed in a glass case.

The American Electrical Works, of Providence, R. I., were well represented by Mr. P. C. Ackerman, manager of the New York office.

The New Process Rawhide Company, of Syracuse, interested many of the delegates by its exhibit of rawhide pinions for motors.

The Keller Printing Company, of New York, made an exhibit of various styles of railroad tickets and machines for printing them.

W. R. Brixey's famous "Kerite" specialties were well represented. They have many admirers among the street railway men.

Arthur S. Partridge, of St. Louis, distributed among his friends pencils, on which his name appeared in gilt letters.

Mr. George F. Porter, secretary of the National Electric Light Association, was an interested visitor at the convention.

The Scarritt Furniture Company, of St. Louis, showed various styles of car seats for street railway service.

The Breed emergency wagon was exhibited by the New England Engineering Company of Waterbury, Conn.

J. H. Stedman, of Rochester, N. Y., exhibited an interesting collection of his well known transfer tickets.

The Central Electric Heating Company, of New York, exhibited its apparatus for electric car heating.

SOCIAL FEATURES.

The banquet took place on Thursday evening at the Knickerbocker House and was a brilliant affair. The toasts and responses were thoroughly enjoyed by those fortunate enough to be present. The programme of toasts was as follows, the initial address being by Mr. J. H. Stedman in his usual witty style: "Our Association," C. D. Wyman; "City of Atlanta," H. E. W. Palmer; "The

Street Car as a Factor in Modern Civilization," Geo. W. H. Jackson; "The Railroads and the Law," Henry Jackson; "The New South," Ben. Lionel C. Levy; "The Technical Press," J. H. McGraw; "The Local Press," Lucian L. Knight; "Our Country," Hon. Fleming Dubignon.

A large party left Friday night for Chattanooga and Lookout Mountain, where it had been invited by the Chattanooga Electric Railway Company. After viewing the magnificent scenery and enjoying a bountiful repast at the inn on Lookout Mountain, the party left for the famous Luray Caverns and the Natural Bridge in Virginia, and reached New York on Monday morning.

On Wednesday evening a very enjoyable reception was given at the Capital City Club, which was largely attended by the ladies and gentlemen in attendance at the convention, as well as by many of Atlanta's prominent people.

On Friday afternoon the "genuine Georgia barbecue" took place at Ponce de Leon Springs. The entertainment was a novel one to most of the Northern visitors, and was thoroughly enjoyed.

On Wednesday delegates and visitors were given a ride over the Consolidated company's lines.

New Securities to be Issued by Chicago Metropolitan.—The plan of the Metropolitan Elevated Railroad people to build additional lines in various directions, with an aggregate mileage of probably exceeding that already authorized, carries with it the practical certainty that the company will have to issue more securities in order to provide funds for its big enterprise. It was reported yesterday that the company would double its capitalization and also increase the amount of construction stock 100 per cent. It was intimated that certain strong Eastern people had signified their willingness to put more money into the Metropolitan scheme if they might be allowed to come in on the same terms as the original projectors of the company. If this plan is carried out the Metropolitan Elevated will have an aggregate capitalization of \$60,000,000; \$30,000,000 stock and \$30,000,000 bonds.—Chicago Herald.

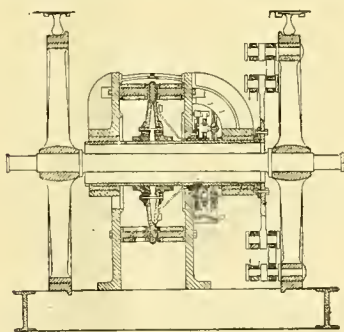
RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Oct. 9 and 16, 1894.

- 527,050. **Dynamic Electric Heater;** Herman B. Collins, Fulton, assignor of one-half to Warren H. Boles, Syracuse, N. Y. Filed Sept. 22, 1892. The heater comprises magnetic fields, a short circuited armature arranged in connection with the magnetic fields to cut lines of magnetic force and generate heat, and a circulating fluid conduit arranged in proximity to the armature and leading away from the same, whereby the circulating fluid therein is heated.
- 527,069. **Cable Stop Mechanism;** Edwin Neil, Newark, N. J. Filed July 11, 1894. This is the combination, with the working cable, of an extra or idle cable in the conduit with the working cable, the extra or idle cable being connected at the power station with means for shutting off the power from the working cable. (See illustration.)
- 527,075. **Burning Compound-Wound Dynamo-Electric Machine in Multiple;** William B. Potter, Science Garden, N. Y. Assignor to the General Electric Company, of New York. Filed June 2, 1894. The method consists in energizing the series coil of the idle machine with current from the other machines, to acquire a preliminary magnetization.
- 527,100. **Rail Bender;** Harry W. Armstrong, Oakmont, Pa. Filed June 30, 1894. The rail bender has plates arranged to extend above and below the rail. There are bearing blocks held between the end of the plates, and means for applying pressure to the rail between the bearing blocks.
- 527,126. **Electric Locomotive;** Nicholas J. Raffald Paris, France. Assignor to the Thomson-Houston Electric Company, of Connecticut. Filed July 23, 1891. Renewed April 13, 1894. Patented in France Sept. 10,

frame with sleeves adjustable longitudinally of the base, and shells adjustable in the sleeves transversely of the base; there are a binding post and brush-guide on each shell, and a crank that has one arm thereof under spring tension within said shell. Its other arm is loosely engaged with the adjacent brush guide.

- 527,203. **Spring Buffer for Street Cars;** Henry A. Howe, New York, N. Y., Assignor to himself, Joseph Livingston and Albert H. Gross, same place. Filed July 2, 1894. The buffer is formed of a long wire helix coiled into a cylindrical form, and the adjacent interlocking

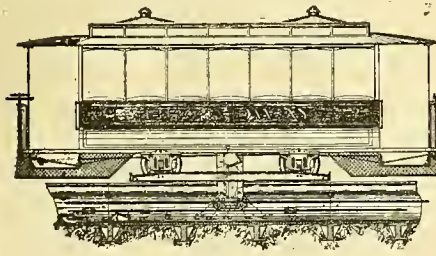


the main dynamo is driven by an engine having a fixed cut-off, an exciting dynamo is driven by a separate engine, and a rheostat is provided for varying the current supplied by the exciter to the main field magnets. (See illustration.)

- 527,262. **Street Car Mechanism for Operating Switches;** Everett A. Barber, Lakewood, and Arthur B. Babbit, Pawtucket, R. I. Filed June 27, 1894. There are two pairs of vertical bars having inclined shoes on their lower ends, held on sliding boxes having springs on each side to keep them in place when not moved by obstructions. Horizontal bars connect the pairs of vertical bars, and springs raise the horizontal and vertical bars. Levers raise and lower the said rods, and means are provided for operating the levers from the car platform.
- 527,265. **Conduit System for Electric Railways;** William A. Butler, New York, N. Y., Assignor to John Gilmore Boyd, same place. Filed April 2, 1894. This is the combination of a conduit, the main conductor running through it, a series of brackets, each having a coupling box through which the main conductor passes, and a contact box consisting of a closed inner shell, a locking closed outer shell, a contact or contact projecting from the outer shell, and controlling the contacts within the inner shell, and a contact device carried by the car adapted to lock the outer shells to complete the circuit. (See illustration.)
- 527,270. **Life-Saving Guard for Cars;** Louis E. Ducois, Toronto, Canada. Filed Nov. 20, 1893. A spindle is pivotally connected to the car and a balance is connected to the spindle with a framework rigidly connected to the framework and to the car. A netting is stretched to the framework and to the car. A lever operates the spindle and a switch mechanism is adapted to cut on

portions of the small helices are held together by an interlaced larger helix.

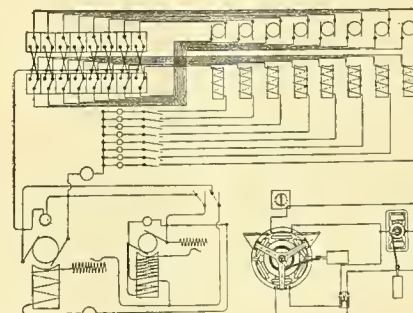
- 527,225. **Adjuster for Field-Magnets of Dynamo Electric Motor;** Montgomery Waddell, Bridgeport, Conn., Assignor to Montgomery Waddell, receiver of the Waddell-Entz Company, of West Virginia. Filed Sept. 6, 1893. Fastening devices extend through the perforations of the perforated frames' support the field magnets, and a support is mounted on the frame carrying adjusting devices upon which the field magnets rest.
- 527,236. **Elevated Railway;** John C. des Granges, Pittsburg, La. Filed May 21, 1894. The elevated track supporting structure comprises supporting posts, cross beams resting on the posts and having their ends projecting beyond the posts. There are rail supporting girders on the cross-beams and braces extend outwardly from the upper portions of the girders to the projecting ends of the cross-beams.
- 527,241. **Car Ventilator;** Otilie H. Goldberg, St. Louis, Mo. Filed March 12, 1894. A rectangular casing having flaring open ends is located adjacent an opening in the upper portion of a car, and an oscillating rectangular ventilator is located within this opening, and a ventilator is located within a rectangular casing upon the interior of a car.
- 527,244. **Electric Locomotion on Railways;** Jean J. Heilmann, Paris, France. Filed April 20, 1891. Patented in France, Feb. 22, 1894, No. 236,493; in Belgium, Feb. 24, 1894, No. 108,723; and in England, March 12, 1894, No. 5,118. In an electro locomotive system



No. 527,069.

1883, No. 157,466. An electric motor is supported from the axle through spring supports allowing of relative movements due to vibrations of the parts, a part being driven by the motor and surrounding the axle, but out of direct or rigid contact therewith, and a flexible driving connection between such part and the axle. (See illustration.)

- 527,127. **Commutator-Brush Holder;** George Rausch, Milwaukee, Wis. Filed April 28, 1894. An insulating base is attachable to a commutator supporting



No. 527,244.

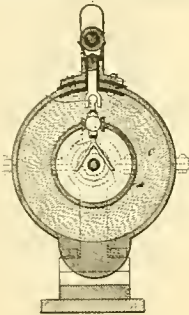
or off the current to the motor of the car, operated by the respective movement of the lever.

- 527,294. **Track Switch for Electric Railways;** August F. Schieber, Milwaukee, Wis. Filed June 16, 1894. Claim 1 reads as follows: "The combination of a swinging switch point, a plurality of electric magnets, a core reciprocative in the magnets, which core is connected to the switch point in such manner that the movement of the core correspondingly moves the



switch point, a conductor leading from a main source of supply, a trolley wire, an insulated strip therein, a conductor leading from said insulated strip to the respective magnets, and a shifting bar electrically connected with the conductor leading from the main supply, said bar arranged to be shifted by the movement of the axle, and in its alternate positions to close and complete electric circuits through the magnets for actuating the core."

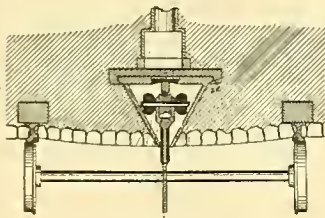
**527,301. Conduit Electric Railway;** James E. Toole, Northumberland, Pa. Filed Jan. 24, 1894. The conduit is composed of two similar parts, each having



No. 527,301.

an inwardly-extending base and an inclined side, the inwardly-extending base portions being spaced apart to form a drainage slot and provided at intervals with ribs which cross the slot. (See illustration.)

**527,324. Electric Heater;** Jesse R. Davis, Parkersburg, W. Va., Assignor to one-third to Charles A. Wade, same place. Filed Feb. 24, 1894. This is an electric heater having a heat-resisting medium and is composed of electrically conductive carbon particles mixed with non-combustible and non-conductive material. Of the two electrodes one is constructed as a plate at



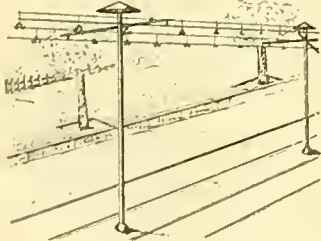
No. 527,301.

the bottom of the heating medium, and the other is constructed as a gravitating ring-shaped electrode arranged at the top of the heating medium.

**527,355. Trolley-Wire Support or Hanger;** Saml C. Woodhead, Philadelphia, Pa. Filed April 21, 1894. A wire is attached to the trolley, and a series of revoluble supports or hangers is supported by the wire, whereby when the trolley wire has become broken or cut, the supports or hangers will prevent it from falling to the ground. (See illustration.)

**527,111. Electric Cable;** Thomas J. Dawees, Palmyra, N. J., Assignor to the Electric Cable Construction and Maintenance Company, of Pennsylvania. Filed June 20, 1894. The electric cable has an irregular inclosing covering of fibrous material forming air spaces about it. An outer metallic tubing or casing incloses the cable and its fibrous covering, and a moisture absorbing substance is interposed between the fibrous covering of the cable and the metallic tube or casing.

**527,415. Dynamo-Electric Machine;** Ezra Fawcett, Alliance, Assignor of one-half to Leonard W. Bradley, Cleveland, Ohio. Filed Feb. 15, 1894. The field



No. 527,355.

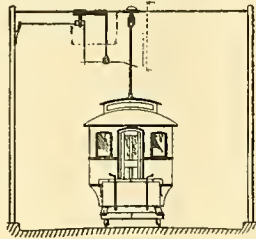
piece has a tapering end, the pole piece having a tapering opening to receive the tapering end of the field piece.

**527,116. Sand-Delivering Mechanism for Street Cars;** Alexander Pirani, Worcester, Mass. Filed May 11, 1894. This is the combination with the car and its wheel-axle, of the sand receptacle, the sliding gate and delivery chute, the gate-operating lever, the contact-shoe movable and sliding on the end of the lever, the lift-spring attached to the lever, a cam on the wheel-axle and means for shifting the contact-shoe endwise into and from engagement with said cam.

**527,161. Apparatus for Signalling the Approach of Street Cars;** Garland B. St. John, Kalamazoo, Mich., Assignor to one-half to Charles D. Fuller, same place. Filed Nov. 27, 1893. This apparatus is designed for use over a single track roadway. A connecting wire runs from a signal to the street car line. The circuit is closed at the street car line is operated only by the approach of the car, an electric supply pulsing through the contact box wire and operating the signal momentarily while the car is moving in only one direction. (See illustration.)

**527,523. Snow-Plow for Street Railways;** Francis W. Dean, Cambridge, and William E. Mathews, Boston, Assignors to the Traction Locomotive Manufacturing Company, Taunton, Mass. Filed July 25, 1894. A V shaped plow is constructed and arranged to partially inclose the lower portion of one end of the vehicle body, and is connected to the latter by a system of parallel motion links. Means are provided for raising and lowering the plow from the vehicle platform, without changing the substantial parallelism of the plow relative to the railway track. (See illustration.)

**527,546. Trolley;** William H. Bache, Broad Brook, N. J. Filed Oct. 31, 1893. A socketed support has an internal groove while the divided bracket has a divided

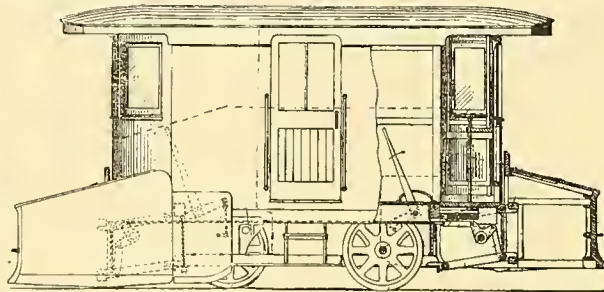


No. 527,431.

pintle, each section of the pintle being provided with a lug extending into the groove.

**527,556. Weather Protecting Covering for Electrical Conductors;** Edwin J. Houston, Philadelphia, Pa. Filed Nov. 17, 1891. The conductor has a thin, pliable, continuous, adhesive, permanent, weather-protecting coating of carbon, substantially integral therewith, and there is a contact device having a contact substance of substantially the same material as the coating.

**527,601. Conduit Electric Railway;** Oliver B. Finn, Philadelphia, Pa. Filed Mar. 16, 1894. The features of this system are a conduit, a box with an opening in its wall, a sliding stem in the opening having

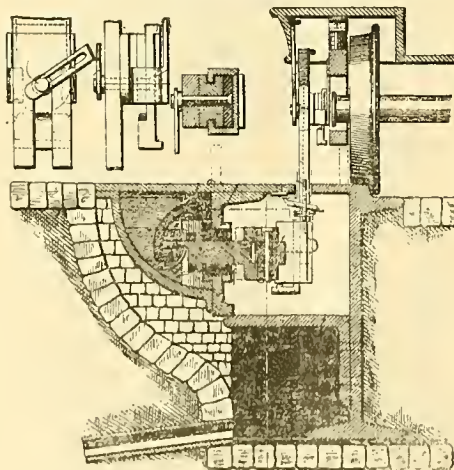


No. 527,523.

a roller thereon, an insulated wire in the box having an arm rigidly connected therewith, the arm having a hooked end adapted to be engaged by a tongue on the stem, and a spring bearing against the stem, all these parts being combined. (See illustration.)

**527,630. Ball-Sanding Apparatus;** William L. Truland, Lonsmeburg, N. Y. Filed May 10, 1894. The sand-box has a valved outlet, and in the box is an edgewise tapered disk rotary, and having a plurality of apertures in the tapered part, means being provided for rotating the disk.

**527,616. Safety Apparatus for Street Railway Cars;** James J. Andrews, Hempstead, and Theodore Mott, Far Rockaway, N. Y. Filed March 8, 1894. A bracket apparatus is extended forward from the platform, and a trap is constructed with a convex forwardly extended lower part, and concave rearwardly extended upper part. An arm is extended downward from the



No. 527,601.

lower and convex part. Means are provided for transversely pivoting the arm to the front of the bracket.

**527,715. Car-Brake;** Herman B. Ozden, Brooklyn, N. Y. Filed Jan. 21, 1894. The tender comprises two frames hinged together and adapted to be hung on a car and a roller supported beneath the lower frame, which has an extension end.

**527,743. Hydraulic Car-Brake;** William L. Fitzhugh, Baltimore, Md. Filed April 16, 1894. An operating screw is connected with the brake rod of the car and a piston having a threaded hub which turns on the screw. A hose which on the car-axle meshes with the piston; a clutch mechanism connects with the axle and coacts with the hose wheel, means being provided for operating the clutch mechanism.

TRADE NOTES.

"The Light of the Future."—Under this title a very interesting article appeared in *Cassier's Magazine* for July, from the pen of D. McFarlan Moore, E. E., accompanied by unique illustrations. Last week the Moore Electrical Company was incorporated under the laws of New York State. The directors are Leopold Wallach, counsel for several trunk lines; Joseph Livingstone, banker; Edward J. Wessels, general manager of the Genett Air Brake Company; and Mr. Moore, the inventor. Neither Mr. Wessels nor Mr. Moore needs an introduction to the readers of this paper, as their work is well known. Mr. Moore's claims concerning current control and phosphorescent light have been made public in all of the scientific and daily papers in this country and abroad, since the time of the reading of his paper before the American Institute of Electrical Engineers on a "New Method of Current Control." For the last five years Mr. Moore has been an engineer for the Edison, Thomson-Houston and General Electric companies. On Oct. 1 he tendered his resignation, and is now devoting his entire energies to developing the business of the Moore Electrical Company, under agreement with them. The new company has secured all the patents owned jointly by Messrs. Wessels and Moore, and an excellent laboratory has been placed at Mr. Moore's disposal.

Prices for Overhead Material Wanted.—F. H. Tidman, who has been for the last 15 years connected with street railways and electrical enterprises, has been appointed superintendent and consulting engineer of the Suburban Traction Company, of Orange, N. J. Mr. Tidman has had a wide experience. While with the Westinghouse Company he built the electric road at Montgomery, Ala., the Passaic section of the Paterson, Passaic & Rutherford Company and has installed a great number of electrical plants both for railway and lighting purposes. Mr. Tidman will extend the electrical equipment of the road to Bloomfield. Manufacturers will do well to send to Mr. Tidman prices for overhead material, also prices for wooden poles, iron poles, feeders, trolleys, etc.

Duggan Pipe Brackets.—Morris, Tasker & Co., of 222 and 224 South Third street, Philadelphia, have been made sole manufacturers of the Duggan patent adjustable pipe bracket. These brackets are made of wrought iron pipe, and are excellent and cheap, while being the simplest form of bracket that is manufactured. The price lately has been very much reduced, so that any road can afford to buy them. They can be purchased direct from the manufacturers, Morris, Tasker & Co., or from the Burnham & Duggan Railway Appliance Company, of Boston.

Edwin Harrington, Son & Co., of 1527 Pennsylvania avenue, Philadelphia, have just issued a little pamphlet on handling electrical machinery. The hoists, overhead tramways, traveling cranes, etc., sold by the company are illustrated and described. A list of electrical companies using the Harrington system in their plants is given. The firm states that in the Harrington system safety, ease of movement and durability are guaranteed.

Portland Water-Power Plant.—A description of the Portland General Electric Company's plant has just been issued in pamphlet form. The power station is of particular interest because of the immense size of the water-power equipment and the special features necessary in the installation. The power equipment was furnished by the Stillwell-Bierce and Smith-Valle Company, of Dayton, which has published the pamphlet.

The H. W. Johns Manufacturing Company has just issued a handsome pamphlet profusely illustrated by views of some of the prominent buildings in which the company's asbestos pipe and boiler coverings are in use. The various forms of these asbestos heat insulating coverings, it is stated, possess every essential requisite for their respective purposes—lightness, strength, durability and superior fire-proof qualities.

The Consolidated Car Heating Company, Albany, N. Y., has recently received, as a result of competitive tests, orders to equip with its electric heaters and temperature-regulating switch 100 cars belonging to the Nassau Railway, Brooklyn, the Allentown & Lehigh Valley Traction Company and the Yonkers Railway, all of which roads are operated by the well-known Johnson syndicate.

Baker & Co., of 121 Liberty street, New York, have just issued the third edition of their pamphlet entitled "Data Concerning Platinum." The pamphlet is profusely illustrated, and will be found of great interest to all those who use platinum. The factory of the firm is 408-414 N. J. Railroad avenue, Newark.



# Street Railway Gazette.

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We invite correspondence upon all subjects of interest to street railway men. Information regarding changes of officers, new equipment, extensions, etc., will be greatly appreciated for our news columns. Communications for the attention of the editor, new advertisements and changes should reach this office not later than Thursday morning of each week.

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### The Fender Question.

It has been repeatedly charged that street railway companies are by no means over-anxious to adopt fenders, but are pursuing dilatory tactics with the sole object of avoiding the necessity of purchasing, at a large expense, life saving devices for their cars. Such a charge certainly cannot be urged against the traction companies of Philadelphia. We publish in this issue an account of some of the attempts that have been made in that city to find a meritorious life-protecting device. Tests of a large number of fenders have been made, but nothing that promises such satisfactory results that those who witnessed the experiments felt warranted in urging its adoption, has yet been discovered. Not all the fenders that have been invented have been tested, to be sure, for the number of those patented must now reach, if it does not indeed exceed, 300; but enough have been tried to prove that the companies are in earnest in their search for the proper device. It may safely be asserted that when street railway companies generally are satisfied that a fender has been produced that will operate successfully, it will soon form the part of every car equipment, no matter what expense may attend its adoption, and that too without any compulsory ordinances to hasten their action.

### Driving on Street Railway Tracks.

The fact has been commented on more than once in these columns that Philadelphia has taken steps to abate the nuisance caused by the blockading of trolley cars by drivers of wagons who refuse to leave the tracks. Recently an ordinance was introduced by a councilman in that city providing that a fine of \$5 should be imposed upon all drivers who fail to turn out of the tracks when called upon to do so. This measure has met with considerable opposition, because it was assumed that the measure was introduced in the interest of the street railway companies, but such is not the case. The traveling public will derive much more benefit than the companies, if the measure is adopted, and is found to abate the nuisance. In Philadelphia there is no excuse for the existence of a practice that is such an imposition on the public and the companies. When franchises for the introduction of electricity were granted it was provided that new paving should be laid on each side of the tracks, so that at the present time good roadways are available for vehicles. It would seem that a few incidents like one which recently occurred in Philadelphia would hasten the adoption of such an ordinance as the one in question, by emphasizing the necessity of keeping vehicles off the tracks as far as possible. A driver a few days ago while crossing the Reading tracks at Girard avenue suddenly discovered that he had lost his order book. He stopped his wagon within a few feet of the rails and then left the seat to look for the missing book. A trolley car was following the wagon quite closely, and the motorman was, of necessity, obliged to bring his car to a standstill on the railroad tracks when the former was stopped. It so happened that at this moment a Reading train was speeding down the tracks toward the trolley car, and the passengers seeing the impending danger hurried out. Some one, however, flagged the train and stopped the car, and a collision was averted.

The driver was subsequently arrested for his carelessness, which had imperiled the lives of several persons.

### Competition with Elevated Roads.

The elevated railroad companies in New York and Brooklyn, like many of the surface steam railways, are complaining of disastrous decreases in their earnings resulting from the competition of rapid transit surface lines. The aerial transportation companies in Chicago are not in a position to find fault on this score, for the reason that the construction of their roads was not begun until years after rapid transit had been introduced on the surface. At the same time their directors are by no means pleased by the comparative popularity of the surface lines. The patronage taken away from the latter, in fact the entire traffic, has been far less than was anticipated. The elevated roads in Brooklyn and the metropolis, however, have seen a huge traffic materially reduced by the introduction of electricity in the former city and of the cable on Broadway and Third avenue in New York. The effects are noted in an article that is published elsewhere in this issue. The elevated roads feel that they ought not to be obliged to suffer in this way, and seem to think the activity of their enterprising neighbors on the surface should in some way be effectually curbed. It is plain enough that elevated roads labor under a tremendous disadvantage. The flight of steep stairs that must be mounted before trains can be boarded is so great an obstacle in itself that it keeps on the surface a vast army of persons who feel that the gain in time of two or three or perhaps four minutes is not a sufficient compensation for the laborious climb. The elevated railways may attribute the fact that they have not lost more traffic to the almost common superstitious belief that the matter of gaining three or four minutes by the average passenger is one of the most overwhelming importance; it may be questioned whether it is actually of such consequence. No matter how that may be, the number of deserting passengers has already been large and the number is growing; still no one can feel much sympathy for the companies, for the simple reason that they have made absolutely no effort to retain the splendid business they have enjoyed for so many years. In other lines of activity men expect to make concessions or reductions in prices to meet competition, but the elevated roads seem to think that they should not be compelled to submit to this general rule. As a matter of fact not only have there been no improvements introduced by the companies, but the service has actually deteriorated in some cases because of changes instituted on the ground of economy. The aerial roads then are still losing patronage and the loss is bound to continue as long as the difference in speed between surface cars and those above them is no greater; as long as the coaches on the steam roads are dirty, dingy and uncomfortable; as long as these coaches are lighted by smoky, ill-smelling lamps which do not give light enough so that the passenger can read, and which were out of date six years ago; as long as the train service is so infrequent that long waits on station platforms are inevitable—in fact, until improvements are made and riding is made decidedly more attractive than it is on the surface.



### UNIFORMITY IN STOPPING CARS IN PHILADELPHIA.

Ever since the introduction of electric cars in Philadelphia, the matter of stopping at street intersections has been under active discussion. There have been among the street railway companies advocates both of stopping at the far as well as at the near crossing, and both plans have, in fact, been in practice. Before electricity was introduced all cars stopped at the far crossing, but when the Philadelphia Traction Company started its trolley cars a change was made, and its example was adopted by the Electric Traction Company. There is, however, a slight difference in the manner in which the two companies have followed out this plan of stopping at the near crossing. The Philadelphia Traction Company requires its motormen to bring their cars to a full stop on the near side of every street on which there is a street railway track. The cars of the Electric Traction Company, however, do not come to a full stop unless a passenger wishes to get off or the car is signaled. The cars run slowly on crossing a street, and, unless it is necessary to stop, go ahead without delay. The People's Traction Company did not adopt the new practice when it introduced the trolley system, and its officers were decidedly opposed to it.

The great argument in favor of stopping cars at near crossings was that the risk of accidents was thereby greatly reduced. If a car approached a crossing at considerable speed, it was far more likely, it was said, to run down a pedestrian or collide with a vehicle, than if it stopped at the near crossing and started from that point slowly. It is only fair to state that this view of the case seems to have been borne out to a very great extent in practice. Certainly both the Philadelphia Traction Company and the Electric Traction Company considered that the liability to accident was greatly reduced under the new rule. A host of arguments, however, was urged against the new rule. In the first place it was stated that the people had been accustomed to a different practice and great danger would exist until they could be educated up to the new state of things. Again, if cars stop at near crossing, passengers, it is urged, are oftentimes obliged to step into the mud or snow. It was also asserted that when the cars stopped only upon signal at the near crossing, drivers and pedestrians can never tell absolutely if the cars are going to stop. This, it was claimed, was likely to produce uncertainty and therefore lead to accidents.

While the officers of the several street railway companies of Philadelphia did not agree as to the best plan of stopping the cars, they were entirely agreed upon the fact that uniformity was desirable and even necessary. It was conceded that lack of uniformity in this respect was not only an annoyance, but was likely to prove a source of actual danger to the public. The matter was discussed in the daily papers to a considerable extent, and was finally brought before the city authorities. Ordinances were introduced providing for the stopping of cars at the near and at the far crossing, but nothing has come of them, for the simple reason that the street railway men were wise enough to reach an agreement upon this subject themselves. That they were able to arrive at a harmonious decision on such a disputed point is almost as surprising as it is creditable to their intelligence and common-sense. The matter was taken up at a meeting of the Board of Street Railway Presidents, and among those who were present were P. A. B. Widener and W. L. Elkins, of the Philadelphia Traction Company; J. J. Sullivan, of the Electric Traction Company; Henry C. Moore, of the People's Passenger Railway Company, and E. B. Edwards, James McManes, Thomas Dolan and Frank Weckerly. After some little discussion the Board decided that all trolley cars should stop on the near side of street crossings, and it was determined that the new plan should be adopted at once. The Philadelphia Traction Company, to make the system uniform throughout the city, de-

cidated that its cable cars should conform to the new rule, so that all cars in Philadelphia now stop in accordance with the new practice, except the horse cars, which are fortunately rapidly disappearing.

### ELECTRIC TRACTION COMPANY OF PHILADELPHIA.

The first annual meeting of the Electric Traction Company of Philadelphia was held last week. President Sullivan read the report of the Board of Directors, which showed that during the year ended June 30th the Electric Traction Company's systems carried 41,040,346 passengers, and the receipts were \$1,916,936.77. The total expenditures were \$1,823,562.82; leaving a balance of \$93,373.95.

The report also showed that \$2,016,723.07 had been expended during the year in equipping the various lines with the trolley system. The operation of the company's lines by electricity, it was predicted, would soon show heavy reductions in the expense account, and greater returns than were at first hoped for.

This showing is practically without any of the results of electricity as a motive power; the only electric cars which the company had in operation on June 30 last were those on Tenth and Eleventh streets, which had been in operation one month, with the effect of increasing the traffic 47½ per cent.

Regarding the question of fenders, President Sullivan said the officials of the company were fully alive to the importance of equipping these cars with a life-saving device, and were very desirous of securing a fender that will meet the requirements.

### WAS IT COMPLETE?

The *Electrical Review* appeared last week with a complete report of the convention from 24 to 48 hours ahead of its contemporaries, and has received many very flattering compliments over its prompt and excellent publication from the street railway fraternity.—*Electrical Review*.

Yes, the report was "complete" with some trifling exceptions, such as, for example, John N. Beckley's valuable report on transfers; Russell B. Harrison's exhaustive paper on T-rail construction in Terre Haute; Strathearn Hendrie's valuable contribution on the same general subject; the important report of Powell Evans and D. F. Henry on the standardizing of brakeshoes; E. J. Wessels' eight column paper on air-brakes; W. E. Harrington's paper on the destructive arcing of 500 volt fuses; H. I. Bettis' paper on standard forms for street railway accounts; all the essential portions of the executive committee's report; some discussions of the most interesting character, and a few other matters.

The report of the *Electrical Review* was excellent and prompt, to be sure, and had the matter to which reference has been made been printed in full in the issue of the 24th ult., aggregating perhaps 90 or 100 of the *Review's* columns, the report of the Atlanta Convention of the American Street Railway Association would have been far more complete.

### ELEVATED AND SURFACE LINES.

The decline in the Manhattan Elevated stock is attributed generally to the competition of surface lines. The *New York Times* refers to the matter in these terms in a recent financial letter:

The cable roads give a speed which, except for very long distances, meets the wants of the average city rider, and since he can get on the cars at any point along their route, he saves the time spent in walking to a railroad station. Hence, the time actually required to get from his start to destination may be no longer for average distances on the cable cars than on the railroad. For short distances there is a saving. Therefore, he has no inducement to take the railroad, and climb up stairs to do it, in order to gain time. But suppose he lives off the lines of the cable cars, which are also the lines of the elevated roads. He then goes to a cross-town line, pays his five cents, and gets a transfer ticket and rides to the junction with a cable line. Here his ticket carries him

up or down town to his destination. He has made the double ride for the single five-cent fare, and with no stair-climbing to do. Had he taken the elevated road he would have had to climb stairs and pay two fares besides. The system of transfer tickets among the surface roads is only partially developed so far, but it is working with such success that all lines which cross each other will doubtless be soon included in common transfer arrangements. The Manhattan company cannot protect itself against this sort of competition. It is overhead, the surface lines are below; its system is rigid, while the extension of cross-town surface lines as feeders to the main cable lines may go on indefinitely. Now, it happens that a good many capitalists who have held or hold Manhattan stock are also interested in the surface lines, and they are in a position to see how the one is affecting the other. From their tin boxes has undoubtedly come that dribbling of long stock which keeps Manhattan down to prices which seem wholly inconsistent with the dividends it has paid, is paying, and its heretofore secure position.

The recent decline in the stock and bonds of the Brooklyn Elevated Railroad is attributed by authorities to liquidation on the part of holders, caused by the poor showing made in its published earnings since the introduction of the trolley system. These earnings, it is stated, show a falling off from \$2,000 to \$2,500 a week in spite of the fact that the management of the company has introduced numerous economies, such as the employment of women in its ticket offices and a reduction of train service, except in the rush hours. The short haul, which is the most profitable business, has been to a great extent taken over by the surface roads.

### THE UNION QUESTION IN PHILADELPHIA.

A union of the Brotherhood of Electric Car Workmen was formed in Philadelphia a few days ago. It is stated that several hundred motormen and conductors of the several street railway companies were present when the association was organized. The reports of the meeting state that the speakers displayed no sort of ill-feeling toward the management of the different companies, but asserted, on the other hand, that the interests of the employees and employers were common to a very great extent. A day or so after the meeting it was rumored that a number of men had been discharged by some of the companies for participation in the organization of the union. Some of the companies have taken no positive stand in the matter apparently, but the Philadelphia Traction Company has expressed its opposition to the union in the most positive terms. The following statement was made by George D. Widener, vice-president of the company, in defining the position of the company, and it was subsequently confirmed in all respects by President P. A. B. Widener:

"We do not recognize any labor organization, and will not have in our employ any man that belongs to one. Any motorman or conductor found to be taking active part in any meeting for the purpose of forming an organization or in such an organization as has been talked about, will be discharged, and any employé attending these meetings is liable to discharge. Our men have no grievances. We made an agreement several years ago to give them 12 hours' work a day and \$2 a day wages, and we have never broken it."

### NEWBURYPORT CAR WORKS BURNED.

In the fire which occurred in Newburyport, Mass., Oct. 31 the works of the Newburyport Car Company were totally destroyed. There were two buildings, and the loss was about \$19,000. Six unfinished cars, valued at \$3,000, stock and fittings valued at \$5,000 and machinery at \$2,500 were destroyed. The company, it is announced, will not rebuild at once. The loss was covered by insurance.

STOPPING AT CROSSINGS.—It is better that a uniform system of stopping trolley and other cars at the street corners should be fixed by agreement between the companies than by ordinance of Councils, for the reason that when thus fixed it can be more readily changed if found to be imperfect in its workings.—*Philadelphia Public Ledger*.



## QUESTIONS AND ANSWERS.

## GAS AND OIL ENGINES.

Please inform me whether the gas or oil engine has come into use in this country for driving dynamos for electric lighting purposes, and, if so, what is its proved economy. SUBSCRIBER.

## ANSWER.

Both gas and oil engines have been used for this purpose to some extent in this country, but not so generally as abroad. For small powers, say up to 25 H. P., they are much more economical than steam engines, but with larger powers their advantage disappears. This is not because the larger gas engines become less efficient, but because the larger steam engines become more efficient. The makers of gas engines will guarantee the production of 1 B. H. P.-hour for a consumption of from 17 to 20 cubic feet of gas. These engines are very extensively used abroad for this purpose, but have not been extensively applied to electric lighting purposes, here because of their suitability for this application not being generally known. Abroad, the manufacturers are intelligent enough to push their engines to the utmost extent in the market. Here they, in some cases at least, refuse to give information to inquirers. We know of one company that has lost a number of customers recently by their dis-

## THE POUGHKEEPSIE CITY AND WAPPINGER'S FALLS ELECTRIC RAILWAY.

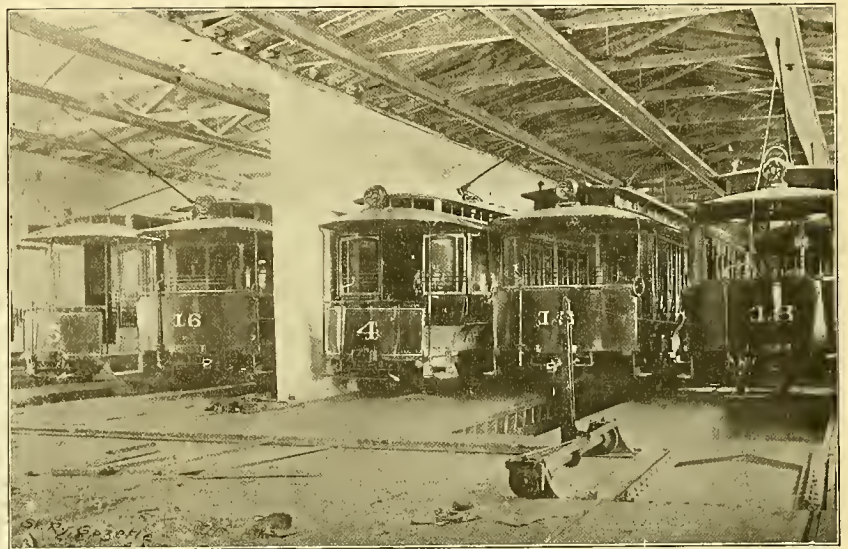
In the conversion of this road from horse to electric traction, it was deemed advisable, in view of the substantial character of the horse stables and car barn, to utilize the existing buildings. To this end, the old brick horse-stable, 63 feet square and 25 feet high, was remodeled by the removal of the interior studding and beams, and the building of a central 12-inch brick partition. The two rooms formed by this partition wall have been utilized for boilers and engines respectively.

The boiler-room contains two 300-H. P. Stirling boilers, and is of capacity sufficient for a duplicate battery. It is floored with brick, laid in cement and grouted. In the engine-room are two 200-K. W. General Electric multipolar generators, each of which is direct connected to a 300-H. P. Ball & Wood compound condensing engine. The foundations for these units are of extremely heavy masonry. As in the boiler-room, there is here space for duplicating the plant. The condenser, feed-water heater and boiler feed pumps are located in the rear of the engines and close to the division wall. All of the piping is carried in pipe channels below the floor line, the floor being composed of

spurs connected with the Hathaway transfer table, which cuts across all six tracks near the transverse center of the building.

Several car pits are provided under each track. A convenient place for coal storage is provided under the west carhouse, giving ready access to the boiler-room. This provides a space for a storage of upwards of 1,000 tons of coal. Messrs. Berger & Slater executed the mason-work, while Mr. Isaac G. Manning, of Poughkeepsie, attended to the wood construction.

The track system consists of 10 miles of single and double track, laid through the streets of the city. A spur 10 miles in length reaches from Poughkeepsie along the Ridge road to Wappinger's Falls, and thence to New Hamburg. The heaviest grades within the city limits occur on that portion of the line leading from the steamboat landing on the Hudson River, near the New York Central depot, up Main street for about one mile. The grades here vary from 5 to 8½ per cent. The track on Main street is laid with the best 90-pound girder rail, rails and special construction being furnished by the Johnson Company. The remainder of the track is laid with 60-pound and 56-pound T-rails. The track is bonded throughout with two No. 0 B. & S. copper wires, riveted in place, all of the elec-



CAR HOUSE OF THE POUGHKEEPSIE &amp; WAPPINGER'S FALLS ELECTRIC RAILWAY.

courteous treatment of them, but why this is so we do not know.

## COLLECTING CURRENT.

Which is the better method of collecting the current from the trolley wire—by means of a rolling or sliding contact? K. A. M., Dayton, O.

## ANSWER.

This is still a mooted question. The sliding contact is much used abroad and seems to be particularly favored by German constructors. Where used two rectangular frames are commonly employed, each flexibly supported, one above the front end and the other above the rear end of the car. This arrangement certainly possesses some advantages, one of which is that there is no losing of contact with the trolley wire or difficulty in replacing the trolley. Another is that the flexible support allows the frame to adjust itself automatically on a reversal of direction of car. In this country the Short Electric Railway Company used a sliding contact for some time and claimed some advantages for it. This device consisted of a metallic spoon with replaceable wearing surface, which was mounted on the trolley pole very much as the ordinary wheel now is, and when the car was reversed the trolley required reversing also. From the fact that the Short company has discarded them for the wheel it would naturally be inferred that they proved less satisfactory in use. We surmise, however, that when the extremely high speeds now talked of come into vogue the wheel will have to give way to the sliding contact, for mechanical reasons,

12 inches of concrete surfaced with an inch of Portland cement. The pipe channels are provided with cast iron covers, set flush with the flooring, this arrangement affording ready and convenient access to any part of the piping system.

The switchboard is built up of black enameled slate slabs of the General Electric panel type. The dynamo leads run beneath the floor in vitrified pipe conduits. In general effect the interior of the power-house is extremely pleasing; the walls are painted in buff, and in the engine-room there is a Portland cement wainscoting, capped with a three-inch pine nosing. There is an abundance of light and ventilation, and the metamorphosis of the old stable is so complete as to defy detection. The old car barn has been entirely remodeled and largely increased in space and convenience. The roof was raised four feet, an extension 30 feet by 90 feet added, and an entire new front constructed, containing superintendent's office and waiting-room on first floor, with large and commodious general offices on second floor, and the storage-rooms in the basement. The repair shop is situated in the basement and provision has been made for the comfort of the employees by devoting a suitable room to their exclusive use. The superintendent's office and the waiting-room are handsomely finished in paneled cherry wainscoting with ornamental steel-pressed walls and a delicately tinted ceiling.

The entire carhouse is practically in two sections, the longer being 194 feet in depth and the latter 90. There are six tracks in all, four having direct access to the street, the other two being

tric bonding being performed by the employees of the railway company, under the charge of the superintendent.

The line leading from Poughkeepsie to Wappinger's Falls is nearly straight in its course, the grades varying from one to eight per cent. Between Wappinger's Falls and New Hamburg, where the track leads down toward the Hudson River, the grade is as heavy as nine per cent.

The line construction consists of the usual form of stout octagonal hard-pine poles with treated butts. These are set up on Main street and Market street, the remainder of the poles throughout being round, shaved and painted.

Span wire construction is used throughout the city; bracket construction is used on the line leading to Wappinger's Falls and New Hamburg. The trolley wire is No. 0 B. & S., supported by five-sixteenths-inch stranded steel span wire. The line material is of the H. W. Johns manufacture.

Feeders of No. 0000 B. & S. wire are placed as required for electric distribution within the city limits. An interesting feature of the feeding system is the application of the booster idea to the long-distance feeder from the power-house to Wappinger's Falls. The feeding point is eight miles from the station, with a nine per cent. grade two miles beyond the end of the feeder. By the use of the booster it is possible to properly supply this section of the line through two No. 0000 B. & S. wires. The Woodbridge & Turner Engineering Company constructed the linework, while the track construction, including bonding, was under



the charge of Supt. C. M. Davis, of the railway company.

The rolling stock equipment consists of 8 closed motor cars, 18 feet in length, built by James A. Trimble, of New York; 10 open motor cars, 30 feet in length, built by the American Car Company, of St. Louis, Mo.; and 2 closed vestibule cars, made by the latter company. All motor cars are mounted on the latest type of Peckam cantilever truck.

The electric equipment of the cars consists of two G. E. 800 motors per car, with type K series multiple controller. All cars are fitted with the Star electric headlights, and all closed cars with the American Car Heating Company's electric heaters.

The entire engineering supervision of the work has been under the charge of Mr. J. H. Vail, chief engineer of the Electrical & Mechanical Engineering & Trading Company, of New York, from whose offices all plans and specifications were issued.

The new electrical railway will supplant an extensive passenger and express stage business between Poughkeepsie and Wappinger's Falls. It furnishes convenient transportation facilities between the river front and the higher urban localities, such as Vassar College, the Seminary, the Driving Park, the Insane-Asylum, the P. & E. R. R. Depot and the Cemetery. The same accommo-

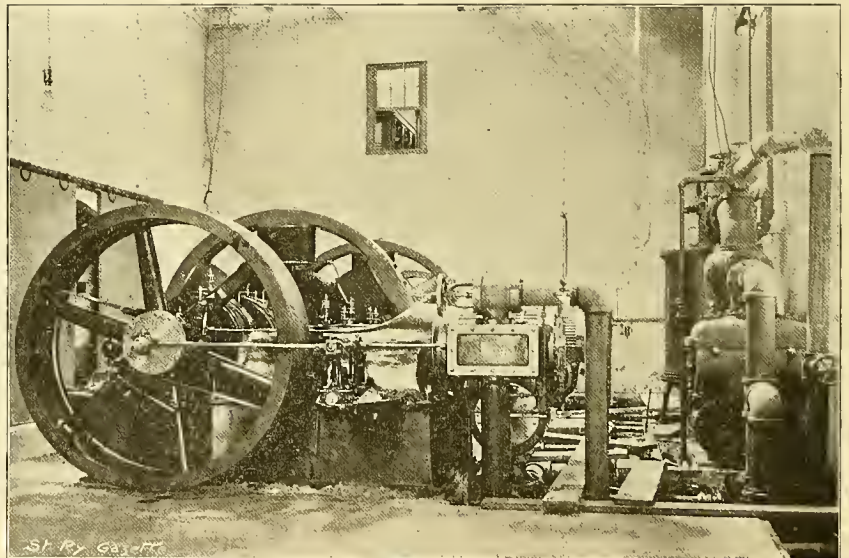
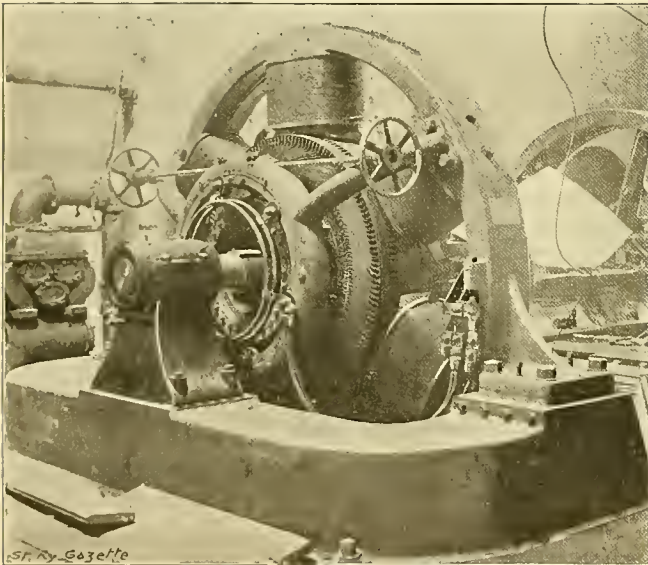
#### TRIALS OF FENDERS IN PHILADELPHIA.

The traction companies of Philadelphia have been engaged in testing fenders during the last few weeks with a view to the selection of a certain style as a standard. The experiments have developed many interesting facts, but no fender has as yet proved so satisfactory that the companies felt warranted in adopting it. Interest in the matter has been stimulated by the fact that the councils committees have been considering ordinances that would make the adoption of fenders compulsory. The companies preferred, if possible, to find something that they knew would be satisfactory, rather than adopt some device forced upon them by the authorities regardless of its value or its cost.

At a recent meeting of the councils committees that are considering this matter some little discussion was indulged in relative to accidents on street railways. Chief Bullock, of the Highway Bureau, remarked that in his opinion the only solution of the problem of avoiding accidents lay in a reduction of speed and the employment of careful motormen. He asserted that he had little faith in the efficacy of fenders, as he considered the lessening of speed of far greater importance. It was his opinion that accidents were due in the main to the carelessness of the public, and he suggested

and Bolleta fender, Parmenter fender, Wright fender, Hall fender and Thomas fender. The tests were made with dummies formed of canvas and stuffed with bran. Although invited to do so, the inventors did not care to stand in front of the fenders to illustrate their efficacy. This fact has been commented upon to a considerable extent by the papers, but it has no special significance. Probably none of those who designed fenders would assert that they would operate successfully every time, and would invariably pick up persons so successfully that no bruises of any kind would be inflicted in any case. Naturally none of them cared to run the risk of a failure of the fender or of receiving even slight injuries.

The tests of each fender were severe; the dummies were laid in different positions on the track, were set up in front of the cars, and then were thrown from the front platforms as the cars were moving. It was concluded from these tests that several of the simple fenders would operate to save persons who had been knocked down once in three times and perhaps every other time. Pedestrians who had been knocked down might be saved from other injuries further than those received from the blow, it was thought, though in some cases the dummy was rolled under or pushed several feet before being picked up. Fenders that were designed to push a body



POWER PLANT OF THE POUGHKEEPSIE & WAPPINGER'S FALLS ELECTRIC RAILWAY.

datations are offered at the New Hamburg end of the line, which reaches down to the river front.

Maj. J. W. Hinckley, the enterprising president of the railway company, has taken great personal interest in the construction of the entire system, and the citizens of Poughkeepsie will be largely indebted to him as the means of furnishing in their city a first class electric railway system.

#### ELECTRIC LIGHTS ON BRIDGE CARS.

The wretched oil lamps that have caused injury to the eyes of countless thousands of persistent newspaper readers on the cars of the Brooklyn Bridge, are finally to be discarded. At a recent meeting of the bridge trustees a contract for lighting the cars by electricity was awarded to the Electrical and Mechanical Engineering and Trading Company of New York. The contract includes the steam and electric generating plants and the complete system of distribution. There are to be 10 16-c. p. lamps in each coach. It is stated that the expense of the installation will be \$18,135, and that the cost of maintenance will be \$1,350 per annum.

**Detroit, Mich.**—The City Council has decided to submit to a vote of the people the question whether the city should own the street-car tracks in its limits. The question will be voted on in November.

that every car be equipped with a continuously ringing gong. David H. Lane, of the Philadelphia Traction Company, addressed the committee at considerable length, and in the course of his remarks said:

"I do not know why, but there is a great public cry about every accident to-day. Do not forget the fact that under the old horse car system people would either, through imprudence or preoccupation, get in front of them. On the average, I can almost state to-day that the general run of accidents is less. The great bulk of accidents was the result of people getting on and off cars while in motion. They were justified in doing it under the old horse-car system, because the cars moved very slowly. Accidents like that on Girard avenue, no caution in the world could prevent. Where the track runs close to the curb, a person, walking along the street, would be run over just as easily by a horse car as by a trolley car, should they suddenly venture upon the track, so there is perhaps an unnecessary scare.

"You can never prevent people from being imprudent and careless. I actually put myself in the way of a moving car, a few days ago, walking across Chestnut street. I was not conscious that the motorman was ringing his gong until within four or five feet of me. If I had been run down there would have been no cause to blame the motorman. Accidents like that will always happen."

At the tests made by the Philadelphia Traction Company 11 different types of fenders were experimented with; among these were several different styles of the Crawford fender, the Kennedy

away from danger or along the pavement until the car could be stopped, were partially successful, but the state a person would be in after suffering this experience furnished a matter for rather gruesome speculation. In some of the cases these fenders failed to act properly, and an arm or leg of the dummy was caught underneath them. The pick-up fenders were not regarded as very successful from the fact that it was found that the person who was supposed to be saved would probably receive a hard blow while he was being picked up. The fenders were tried in two different places; part of the tests took place on a street where the paving was brick, almost as smooth as asphalt, and again on a street where granite blocks were used. It was found that some of the fenders did not act equally well under all conditions of paving. The members of the committee of the councils which had been invited to witness the tests of the fenders expressed it as their opinion that, of the eleven fenders tried, three or four would save the life of one out of three or four persons struck by the cars.

The Philadelphia Traction Company has been given a great deal of credit for its earnestness in its endeavor to find a satisfactory form of fender. All the inventors of the several types that were tested were given each the use of a separate car in order that he could illustrate his design to the best advantage.



The People's Traction Company has also been experimenting with fenders, and recently two of its cars have been equipped with a device of a scoop form, made in accordance with a design of one of the officers. This will be tested by putting it into actual service, as the company thinks that experiments with dummies prove nothing.

The Electric Traction Company a few days ago allowed the inventor of the Robins lifeguard to give an exhibition of the fender on its tracks. While a car was running at a fair rate of speed, a boy was picked up half a dozen times. Mr. Robins, the inventor, who is rather a heavy man, was also picked up.

#### MASSACHUSETTS COMMISSIONERS' INVESTIGATION.

The Railroad Commissioners of Massachusetts are now examining models of street car fenders. They were directed to investigate this matter by the last legislature and to report to the next general court whether a type had been devised which would afford reasonable protection for human life. About 30 models were submitted to the commissioners by their inventors. Arrangements for the trials of the various types will be made by the inventors.

#### NEW BROOKLYN FENDER.

J. E. McBride, of Brooklyn, has recently invented a new type of fender, and the Atlantic Avenue Railroad Company will give the new invention a trial this week. They assert that the device has many good points.

#### THE MERITS OF T-RAILS.

The fact that objection has been made to the laying of T-rail by the Philadelphia, Cheltenham & Jenkintown Passenger Railway Company has already been noted. The company, in contesting the application for an injunction restraining it from using rails of this kind, presented its view of the case, and defended the use of T-rails. It was contended for the company that the railway is being constructed in the most improved manner, and that the "T"-rail complained of is the same as is used in most suburban roads in that vicinity, and is better suited to the purpose for which it is used than the flat girder rails; that, according to the plans under which the railway is being constructed, when it is completed the space between the rails and the roadway between the tracks will have been filled with macadam and rolled, so that the top of the rails will be on a level with the rest of the road, and the turnpike over its entire width will present a uniform and even surface. It was also asserted that, opposite the entrance to each property where there will be unusual wear and tear by reason of the constant ingress and egress, filling pieces are being placed on each side of both rails, so that the use of "T"-rails so laid will not present greater obstruction to public travel than would be caused by the use of the ordinary girder rails. It is further contended that there is no provision in the act under which the defendant company is incorporated as to the method of constructing the railway thereby authorized, or as to the kind of rails to be used; that the whole matter is left to the local authorities, who have approved of the plans, and the fair implication is that what they approve of is a proper construction.

#### GERMAN GAS MOTORS.

Writing of gas motors a correspondent of the STREET RAILWAY GAZETTE remarks: "From what I recently saw of their operation in Germany the results are certainly very satisfactory and the German motors are excellent. With gas at \$1 the economy is shown to be very substantial. The use of gas seemed to be increasing in many large towns in Germany where the traffic is light and grades considerable."

Philadelphia, Pa.—All the closed cars on the People's Traction Company are to be heated with electric heaters. Several have already been equipped with different styles in order that the company may test their relative efficiency.

#### ELECTROLYSIS.\*

BY JAMES A. BAYLIS.

"Electrolysis" has been announced as the subject of my paper, but it is too comprehensive a term to be applied to it, as it is to the electrolytic corrosion of underground pipes and electrical conductors by stray earth currents that I wish to confine my remarks.

One of the first places to suffer from the evil effects of stray earth currents was Boston, Mass. Almost three years ago the New England Telephone and Telegraph Company found that the insulation of some of its underground cables had broken down; upon investigating it was discovered that the lead sheathing had been eaten through in spots in some of the manholes. The matter was carefully looked into, and it was proved beyond a doubt that the current from the rail side of the street railway circuit had leaked on to the sheathing of the cables at various points, and, leaving the cables at others, had, at the points of leaving the lead, eaten it away to such an extent as to allow water to penetrate to the core, thus destroying the insulation of the wires.

It was soon found that the destruction of the telephone cables was but an item of the damage being done by these stray currents; water and gas pipes were being eaten through in a number of towns in which single-trolley street railways were being operated. After careful experiment, it was shown that only where the current left the pipes to pass to earth (i. e., where pipes were electro-positive to the earth) was any damage being done. The explanation given and the one generally accepted as correct was, that electricity, passing through a conducting liquid from the anode to the cathode, decomposes the liquid; and in the case of water which contains enough foreign matter to make it a conductor, the hydrogen is carried, as it were, and liberated at the cathode, while the oxygen is set free at the anode, which, if it be of an easily oxidizable material, will soon be attacked, nascent oxygen being a very active agent.

The truth of this has lately been questioned in a most interesting and valuable paper on this subject by Prof. D. C. Jackson, read before the Western Society of Engineers, July 11, 1894. After a series of careful experiments Professor Jackson came to the conclusion that the oxidation of the metal as before mentioned played an unimportant part in the destruction of the pipes, and that the corrosive action was due entirely to the electrolysis of the substances held in solution in the water of the soils. The gravity of the corrosion of the pipe depends on the amount of current flowing from a given area and the nature of the salts in the soil.

What happens in the case of buried pipes is this: The current which has leaked from the rails passes on to the pipes, and will leave them and flow to earth at points from which the resistance of the earth circuit to the power-house is less than by the metallic one. The soil of cities contains more or less moisture holding in solution chemicals, which, when their components are set free, are of a more or less corrosive nature.

To decompose acidulated water between two platinum electrodes an E. M. F. of about 1.5 volts is necessary; with lead plates a smaller voltage; and with iron and zinc still less, as the affinity of the metals enters into the reaction. Metals buried in moist earth containing impurities may be about at the point of corrosion, a very slight potential difference being enough to set up marked action. This accounts for the destruction of pipes where only a fraction of a volt P. D. was found between them and the surrounding earth; because the P. D. is under one volt is no surety that action will not take place, not so rapidly or violently of course, but just as surely.

What forces the current to leave the rails and pass to the earth? Undoubtedly because of the too high resistance of the rail circuit, due to imperfect bonding; either the bonds are too small, or, what is more likely, the contacts between the rails and the bonds are not good. Sometimes the rails are connected to the water pipes of a town; if this is done care must be taken to have the water mains connected to the dynamo at the power-house; otherwise if the negative pole of the dynamo be grounded or connected to the track, a path of low resistance has been provided for the current to get on to the pipes, but to return to the dynamo it must pass through the earth, and damage is sure to follow.

Very many remedies have been suggested and tried. Here are some of them:

1st. Grounding the positive pole of the dynamo and putting the negative to line.

This only has the effect of changing the location of the district in which the pipes are positive to the earth from the immediate vicinity of the power-house to more distant points, and while the action is not so violent it is spread over a much larger area and the trouble is much more difficult to deal with.

\* Read at the convention of the Canadian Electrical Association, Montreal, Sept. 19, 1894.

2d. Breaking the metallic continuity of the pipes and cables has been suggested.

This is impracticable, of course, not only because of the enormous expense of changing all the pipes at present in the ground, but from the fact that current would leave one section of pipe, pass to earth, and back on to the next section.

3d. Frequent reversals of the polarity of the street-railway currents.

This would only retard the action, not stop it altogether. Various other more or less impracticable remedies have been proposed, but it will be unnecessary to notice them.

The only sure cure for this trouble, as far as we know at present, is in the adoption of some other street-railway system than that of the single trolley with track return; such as a double-trolley system, storage batteries, or alternating currents, if a practical motor can be constructed. A method of street-railway construction was described by Mr. W. Nelson Smith in the STREET RAILWAY GAZETTE of Feb. 17, 1894, which does away with the track return, being practically a double-trolley road, operated under the three-wire system, using the earth and rails as a neutral. Another system was described by Mr. Nelson W. Perry in the *Engineering Magazine* for March, 1894. Many, if not all, of the proposed underground conduit systems would have, as an additional recommendation, freedom from attendant electrolytic effects.

The discussion of the merits or demerits of these various systems, their practicability or impracticability, is outside the province of this paper; suffice it to say that there seems to be more than one way of operating street cars without destroying pipes, etc., already under ground.

Nevertheless, the fact remains that there are very many single-trolley roads in operation in this country, and that something should be done to protect the pipes of the municipalities under whose franchises the street-railway companies operate.

Absolute protection, as far as is known, is impossible to have, but to insure the greatest freedom from destructive action the track circuit must be of the lowest possible resistance. This can only be accomplished by the best of bonding and frequent cross connections of rail. Electrically welded rails should be of great service in this connection. The rail circuit should be re-enforced by overhead returns connected to the rails at intervals, as is done with the trolley and feeder wires. The negative pole of the dynamo should be grounded, and the various systems of underground pipes connected to it by conductors of large carrying capacity.

These are the principal safeguards that can be adopted.

The telephone companies having underground wires have been among the sufferers from the electrolytic corrosion of the lead of their cables, and a brief description of the method used in the United States for their protection may be of interest.

A map of the underground conduits and manholes is made, and on it are marked the differences of potential between the cables in the manholes and the earth, also the direction of the current, whether to or from the cables. In this way, the "danger district," or section where the cables are positive to the earth, may be seen at a glance. In this direct, the sheathings of the cables are carefully connected together by large wire, and a heavy wire (or wires) is run from the negative pole of the dynamo, which is to ground, to the nearest manhole in the danger district, and, if the current is of great volume, to several of the manholes. As far as I know, in every case, this changed the direction of the current, causing it to flow from the earth to the cables, thus giving adequate protection in an inexpensive way. Unfortunately all pipes cannot be protected to the same extent in the same way, and the responsibility of doing proper track construction rests with the street-railway companies.

Finally, because in a town there may be but small differences of potential between pipes and the surrounding earth, and the decomposition of them does not set in as soon as the street-railway current is turned on, we should not be deceived into a feeling of false security, for though the destructive action may be slow in coming, come it will, none the less surely.

#### THE DISCUSSION.

Mr. BLACK: In reference to Hamilton, I know every few days I used to see something in the papers about the water pipes being examined in the City Engineer's office; he has a pile in the corner of his office, but those were the days when they used the old strap rail and the bonds were broken. Those familiar with the position of Hamilton will remember that the main return circuit ran down James street. The single track ran to the power-house; and York street, King street, Barton street branched off. The whole current had to be returned to this one set of strap rails, and when the strap rails were worn the bonds broke, and the current would get off some other way. Since they have laid the new rails and made their bonding I believe there has been no com-



plaint. All the pipes taken out were in the neighborhood of and not very far from the power-house. I believe they were not found injured in any other place than in the neighborhood of the power-house. But I think everything is changed there now, for I understand the railway company has now connected the main water pipe with its ground wire at the power-house, and that reduces the chances of further trouble.

Mr. SHAW: In regard to the remarks as to the electrolysis being occasioned by the polarization of gases, that would cause an even wearing away of the pipes right along, but there is not an even wear.

Mr. KEELEY: I think it would be found that wherever there was a marked effect on the cable, the ground would be very moist at that point. I think it would be found surrounded by water. Here is a piece taken from the vicinity of the power-house in Hamilton, and it looks as if it had the smallpox, and it has evidently been in water. Possibly the water may have passed through a limestone formation. I think it would be well for the members to keep in mind to note particularly the condition of the spot from which the specimens are taken.

Mr. LOCKWOOD: The subject of this paper is one of great importance to many classes of people. It is of great importance to city engineers because they have control of gas and water pipes—at least they ought to have if they have not. It is important to the telephone man, and it is important to the railroad man, because he naturally does not want to interfere with other people's belongings any more than he can or must. Then it is of importance generally, because we ought to know, and we want to know, all about the working phenomena of electricity that we can know, in order that we may perform our own work properly. There seems to be one thing further that paper might have mentioned and did not, and that is that a great deal of this electrolytic corrosion of underground cable is dependent on the amount of electricity that is pumped into the earth within a given area of space. Now, I suppose the most noticeable instance of this kind of thing is that which has occurred in Boston. Many of you, certainly all of you who are concerned in street railroading, know that there is the largest installation of electric street railway in the world, and it is needless to say that there the largest currents are brought back to the dynamos through the earth: larger than anywhere else. I was a little surprised in learning that the paper says that one of the remedies, the first remedy that has been suggested and tried, is grounding the positive pole at the dynamo and putting the negative pole to line. I wish to do them justice by saying that they have showed themselves always ready to try an experiment which persons conceiving themselves electricians have suggested, to prevent the electrolytic corrosion of underground cables. It is my memory that the dynamos of that company ordinarily have their negative pole to line, and that it was not until their attention was called to the fact that they changed it and put the positive pole to line. With the negative pole to line (and this again is entirely a question of memory), with the negative pole to line, so large is that system and so enormous are the amounts of electricity delivered to the earth after passing through the trolleys and the motors, that the electrolytic corrosion of pipes and cable tubes was in all quarters. In fact, it spread nearly all over the city, and it seems to me that it was as a suggested remedy that the present method has been adopted, in which the positive pole of the dynamo is to line, and while it is not a remedy, still it is a change which is mentioned in the paper, in a kind of negative way. It does restrict the trouble to a small area immediately around the power station, and when it is restricted to such a small area it is much more easily handled than a corrosion distributed around a large city. In addition extremely large copper cables are used. In Boston, copper cables of more than one inch in diameter have been employed, to aid the rails in returning the trolley current, and the trouble is very largely minimized. I personally do not think that in small installations of electric railroad serious trouble need be expected, but I think in large cities it is to be expected, and every remedy that can be thought of, provided it is proved to be at all efficacious, should be effected. The bonding of the rails, as suggested, is no doubt one of the principal things that are required. I do not think that the electric welded rails have, to any great extent, gone into use yet, and I think the unwieldiness of handling them will be an insuperable objection. But, with the best conductors that are made, we have still to remember that the old doctrine that used to be promulgated, that electricity would choose only the best path, must be discarded, not only from our lips but also from our thoughts, and remember that electricity avails itself of all paths in proportion to their respective resistances; and when we think of that, we cannot help but see, no matter how perfectly our roads are constructed, we should make the return con-

ductor as perfect as it can be, and it is still the best thing to have the positive pole of the dynamo to line, and to aid the rail in the vicinity of the dynamo and of the power-house by very large copper conductors.

Mr. BAYLIS: That remedy was suggested in an article issued in one of our papers in July of this last summer, as having been tried in Marseilles, in France, and it was strongly recommended there. They grounded the positive pole and had the dangerous area distributed over a large portion of the town, and they were experiencing no trouble. It was stated, however, that it was not a true remedy.

Mr. MEDBURY: In Ottawa I had some experience with the engineer of the Bell Telephone Company in taking some readings of the different potentials between our rails and the ground, and after looking up the matter carefully we believed that by taking readings at different points, different manholes, we could simply connect the cables to the rails where there was the greatest difference potentially, or make the connection between the rail and that portion of the telephone cable which came nearest the power-house, and in that way, of course, assuming always that the cable is positive regarding the rail, do away with pretty nearly all the effects of any electrolytic action. In a small city that would entirely remedy the matter, I think. In that case I would have the positive pole of the machine to the trolley wire. Of course our station there is located some way from the center of the telephone cables, and unfortunately we could not measure the amount of current flowing on the cables. We did not much more than find out where the greatest action was going on, but of course, with a careful test, we could find out how much current was flowing, and whether it was bunched, or where the greatest tendency was to leave the cable.

Mr. BAYLIS: In Toronto, in the western portion of the city, the potential difference is three volts. Taking the opposite side of the city, it varies from two and a half to four volts. And there is a gradual decrease from the three volts in the west to about zero in the center, and gradually increasing to about four in the east.

Mr. SHAW: Which pole does the trolley wire connect with?

Mr. BAYLIS: To the positive. And the current we get off the cables, measuring from the cables in our easterly manhole, the manhole nearest the power-house, to the water main which is in the manhole, is 11 amperes.

Mr. MEDBURY: The potential difference between those cables and the rail does not mean anything unless you take the amperes along to make a reading of.

Mr. BAYLIS: I think the potential is the most important thing, because, in the case I have been speaking of, I can measure the number of amperes flowing from the cable to a given point; at the junction of a water main in a manhole, we can get a large amperage. The measurements that may be taken on any pipes, either cables or water or gas pipes, with an ammeter and voltmeter, are generally valuable in showing the direction in which the current is flowing. It is impossible to measure the number of amperes running from one point to another unless you can insulate the pipe entirely from the ground through its entire length. You are simply taking the alternative path of the current, as it were.

Mr. MEDBURY: Potential difference is not what is doing the damage. We get a very low potential difference, but get a considerable current on the pipe. You can find out a cable is carrying a certain amount of current by fastening on to that cable and conducting it back to the rail or any other circuit.

Mr. BAYLIS: Well, if you take the readings of the ammeter, taking a gas or water pipe, for instance, which is buried in the earth, and expose the pipe for 7 or 8 feet, and put an ammeter between the pipe and the ground, you probably will get a very small current flowing. At the same time a great deal of current may be flowing from the pipe to the ground. The current is leaving the pipe all right enough, but it is not going through your ammeter.

Mr. MEDBURY: I can see your point. My point, as I have understood it, and my experience in the matter, are this: Suppose there are two parallel streets, and this cable runs down one street and the electric railway is on the other street, but as there is a current going up to the farther street it takes just a short cut over that cable, and the whole of that current is going down that cable. It branches off the street and makes a conductor for it. If the cable happens to turn three or four streets down there, the current is leaving the cable again. Of course, if you take it at that point and put a tap on, you are not getting any electrolytic action at all. The cable simply acts as a conductor for the 20 or 30 amperes that happen to be flowing over it. Of course, after you have got away 100 feet from that corner perhaps there would be no current to speak of flowing around the outside of the cable; it would all be going over that cable—

perhaps 20 amperes. Of course, readings taken anywhere inside that zone of electric current would give various results according to the position at which you are taking the readings, but 20 feet from the corner you have quite a number of amperes running over the cable.

## CAN THE T-RAIL BE SATISFACTORILY USED ON PAVED STREETS?\*

BY STRATHEARN HENDRIE.

For reasons unnecessary to mention, your committee's report has been prepared with more haste than the subject deserves, and you will undoubtedly find it incomplete in many details. A vivid recollection, however, of the disappointment of your members at previous meetings, when papers have failed to materialize has emboldened us to present this report in its incomplete state as better than no report at all and as continuing the discussion of a subject in which so much interest was expressed at the last convention.

We would preface our report by the explanation that we have considered the word "satisfactorily" as applying to the point of view of the city and the driving public, as well as that of the company; and we will endeavor to show that the T-rail is not only satisfactorily used in paved streets, but that it is the best rail for the purpose.

The tendency of the larger cities in this country—in fact we might say in all the cities of this country—during the past 10 or 12 years has been toward smoother and better paved streets, and the general public, watching the progress of its city officials, has become in many places impatient of the action of the street railway people in maintaining the old forms of rail, which make a ridge on the smooth surface of a first class modern street in an American city. Our travelers have come home from England and the Continent exclaiming the grooved rail, and our city officials have in many cases forced either the English grooved rail or its American modification upon the railway companies. No street railway man bankers after the grooved head before he gets it, or enjoys it after he has put it in, and he therefore fights its introduction, demanding to be left alone, as he was, with his center-bearing or five-inch tram head. What we would show him—and through and beyond him his public—is that he can progress in the direction of their desires for a smooth street, and can give them something even more satisfactory to them than their favorite grooved rail.

For the street railway man, questions of price, joints, quick delivery, competition, coal pile and construction combine to recommend the T-rail. The old argument for the tram head—that the steel paving for the three inches is the cheapest in the end—no longer holds good in these days of good street pavements and rapid transit. Wagon traffic goes where it belongs—on the side of the street. To those who can still use the clear-headed old center-bearing rail, we can only say, "You lucky dogs"; to most of us it is lost forever. As a substitute for this, where old grants are being renewed or new ones made, the grooved-headed rail has been in many places hastily and, we believe, unadvisedly required. While the suggestion of a T-rail, for use in paved streets in cities, is startling to the average citizen, alderman or city engineer, and is in most cases impatiently rejected by them, yet we must recollect that the mention of a rail, such as steam roads use, calls up in their minds the idea of four or five inches of steel standing up above the street and of dilapidated plank crossings with half-drawn spikes, and we should go patiently to work to teach them that, as there is more than one way to supply motive power to a car, so there is more than one way of putting a rail in the street.

To aid you in this, we have prepared a list of 26 cities in which the T-rail is used, with remarks thereon (to be found at the end of this paper), kindly furnished this committee, by the railway companies, in answer to a list of questions sent out; and we might also say that there are over 50 other members of this association whose roads are reported in the railway publications as being partly or wholly constructed of T-rail, who declined or neglected to answer the inquiries of your committee. The general consensus of opinion of the 26 roads referred to, and of the officials of the cities in which they run, is that if you can once get down a 100 yards of T-rail and make a decent job of the paving, neither the officials nor the citizens will permit you to use anything else in the future. The main thing is to make your paving job a neat and good one. In three of the other cities, where there is at present no T-rail, but which are blessed with enlightened city officials, the T-rail is about to be made a requirement on the companies.

Modern street railway construction and street paving imply a broken stone, concrete or other solid foundation, a high girder or T-rail and a brick, asphalt or granite surface to the street in

\* Read at the Convention of the American Street Railway Association, Atlanta, Oct. 17-19, 1894.



the larger cities, or cedar block, cobble or macadam in the smaller ones.

Asphalt or macadam can be paved as easily to a T-rail as to any other. They should be laid flush, and room should be made for the flange by running a railroad freight car, or other car having a larger flange than the street car, over the track before it is opened for traffic. Bricks are now molded by many paving brick manufacturers to fit girder and T-rails, those for the latter allowing a space for the flange of the car wheel. Whether it is more expensive to chip the corners of granite or Medina blocks or to leave them intact a short distance from the head of the rail and fill the space thus made with asphalt, creosoted wood or concrete is open to question, but, in either case, a first-class job can be made. The writer is familiar with two excellent pieces of 56-pound T-rail construction on chairs, in one of which the pavement consists of 6-inch cedar blocks, and in the other of small 3 or 4-inch cobbles, both paved close to the rail with no filling.

It may be useful in your arguments with city officials in favor of a T-rail as against a grooved

the details of construction from a street railway point of view, because these must necessarily vary in different localities, but it suggests that the progress which has been made in girder rail construction in the past two or three years should not be lost sight of when we secure the T. Have it big enough and heavy enough.

As it may be of use to the members of the association, your committee has attached to this report, in the form of an appendix, a list of the street railways which have answered its queries, together with a synopsis of the answers, regretting that out of 178 letters sent out with stamped envelopes for reply, it received but 80 responses, and, as above stated, of the 98 who failed to come to time more than 50 are using the T-rail, but whether in paved streets or not is not known.

**DUTY OF PEDESTRIANS.**

In a recent case the Michigan Supreme Court called attention to the caution that pedestrians must exercise in order that they may not be

**A STANDARD FORM OF STREET RAILWAY ACCOUNTS.\***

BY H. I. BETTIS.

On Sept. 7 the committee sent to all the members of the association a classification of expenditures, which could be readily adopted for use upon any road, and so arranged that any or all of these accounts can be subdivided to any degree desired by the road adopting them, without impairing its value as a basis for comparative statements. Accompanying this was a circular-letter, requesting the accounting officers of the several roads to carefully examine this classification, noting such items as in their opinion are erroneously classified, and also requesting that sample reports, blanks and special rulings for account books be sent the committee for inspection. The replies received were in the main very full and complete, and showed an interest in the subject, but the number, compared with the number of members with the association, was very small, and in consequence there was a postal sent out about two weeks later, but with little effect upon the

T-RAIL IN PAVED STREETS.

Place.	Company.	Rail in Paved Streets.				Construction.	Pavement.		Filling.	Remarks.
		Miles, T.	Other rail.	Weight, lbs.	Height, in.		Inside.	Outside.		
Augusta, Ga. ....	Augusta Ry. Co.	.5	3.5	56	3½	Ties 3 ft. centers, steel chairs	Brick	3-in. brick, then asphalt	None	Public and officials think it better than girder.
Bay City, Mich. ....	Bay Cities Con. Ry. Co.	8	11	60	6				Oak strip, gravel, etc.	City Engineer and B. of P. W. think it the only rail.
Boston, Mass. ....	West End St. Ry. Co.	24	215	35 to 100	1½ to 9	Largely 6 ft. rail on stringers and 9 in. on ties with tie plate	Granite block	Same		City officials and the public are not in favor of it.
Columbus, O. ....	Columbus St. Ry. Co.	.5	54.5	60	6	Ties 2 ft. centers, broken stone ballast	Brick	Same	Hard wood covered with coal tar	No complaint; more will be laid.
Denver, Colo. ....	Denver City Cable Ry. Co.	6			4	Cable: yokes 4 ft. apart	Asphalt with stone coating	Same	Noac	Makes good street.
Denver, Colo. ....	Denver Cons. Tram. Co.	6.75		48 to 72	3¾ & 6	6 in. concrete under ties; concrete between ties	Stone blocks next rail, then asphalt	Stone block	Oak strip beveled to fit	
Des Moines, Ia. ....	Des Moines City Ry. Co.	2	15.23	60	6	Spiked to ties	Brick			Public and city officials like it.
Duluth, Minn. ....	Duluth St. Ry. Co.	16	10		5¾	Ties 2 ft. centers, oak stringers	Cedar block	Same	Block cut or notched	All like it.
Ft. Wayne, Ind. ....	Ft. Wayne Elec. Ry. Co.	8	7	60	6	Ties 2 ft.; tie rods 10 ft.	Brick block, cobblestone			Company now reconstructing entirely with "T" rail.
Houston, Tex. ....	Houston City St. Ry. Co.	9	1	45	4¾	Ties and chairs and stringers	Brick, gravel, cypress	Same	Concrete	Gives satisfaction.
Lincoln, Neb. ....	Lincoln St. Ry. Co.	15			5¼	Ties 2 ft. centers	Brick, cedar	Same	Sand with brick	Have only two curves now, but intend to lay track.
London, Ont. ....	The London St. Ry. Co.	1	11.5	56	4	Cedar ties, gravel and ballast	Gravel	Macadam		Not favored. (Note—Pavement is not good.)
Marinette, Wis. ...	Marinette Gas, E. Light & St. Ry. Co.	4		40 & 60	3¾ & 6		Wood block	Same	Wooden strip to fit	All well pleased now.
Minneapolis, Minn. ...	Twin City Rapid Transit Co.	5	35	60	5¾		Cedar or granite	Same	Pine or oak strip	City engineers approve.
New Haven, Conn. ...	Winchester Ave. R. R. Co.	14		52 to 72	4¼ & 4¾	On chairs and on ties	Half block, half cobble	Same		Common Council will have nothing else.
Norwalk, Conn. ....	The Norwalk St. Ry. Co.	3		60	6	Three brace chairs to each rail	Blocks and cobbles	Blocks and macadam		Gives satisfaction.
Norwich, Conn. ....	Norwich St. Ry. Co.	1.2		48	4	Chairs and stringers		Same	Gravel	Not favored much.
Port Huron, Mich. ...	The City Electric Ry. Co.	5		45		Cedar ties, pine stringers	Cedar block	Same	Oak strip inside, pine strip outside	Gives satisfaction.
Racine, Wis. ....	Belle City St. Ry. Co.	.227	2.773	72	4¾		Brick	Same		Public and officials like it.
Salt Lake City, U. T. ...	Salt Lake City R. R. Co.	3			6		Sandstone block	Same	Sand	Public and city officials well satisfied.
Savannah, Ga. ....	City & Suburban Ry. Co.	1	7	40 & 60		Chairs or stringers		Same		Not favored.
Springfield, Ill. ....	Springfield Coos. Ry. Co.	22					Beveled brick or block			Gives satisfaction. Authorized by City Council.
Springfield, Mass. ...	Springfield St. Ry. Co.	15		56	4 & 4¼	On stringers and on ties and chairs	Granite and cobble	Granite and macadam	Asphalt and brick	No complaint; evidently satisfactory.
Waterbury, Conn. ...	Waterbury Traction Co.	8			6 & 7	Spiked; ties 2 ft.	Belgian block for 7 in. rail; cobble for 6 in.	Belgian block	None	None better, when properly laid and paved to.
Windsor, Ont. ....	Sandwich, Windsor & Amherstburg Ry.	3	1	56	4¼	Steel chairs, ties bedded in gravel, then inch board and block paving	Cedar block	Same	None	Preferred to girder rail.
Wyandotte, Mich. ...	Wyandotte & Detroit River Ry.	2		56	4¾	On broken stone	Macadam	Same	None	No objections.

girder, to insist that a T-rail is a girder rail with a head differing less from that of the grooved girder than this does from the tram or center bearing head. Also the substitution, in this country, of the steel base and upright member of the girder for the wooden stringer, took place before the introduction of the grooved rail, and was due to entirely different causes, and certainly has not been brought about by any demand for smooth streets originating with the cities or citizens. Such substitution is equivalent to that of steel for wood in buildings. The girder is an established fact; its grooved head, we hope, is merely a passing fancy. The grooved rail might easily be a big-headed T out of which a piece corresponding to the groove has been planed. This can easily be shown by reference to cross-sections. And we should bear in mind that if we hope to peacefully and with good feeling avoid the use of the grooved rail we must do so, not by demanding obstinately what we know in our inmost minds to be reasonably objectionable, to be bad practice, to be obsolete, but by presenting to the public, and educating it up to it, a rail which shall, from its point of view, be as far ahead of the grooved rail as that is ahead of the tram or center-bearing rail. And we should also bear in mind that the public will demand, and in the long run will secure, streets satisfactory to itself. Your committee has not gone more fully into

chargeable with contributory negligence if they meet with accidents from electric cars. These points are emphasized;

"While pedestrians have the right to be upon and travel along the public highway, yet they are bound to take notice of the dangers incident to the public travel thereon, and especially is this so where street cars are constantly passing and re-passing, driven with electricity. The city authorities recognize the necessity of rapid transit and limited the cars upon that street to 15 miles per hour. These cars are heavy, laden with motors and cannot be stopped at once. They have no right to run down pedestrians, but those in charge have a right to suppose that pedestrians will not walk on to the track without looking to see if a car is coming. It is well known that these crossings are places of danger and that cars do not stop at every crossing. He was bound to look both ways before getting on the track. It will not do to say that the man acted prudently and carefully in looking before getting off the curb, and was therefore not bound to look again, because he saw no car coming from the north at that time. A car running fifteen miles an hour would pass a great distance while a pedestrian was going 13 feet 10 inches. The plaintiff was bound to look before stepping upon the place of danger."

delinquents. The results obtained from the replies received will be taken up later.

Special ruled account books and ruled forms of reports of various kinds are a means to accomplish results. To standardize the means, we must first of all seek the same or similar results. If we are seeking the uniform results, uniform methods may be employed, and will naturally be employed, those which are the simplest in form and manner of filling out being preferable. For this reason the committee urges you to take some steps toward adopting a standard classification, that the end to be accomplished by all will be uniform; and this done, the standardizing of forms and methods of street railway accounting will follow.

At the time the subject was assigned, and until the returns came in from the circular-letters, the committee was not aware that a classification of accounts had been presented to the association at one of its earlier meetings in 1884, and long before this committee had even a speaking acquaintance with the street railway business. Had the committee been aware of the fact, it might have understood that its particular function was to prepare a set of blanks, to conform with the classification presented in 1884. It is, perhaps, just as well, for with the progress in street railway affairs in the

\* Read at the Convention of the American Street Railway Association, Atlanta, Oct. 17-19, 1891.



past ten years, the classification presented then, for roads operated entirely by animal power, is nearly out of date, and it would be better to frame one which can be adapted to all classes and kinds of roads, with any or all kinds of motive power, which we believe you will find to be the case of that presented with this report.

In adopting a standard classification as a basis for reports from all roads, we must decide upon the *minimum* number of accounts into which it can be divided, and yet give all the information that the majority would desire. Each of these accounts must be carefully analyzed, and so closely defined that each particular account shall have at all times the same constituent elements on every road. This much decided, any company wishing any more detail may divide and subdivide, until there are twice or thrice the number of accounts; but still retaining the distinctive features of each particular group.

With companies formed under the laws of Great Britain, this is provided for by the "Companies Act" by which all railroad corporations are obliged to keep their accounts according to the forms and methods prescribed by the government, and the books are regularly passed upon by a board of examiners, besides annual or semi-annual audits of the assets, liabilities, accounts and vouchers by independent auditors, or chartered accountants. By this system of government supervision and inspection, the methods and reports are necessarily uniform and afford a means for comparative statements and statistical information, unexcelled by any in the world in precision and accuracy. In the United States the Interstate Commerce Commission and the railroad commissioners of many States have to a certain degree exercised their power in the same direction, demanding yearly reports for publication. In the case of street railways this information is only taken for purely statistical purposes, and so far as the street railway interests are concerned it could be very well dispensed with.

An English writer upon this subject says:

"Uniformity in railway accounting in every respect is greatly to be desired. Much has already been done in this direction; and the periodical reports of our English, Indian, colonial and foreign railways under English control are models of completeness. There is, however, room for improvement. If the able administrators of American railroads could see their way to adopt a more uniform method of compiling their published accounts, setting forth the particulars of capital authorized, raised and expended, revenue earnings and disbursements, assets, and liabilities on defined principles, and in a manner intelligible to any ordinary man of business, it would tend greatly to improve the value of *sound* railway securities."

This is recognized by every thinking man among us, especially those who have to do with the securities of our roads, and yet in the construction, equipment and operation of our tramways we are far in advance of any country in the world, and English capitalists have not been slow to perceive this and demonstrate their faith in our work by investing in our street railway properties. Before doing so they prefer to have the accounts examined by an independent auditor, as is the custom among themselves, nor can we blame them for this businesslike proceeding—it has been instilled into them. Were there a more uniform system of reports and accounting, there is no doubt but that the stock and bonds of our wonderful street railway properties would find an open market abroad.

The classification presented in 1884 was too elaborate for a small company, many directors and managers not caring for information in such minute detail, even on many of our largest and best equipped roads, there being 70 divisions of the operating expenses, while that submitted to you now has but 30, and even this might be simplified.

The interests of this committee are, first, last and all the time, with the owners of the property, the stockholders and their directors, and by conjunction with the bankers who secure a market for their loans, and with the bond purchasers. These are the parties whose money and energy have built up our magnificent structures, and they should receive such information concerning the operation, earnings and expenditures as will enable them to know the value of their investment. The managers and superintendents occasionally look at these monthly reports, and are pleased to carry them before the directors in person if the totals make a good showing; otherwise they are apt to be mailed. Results are what they all want, and it matters but little to them whether the report is divided into 100 distinctive classes of receipts and expenditures, or 10. The road has earned a certain amount, and a certain percentage of that is irrevocably gone, and the subdivision of accounts could not have saved it. This might seem to be an argument in favor of the abolition of everything but the profit and loss account, but we do not go so far as that; we would advocate that the reports be much simplified, and that the standard be simple

and concise enough for the smallest road and the most conservative ideas.

The stockholders and directors, having invested their precious dollars with others in an enterprise which has given every promise of noble returns in due time, are anxious to know the results from their venture, and from time to time wish for a report which can be compared with those of other companies in the same or similar fields.

The banker who has your bonds to put upon the market asks for a statement of your earnings and expenses from the time the road was started. There is, perhaps, another road similarly situated, and with a certain amount of capital, which, to his knowledge, has issued bonds to a certain amount, and this road is not only paying the interest on those bonds, but a certain dividend upon its stock. By a comparison of the reports of the two roads, he makes his calculations which are submitted to the dear public, and purchasers for the bonds are readily found. The creditors, too, and their name is legion, the supply men, manufacturers of cars, electrical, cable, and other machinery, are all interested in your financial reports; the lawyers, judges and receivers sometimes knock at the door for a copy of this valuable document. How necessary, then, that it should be all that is required of it!

Who of all this list cares to go into the minute detail of a lengthy report? Very few, if any. These are the persons who take the greatest interest in our affairs, and they seldom have the time or the inclination to wade through the petty and cumbrous detail. Who is it, then, that has served us this "kettle of fish"? None of the parties mentioned could have laid it at their door; they don't want it. We hold the divining rod in our hand, and it points to the auditor and the accounting officer, the secretary and treasurer, the figure fiend, the statistician, assisted by those managers and superintendents who leave the road to work out its own salvation while they record its progress or degeneration, as the case may be. Statistics costing us thousands of dollars per year, laid away upon the shelf to gather the dust of ages, and, after years of repose, finally consigned to the flames. These statistical fiends appear to believe their only security is in being surrounded with such a mystery and maze of figures as will cause their colleagues to hold up their hands in amazement that any human being can exist in an atmosphere of such dense knowledge and remain perfectly sane.

Don't understand this committee to imply that all accounting officers are of this class. There are some of them who belong to the same as this committee, and are perhaps too lazy to produce so much fire and perform such intricate work, but so long as the stockholders require nothing better we are secure.

In making *tests*, our managers often require statistics as to mileage made by special gears, brushes, truck wheels, trolley wheels, and much other similar information. This is perfectly proper and necessary at times for the good management of the road; but it is a side issue, and not to be considered in making up our standard forms. Not only should we seek uniformity in our reports, but in our methods as well. For instance, we find from the sample pages of some of the account books sent the committee that it is the custom on some roads, when a bill is *paid*, to charge it to the account for which the material is used. While on other roads the charge to expense is made when the material is received, and by others when it is used. This committee holds that the latter is the only correct method, as when material is purchased or paid for we are simply making an exchange of cash for another form of assets, and there is no expense until the material is used.

As an illustration of the incorrectness of the first method, let us take a road which should do a splendid summer business, and during the month of August there is a county fair, which makes that the best month in the year. Then we will suppose that in the early summer they purchased enough supplies to last them several months, amounting to several thousands of dollars, and the bills all fall due or are paid in August; by this method the charges for several months' expense all go into the expenses of one month. In consequence of such methods the reports for August will be very misleading, and, whereas it should show up as the best in the year, it is a question if it is not the worst. Charges to expense should be made as closely as possible in the months to which they belong. When we are of one accord on matters like this, and can agree upon a classification, the balance of the work of standardizing forms of accounting will be very easy and soon accomplished.

There is but one other point upon which the committee wishes to touch, and that is the construction and equipment accounts. There is a great temptation for managers whose roads are running down on account of bad times, no travel, poor motors, bad track (all, of course, due to the mismanagement of predecessors); we repeat, a great temptation to steer as many items as possible into the construction and equipment account.

This is downright fraud, but it is done, nevertheless. Nor are the managers and accounting officers wholly to blame for this. Many of the roads are too heavily capitalized in the start, contracts are let with a huge profit for some one, and the road gets whatever may fall to its lot, sometimes only the broken crust. Burdened with a capital stock of \$2,000,000, it could be paralleled by a better road, with better equipment, for perhaps half the money. Next come the bonds to the amount of another couple of millions, and secured by a mortgage upon the property. Half built in the first place, and with inferior equipment and with interest on a funded debt of more than the entire cost of the road, perhaps the officials of the company think that the game must go on, and that the particular part they are to play is to bluff it as long as possible until the receiver calls time.

The committee might dwell at length upon the distinction between the transportation charges and the maintenance charges which was found to be somewhat confused on many of the reports sent in response to our request, but time is too short. We will say in conclusion, after careful examination of the blank forms and statements sent us, that 40 per cent. are practically the same as the reports used by the committee, and correspond in general detail with the classification submitted to you. Thirty per cent. have practically the same headings, but in each there are instances where expenditures upon the property or maintenance charges are mingled in a confused way with those expenditures which add nothing to the property, either present or future. In 5 per cent. the items are grouped under distinctive headings, but with no regard to the divisions as generally used. In 25 per cent., although the accounts are subdivided to a considerable extent, and some of them have very elaborate statements, the grouping into distinct classes is entirely ignored.

From this you may see that, should the Association adopt the classification submitted, 40 per cent. of the roads would be all right as they stand, and 30 per cent. more would need to change but two or three items—principally putting the repairs of the power plant under the same head as repairs of the balance of the equipment, where it undoubtedly belongs. Twenty-five per cent. more would need to arrange their accounts systematically, instead of having them in a jumbled state, as most of them have the charges made to the proper accounts, but not arranged systematically in the reports.

Nearly 40 per cent. of those replying to the circulars sent out by the committee expressed their approval of the classification sent them, and also a desire that it should be adopted by the Association. None said anything against it.

CLASSIFICATION OF EXPENDITURE FOR STREET RAILWAYS.

- |                                   |  |
|-----------------------------------|--|
|                                   | <ol style="list-style-type: none"> <li>1.—Superintendence and Organization.</li> <li>2.—Engineering.</li> <li>3.—Right of Way.</li> <li>4.—Building Construction.</li> <li>5.—Track and Roadway Construction.</li> <li>6.—Overhead Line Construction.</li> <li>7.—Car Equipment.</li> <li>8.—Snow Plows and Sweepers.</li> <li>9.—Power Station Equipment.</li> <li>10.—Tools and Machinery.</li> <li>11.—Improvements and Betterments.</li> <li>12.—Real Estate.</li> </ol> |
| CONSTRUCTION AND EQUIPMENT.       | <ol style="list-style-type: none"> <li>21.—Salaries General Officers and Clerks.</li> <li>22.—Miscellaneous Expense General Offices.</li> <li>23.—Insurance.</li> <li>24.—Legal Expense.</li> <li>25.—Injuries and Damages.</li> <li>26.—Contingent Expense.</li> <li>27.—Park Properties.</li> </ol>  |
| GENERAL OPERATING EXPENSES.       | <ol style="list-style-type: none"> <li>28.—Car Service.</li> <li>29.—Car House Expense.</li> <li>31.—Lubricants and Waste for Cars.</li> <li>31.—Supplies.</li> <li>32.—Wrecking.</li> <li>33.—Operating Power House.</li> <li>34.—Fuel.</li> <li>35.—Lubricants and Waste for Power House.</li> <li>36.—Water.</li> <li>37.—Hired Power.</li> </ol>   |
| OPERATING EXPENSES.               | <ol style="list-style-type: none"> <li>38.—Repairs Roadway and Track.</li> <li>40.—Renewals of Rails.</li> <li>41.—Renewals of Ties.</li> <li>42.—Repairs and Renewals Paving.</li> <li>43.—Repairs and Renewals Supply Wires.</li> <li>44.—Repairs and Renewals Bldg's, Docks, etc.</li> <li>45.—Repairs and Renewals Overhead Lines.</li> </ol>  |
| MAINTENANCE OF WAY AND BUILDINGS. | <ol style="list-style-type: none"> <li>46.—Repairs of Cars.</li> <li>47.—Repairs of Electric Equipment.</li> <li>49.—Repairs of Steam Plant.</li> <li>50.—Repairs of Electric Plant.</li> <li>51.—Repairs of Tools and Machinery.</li> <li>52.—Miscellaneous Expenses.</li> </ol>  |
| Maintenance of Equipment.         |  |

The classification as given here is not subdivided to the extent that some might think desirable, but sufficiently for any practical purposes, as any further division would be purely statistical.

There are two principal divisions of expenditures, viz.: 1. Construction and Equipment. 2. Operating Expenses. The latter is divided into four groups: 1. General Operating Expense. 2. Transportation Expense. 3. Maintenance of Way and Buildings. 4. Maintenance of Equipment. The construction and equipment charges only



include expenditures which add to the original value of the property.

The first two divisions under the head of Operating Expense—i. e., *General Operating Expense and Transportation Expense*—include only such expenditures as are necessary for operating the road; while the other two divisions—viz.: *Maintenance of Way and Buildings and Maintenance of Equipment*—include all expenditures made upon the property itself, necessary to keep it in perfect repair.

These maintenance charges are purely Operating Expense, but are essentially different from the first two divisions of the Operating Expense in that they add materially to the present or future value of the property while the General and Transportation Charges do not.

The classification as presented is especially prepared for electric railways, but can be easily adapted to use on cable, horse and steam roads; in fact, has been used successfully on a combination of electric, horse and steam roads.

For use upon horse roads.—All the subdivisions of General Operating Expense would be the same.

Under the head of Transportation Expense, for No. 31 would be substituted *Supplies*, including miscellaneous supplies such as are constantly needed for the operation of horse cars and could not be chargeable to repairs.

For No. 33 would be substituted *Stable Expense*, including wages, stablemen and hostlers.

For No. 34, *Fuel*—would be substituted *Provisioner and Bedding*.

The latter expense in each case being that in

Under the head of Maintenance of Equipment, for No. 47, No. 49 and No. 50 would be substituted *Repairs of Locomotives*.

Having had no experience with cable roads the committee cannot say just what substitution would be necessary, but feel very confident that the same classification could easily be adapted for use upon such roads as well.

CONSTRUCTION AND EQUIPMENT ACCOUNTS.

Too much care cannot be exercised in charges to these accounts. Nothing should be charged to Construction and Equipment except that which adds to the first or original cost of the property.

1. *Superintendence and Organization Expense*.—Salaries of superintendent of construction, assistants, wages of clerks and others employed in the offices of this department. Expense of the office, furniture, fuel, lighting, supplies for office, miscellaneous and personal expense of superintendent and assistants while on business. Includes stationery and printing for this department. Also all expenses of organization not coming under either of the following heads:

2. *Engineering*.—Wages and expenses of engineers and draughtsmen on preliminary and construction work.

3. *Right of Way*.—Salaries and expenses of right-of-way agent, together with payments for rights of way, easements, franchises and pole rights.

4. *Building Construction*.—Cost of buildings; car houses, stations, offices, store houses, power

9. *Power Station Equipment*.—Cost of steam plant, engines, boilers, pumps, piping, shafting and belting, dynamos and switchboard equipment, together with installation of the same.

10. *Tools and Machinery*.—Cost of tools and machinery for repair shops, car houses, etc., and expense of setting and placing in running order.

11. *Improvements and Betterments*.—All expenditures which improve the original plant, and of which a portion should be charged to operating and a portion to construction expenses.

12. *Real Estate*.—All land and buildings thereon purchased as an investment and not used by the road for actual operation.

COMMENTS AND VIEWS OF CONTEMPORARIES.

LOCATION OF COUNTRY TROLLEY LINES.—It is desirable, however, that trolley lines should be located near to the roads, for then they are easily accessible. The natural place for them is on the roadside, beyond the ditches. This location involves the expense of grading for the railway road-bed, and hence the builders of trolleys endeavor to secure permission to put their lines on the road-bed, where everything has been prepared in advance. This is as wrong as it can be, for such locations not only ruin the roadway, but make it dangerous to life. There should be incorporated in every road law that no permission should be given to place a railroad on a roadway without referring the question to the popular vote of the township, and requiring that the railroad should then pay a rental of not less than 10 per cent, per annum on the first cost of the roadway. Such a provision of the law would compel trolley roads to seek and find other locations for their lines, and would leave the common roads for the uninterrupted use for which they were intended.—*Harper's Weekly*.

TROLLEY PARTY CARS.—Theatre and wedding parties in the good old days took the family carriages, or, in lieu of them, hired the services of drivers and horses and vehicles, and in either case rolled away to their destination in state. But we're getting beyond that now. We shall soon be so situated that "special cars pass the door every hour," and the bridal party or the dinner party will merely telephone to the street railroad headquarters to "send up one special car, in a hurry," and when it comes they will stroll out to the track and be whirled away to their destination with speed, comfort and ease. A hack is dark; a car is light. A beautiful costume is wasted, so far as the general public is concerned, when it is concealed in a carriage. But in a brilliantly-lighted car the spectators along the route can see the dresses of the women and learn who the men are, and thus find out, to their satisfaction and to the pleasure of those in the car, just what people they are "in society." The possibilities of the new scheme are vast.—*Brockton (Mass.) Enterprise*.

CHANGES CAUSED BY THE TROLLEY SYSTEM.—The introduction of electric cars for street railways has cheapened horse-flesh in the cities and reduced the profits of shippers of and dealers in horses, but it has furnished labor with a new outlet in the direction of the installation of the electric system, with what that involves of improved highways, more substantial tracks, the stringing of wires, the building of expensive cars and the erection of suitable power-buildings equipped with costly dynamos. A case in point is the construction by the Metropolitan Street Railway Company, of New York, at a cost of almost \$1,000,000, of a five-story building to be used principally for the storing of 250 cars. Immense elevators will be used to lift the cars above the ground floor. Great as this expense will be the company regards the project as one in the direction of an economical management of its railway system.—*Philadelphia Public Ledger*.

THE ROD RECOMMENDED.—It is astonishing that the number of accidents due to the vicious practice of children attempting to steal rides on the cable and other cars of this city is so small. A mistaken consideration for the youngsters prevents the conductors from administering a deserved punishment to those caught in the act. If it were recognized as the proper thing for those in charge of cars to give a good switching to those caught stealing rides there would be no repetitions of the affair of yesterday, and the nerves of passengers would be saved many shocks.—*San Francisco Chronicle*.

NEW YORK RAPID TRANSIT.—Constitutional objections are urged against the proposed municipal rapid transit, but they are without force. The simple situation is that the people of this city now have a golden opportunity, such as they never had before, to get rapid transit of the best kind. They have but to say the word and the Commissioners will do the rest. If the people vote for it on Nov. 6 the greatest need of New York will be met in short order.—*New York Herald*.

ELECTRICITY ON STEAM ROADS.—That the electric motor may wholly supplant the steam locomotive

EARNINGS AND EXPENSES.

BALANCE SHEET.

EARNINGS AND EXPENSES.				BALANCE SHEET.				
	This Year.	Prev. Year.	Increase.	Decrease.				
<b>EARNINGS.</b>				<b>RESOURCES.</b>				
Carb Fares					<b>CONSTRUCTION AND EQUIPMENT.</b>			
Sale of Tickets					Superintendence			
Chartered Cars					Engineering			
Freight					Right of Way			
Mail					Buildings and Structures			
Expenses					Track and Roadway			
Advertising					Overhead Lines			
Miscellaneous Earnings					Cars			
Gross Earnings					Snow Plow and Sweepers			
<b>OPERATING EXPENSES.</b>				<b>POWER STATION.</b>				
<b>GENERAL EXPENSES.</b>				Tools and Machinery				
Salaries					Improvements and Betterments			
Advertising and Office Expense					Interest and Discount			
Insurance					Total Construction and Equipment			
Legal					<b>INVESTMENTS</b>			
Repairs and Damages								
Footlight								
Parks								
Total					<b>TOTAL INVESTMENTS.</b>			
<b>TRANSPORTATION EXPENSES.</b>				<b>CASH ASSETS.</b>				
Car Service					Cash			
Car House Expense					Accounts Receivable			
Lubricants and Waste for Cars					Notes Receivable			
Electrical Supplies					Supplies on Hand			
Wrecking					Total Cash Assets			
Operation Power House					<b>SUNDRY ITEMS.</b>			
Fuel					Treasury Stock			
Lubricants and Waste for Power House								
Water					Total Sundry Items			
Hired Power					Total Resources			
Total					<b>LIABILITIES.</b>			
<b>MAINTENANCE OF WAY AND BUILDINGS.</b>				<b>CAPITAL STOCK.</b>				
Repairs Roadbed and Track					The Paterson, Passaic & Rutherford Electric Ry. Co.			
Removing Snow and Ice								
Renewals of Rails					Total Capital Stock			
Renewals of Ties					<b>FUNDED DEBT.</b>			
Repairs and Renewals Painting								
Repairs and Renewals Supplementary Wire					Total Funded Debt			
Repairs Buildings and Structures					<b>CURRENT LIABILITIES.</b>			
Repairs Overhead Lines					Accounts Payable			
Total					Notes Payable			
<b>MAINTENANCE OF EQUIPMENT.</b>				Total Current Liabilities				
Repairs Cars					<b>SUNDRY ITEMS.</b>			
Repairs Apparatus and Fields					Accrued Interest			
Repairs all other Electrical Apparatus					Accrued Taxes			
Repairs Steam Plant					Total Sundry Items			
Repairs Dynamos and Switchboard					<b>PROFIT AND LOSS.</b>			
Repairs Tools and Machinery					Total Liabilities			
Miscellaneous Expense								
Total								
<b>TOTAL OPERATING EXPENSES.</b>								
<b>NET EARNINGS.</b>								
<b>FIXED CHARGES.</b>								
Interest Accrued								
Taxes								
<b>TOTAL FIXED CHARGES.</b>								
<b>SURPLUS EARNINGS.</b>								
<b>DEFICIT.</b>								

(Under operating expenses item No. 39 in above form can be included in No. 38, and item No. 48 in No. 47; hence these two numbers are omitted in schedule.)

horse roads which is offset by the corresponding expense on electric roads.

Proceeding, we would find that the subdivisions under the head of Maintenance of Way and Buildings are all right for horse railways except that No. 43 and No. 45 would be omitted.

Under the head of Maintenance of Equipment, instead of No. 47, No. 49 and No. 50 we would have—*Renewals of Horses, Repairs and Renewals of Harness, Shoeing, Veterinary Services*.

To adapt this classification for use on suburban steam roads we would have the General Operating Expense the same.

Under the head of Transportation Expense, No. 28 would not include the wages of engineers and firemen, only conductors and brakemen, and for No. 33 would be substituted *Locomotive Service*. This being the corresponding expense to Operation of Power House.

All others would remain unchanged except that No. 35 would be *Lubricants and Waste for Locomotives* instead of *Power House*, and No. 37, *Hired Power*, would be omitted.

Under the head of Maintenance of Way and Buildings no change would be necessary except that as with horse roads No. 43 and No. 45 would be omitted.

house, repair shops, wharves, coal sheds, etc., etc.; also furniture and fixtures for the same.

To this account should also be charged the cost of land occupied by the buildings mentioned.

Real estate (land and buildings thereon) not used by the road for actual operation must be charged to real estate account.

5. *Track and Roadway Construction*.—Includes the expense of grading, surfacing, ballasting, ditching and paving; the cost of rails, rail chairs, ties and stringers, tie rods, joint fastenings, track spikes, frogs and switches, supplementary wire, tie wires, channel pins, solder and miscellaneous track material; also the cost of distributing and laying the same, with the supplementary wire and its connections.

6. *Overhead Construction*.—Cost of poles and setting; putting up trolley, feeder and guard wires, including cost of wire and all devices for overhead construction.

7. *Car Equipment*.—Cost of cars built or purchased, including the cost of trucks, wheels, motors, upholstery, painting, lettering, varnishing, etc.

8. *Snow Plows and Sweepers*.—Cost of snow plows and sweepers built and purchased, including the electrical equipment for the same.



in regular railroad service is easily within the bounds of possibility, but we must not expect all this to be done with as great speed as that with which the horse was cut loose from the street car. If electricity shall do as much for the steam railroad in 25 years as has been done for the street railway in five years it will be rapid progress, indeed.—*Baltimore News.*

**RAPID TRANSIT PLANS IN CHICAGO.**—If half the plans for surface and elevated railway construction and extension are carried out that are proposed by the representatives of combinations of capital our people will soon be in the enjoyment of facilities for intramural travel beyond their wildest hopes. Competition will be so sharp that the transportation companies will back a palace car right up to every man's door and pay him for riding.—*Chicago Post.*

#### CANADIAN NOTES.

(From our Ottawa Correspondent.)

**Hamilton, Ont.**—Notice is given that application will be made at the next session of the Legislature of Ontario for an act to incorporate "The Hamilton & Lake Erie Power Company," with power to acquire the right of way for and construct a watercourse and raceway from some point on Lake Erie, through the city of Hamilton to Burlington Bay, through the counties of Haldimand, Lincoln, Welland and Wentworth; to build electrical works in connection with the said watercourses and raceway for the purpose of generating electrical energy; to sell or otherwise dispose of the said electrical energy and the said water for heat, light, power and other purposes, and distribute the same in the city of Hamilton and elsewhere.

**Montreal, Que.**—The stock of the Montreal Street Railway Company is gradually going into the hands of investors. Over 1,000 shares of the old stock was taken over last week; 600 by the Society of Jesus, of Montreal; 300 by John Breakey, Quebec; and 100 by E. J. Barbeau, Montreal, besides several other smaller lots. James Ross is now the largest individual shareholder in the company, having no less than 6,000 shares to his name, representing over half a million dollars at present market prices. R. B. Angus has 2,500 shares, the Seminary of Montreal 2,000 shares and Mr. Breakey, of Quebec, over 1,000 shares.

**Yarmouth, N. S.**—Notice is given of the application to the Dominion Government for charters to confer power for building and operating electric railways between Yarmouth and New Brunswick, E. Franklin Clements, the applicant, says the idea is to follow the main line of travel from Yarmouth skirting the shore to Weymouth, thence to Truro, Amherst, and into St. John, New Brunswick. Water power, and in many instances, it is claimed, the tidal waters, are to be utilized by means of patented appliances. The cost of travel will be 50 per cent. less than on any existing roads.

**Quebec.**—Hon. L. P. Pelletier, Hon. Philippe Landry, J. J. T. Fremont, M. P.; P. B. Dumoulin, banker; Bernard Leonard, John U. Gregory and Ernest Pacaud, are applying to the legislature to be incorporated under the name of the Quebec City and District Electric Railway Company, with power to build and run electric railways in the city of Quebec, and also in the counties of Quebec, Portneuf, Montmorency, Levis, Bellechasse, Dorchester, Beauce and Lotbiniere.

**Hamilton, Ont.**—B. B. Osler has written to the mayor of Dundas proposing that for a bonus of \$25,000 he will convert the Hamilton and Dundas Street Railway into an electric road, with rails and roadbed heavy enough for steam trains, his idea being to run freight trains from the junction with the Toronto, Hamilton and Buffalo road to Dundas. This would give Dundas a first-class electric car service to Hamilton.

**Montreal, Que.**—Much interest is being taken by the street on the forthcoming annual statement of the Montreal Street Railway Company, due next week. It is understood that the statement will be the best in the history of the company, and will show a net surplus of nearly \$40,000 after providing for the dividend, fixed charges, etc. The directors will declare the dividend next week.

**Aylmer, Que.**—T. Viau, contractor, of Hull, acting as representative of a private company, with a stated capital of a quarter of a million dollars, has proposed to the Aylmer town council a scheme whereby Ottawa and Aylmer are to be connected by electric railway. The company wants a bonus of \$10,000 and 35 years' exemption from taxation.

**Niagara Falls, Ont.**—Ex-Mayor Manning, R. F. Segsworth, William Kyle and other Toronto men are asking a bonus of \$75,000 from the Council at Niagara Falls, Ont., to build an electric railway from the Falls to Drummondville and Queeston.

**Toronto, Ont.**—The annual meeting of the shareholders of the Toronto & Scarborough Electric Railway, Light and Power Company will be held on Nov. 13, at Toronto, for the election of directors.

**Montreal, Que.**—Duncan McDonald has been ap-

pointed superintendent of the Montreal Street Railway. Mr. McDonald has been acting superintendent since Mr. Franklin's resignation.

**Ottawa, Ont.**—The Ottawa Car Company has shipped three vestibule cars for the St. John (N. B.) electric railway, equipped with Westinghouse motors.

**Ottawa, Ont.**—A petition asking the Electric Railway Company to extend its line to Billing's Bridge is now being circulated for signatures.

**Hamilton.**—The formal opening of the Hamilton, Grimsby & Beamsville electric railway took place recently.

**Hamilton, Ont.**—An electric railway between Hamilton and Guelph is proposed.

#### NEW ENGLAND NOTES.

(From Our Boston Correspondent.)

The Massachusetts Railroad Commissioners have at last granted permission to the Lynn & Boston Railroad Company to issue \$5,379,000 30-year gold first mortgage 5 per cent. bonds, of which \$2,700,000 is to issue to pay the company's debt to the North Shore Traction Company, and the balance will be used for taking up prior liens of the Lynn & Boston, the Naumkeag, the Essex and the Lynn Belt Line. This will release the North Shore Traction Company from debt and enable it to resume the payment of dividends. A syndicate of New York capitalists, it is reported, has purchased the bonds of the North Shore Traction Company.

The first annual banquet of the Lynn and Chelsea branches of the Federation of Labor took place October 12, the members being entirely employees of the Lynn & Boston Railroad Company. Among the 50 guests were the Mayor of Lynn and the leading officials of the several sections of the Lynn & Boston Railroad Company. Speeches were made by General Manager Foster and Mayor C. E. Harwood. In his address to the men, Mr. Foster spoke of the way in which they could render themselves valuable to their employers and enhance their own and the company's prosperity.

Some of the leading citizens of Cambridge have appealed to the courts to aid them in their opposition to the extensions proposed by the West End Street Railway Company in Cambridge. There are not many towns and cities in the country which have been more stubbornly opposed to the introduction of electric street railways than classic Cambridge. The cars, however, run frequently through the shady streets and by the walls of aristocratic Harvard University.

The electrical railway supply houses of Boston report a most promising outlook for the future. Many new roads are projected throughout New England and new supply houses are being opened. There is not a firm in the electrical field in Boston that is not doing a fair business. A consolidation of two or more Boston firms is talked of and is within the range of possibility.

The General Electric Company is reported exceedingly busy at its Lynn factories in the production of electric railway apparatus. The aggregate output is not of course nearly that of a year and a half ago, but the management has become quite conservative of late and prefers to do less business in the aggregate on a cash basis, than to sell on credit as it was wont to do, and thereby run the risk of contracting bad debts, which have, in the past, seriously crippled the company's business.

The West End Railroad Company now runs special cars from certain suburbs into the city Sunday mornings for the convenience of churchgoers, and advertises these cars in the daily papers. They are proving to be very popular, and will, doubtless, be even more so during winter months. The special cars which were illustrated and described in the October 13th issue of the STREET RAILWAY GAZETTE have caught the popular fancy and are earning no little money.

The Lowell, Lawrence and Haverhill Street Railroad Company is seeking authority to enter the first named city, the desire being to effect an entrance through a certain district. In this wish the Lowell and Suburban Railroad Company joins, but the railway people are opposed by persons who desire to have the road built through another part of the city. A few evenings ago there was a very lively hearing before the Board of Aldermen, but no decision was reached. The matter will come up again in a short time for final consideration.

On Monday of this week some 30 or more inventors of street car fenders appeared before the State Railroad Commissioners to present their respective models. There was some misunderstanding among them, for they all understood that they were to have an opportunity of explaining their respective devices. Such was not the case, however. Each one was asked to leave drawings and a small model of his device if he had one, for the examination and consideration of the members of the board. The hearing was given under the order passed by the last legislature, in which the Railroad Commissioners were directed to investigate the matter of street car fenders,

## FINANCIAL DEPARTMENT.

### Financial Notes.

**No Unnecessary Concealments.**—A financial journal says of the holders of street railway securities: Such holders must have free access to the books showing the financial condition of the companies, and these books should be kept in the simplest form possible, that those who examine them may understand. There should be no secrets between the management and the stock or bond holders other than those necessitated by business prudence. As the situation is to-day in many corporations, security-holders are either prevented from obtaining the knowledge they seek, or the truth is so perverted as to make the information without value. We have already seen the effects of misrepresentations in railroad management, and it is the one great factor that has placed under suspicion many of our railroad securities. Is a similar fate reserved for electric street railway securities? Assuredly so, if the same policy is carried out. It is not unlikely, however, that different methods will be pursued. The public demands it, and the sooner the voice is obeyed the better for the new class of securities that are bidding for public favor.

The "Philadelphia Stockholder" states that Vice-President Frank Thomson and Directors A. J. Cassatt and Clement A. Griscom, of the Pennsylvania Railroad Company, have decided to accept the invitation tendered them to become members of the board of directors of the Consolidated Traction Company of New Jersey. The company will be reorganized early next month, and its directory will be the most powerful and influential, as well as the most capable, of that of any similar corporation in the United States. The advent of Messrs. Thomson, Cassatt and Griscom means not only close relations with the Pennsylvania Railroad, but that a good portion of the brains which have made the Pennsylvania the standard railroad of America will be used to bring the Consolidated into equal prominence among the electric railroad systems of the country.

**Chicago Elevated Roads.**—There are now two elevated railroads finished, the Alley L. and Lake Street. The Metropolitan is nearly finished and the Northwestern is to be built on the North Side. The former, which already has cost ten or eleven millions, proposes to extend itself and parallel the latter, which will take some millions more. A vast amount of money thus has been expended with very little return thus far to show for it. Of course, there may be a return in the future, and if people are willing to discount the future and spend their money on these roads now some time they may get it back. But thus far the stockholders, presuming there are real stockholders, are in the dumps and the bondholders are no happier.—*Chicago Tribune.*

**Columbus, O., Street Railway.**—The September statement of the Columbus Street Railway Company contains the following figures: Gross earnings amounted to \$50,013.71, an increase over the same month last year of \$11,852.27, while expenses were only \$23,474.38, a decrease of \$6,143.76. This is only about 45 per cent. of the operating expenses, and illustrates how cheaply street railways can be operated with electricity as the motive power. Net earnings for the month were \$35,539.33, against \$17,553.30 in September, 1893, an increase of \$17,986.03. For nine months gross earnings increased \$14,514.35, operating expenses decreased \$57,736.44, thus making an increase in net earnings of \$72,250.79.

**Receiver's Report of the Schenectady Road.**—The report of George W. Jones, the receiver of the Schenectady Street Railway, gives the following figures for the last quarter: Gross earnings, \$9,282.40; operating expenses, \$8,315.51; net earnings, \$966.89; other income, \$133.87; gross income, \$1,100.76; fixed charges, \$434.81; net income, \$665.95. For the corresponding quarter of last year the gross earnings were \$11,967.89; expenses, \$12,566.15; net deficit, \$598.26; gross deficit from operation, \$519.95; fixed charges, \$3,443.79; general deficit, \$3,969.74.

**Union Company's New York Report.**—The report of the Union Railway Company of New York City for the quarter ended Sept. 30 last shows: Gross earnings from operation, \$136,338; operating expenses \$67,172; net earnings from operation, \$69,166; other income, \$249; gross income, \$69,415; fixed charges, \$36,674; net income, \$32,741; cash on hand, \$50,065; profit and loss, surplus, \$161,604. The net income for the same quarter last year was \$36,547.

**New Bedford Road Sold.**—The Union Street Railroad Company, of New Bedford, Mass., has sold out to a syndicate formed by J. A. Beauvais and others. The road will be under the control of the new owners on Nov. 1. The total number of shares of the company is 2,600. The new syndicate has acquired 1,350 of these shares and the price paid is \$160 a share. The present syndicate paid \$160 a share when it bought the road.



**Metropolitan Bond Issue.**—At a meeting of the stockholders of the Metropolitan Railroad Company of Washington, D. C., Oct. 3, it was unanimously decided to authorize the issue of \$1,700,000 in bonds, secured on the franchise of the property of the road. The proceeds of the sale of these bonds will be used in equipping the road with an underground electric system of propulsion.

**The Brooklyn Atlantic Avenue Railway Report.**—The report of the Atlantic Avenue Railroad Company of Brooklyn for the quarter ended Sept. 30 shows: Gross earnings, \$252,275; operating expenses, \$158,571; net earnings, \$93,704; other income, \$17,173; gross income, \$110,877; fixed charges, \$66,181; net income, \$44,695; cash on hand, \$77,083; profit and loss, surplus, \$62,358.

**North Shore (Chicago) To Be Leased.**—The North Chicago Street Railroad Company will lease the North Shore Electric Railway, guaranteeing 6 per cent. on the stock and the interest on the bonds.

## NEW INCORPORATIONS.

**Brooklyn, N. Y.**—The Brooklyn, Newtown & Bowery Bay Railway Company has been incorporated, with a capital of \$100,000, to operate a street road for six and a half miles, having its termini at Penny Bridge, Lutheran Cemetery, and Bowery Bay or North Beach, all in the town of Newtown, Queens County. The directors are: S. Fisk Worthington, Alexander Hance, Alexander D. Hance, of Winfield; Abbot C. Combes, Clarence E. Mundy, Peter B. Mundy, of Newtown; Frank W. Meinikheim, Bernard G. Meinikheim, of Maspeth; and Adam Wiener, of New York City. The principal office will be at Newtown.

**Peekskill, N. Y.**—The Peekskill and Cortlandt Electric Railway Company has been incorporated. The capital stock is \$150,000. The company proposes to build and operate a road four miles long, in the towns of Cortlandt and Yorktown, and village of Peekskill. The promoters are Edgar Peckham, Benj. Norton, of New York City; H. C. Soap, of Kingston.

**Jamesstown, N. Y.**—The Jamesstown & Lake Erie Railway Company has been incorporated with a capital stock of \$250,000. The company proposes to operate what was formerly the Chautauqua Lake Railway. The promoters are H. W. Cannon, S. H. Voorhees, Sherman Evarts, H. H. Durand, I. F. Workum, New York City, N. Y.

**Alameda, Cal.**—The Alameda & Oakland Railway Company has been incorporated. The capital stock is \$500,000. The company proposes to build, equip and operate street railway lines in Oakland, Alameda and County of Alameda. The promoters are W. M. Rant, Alameda, Cal.; E. S. Dennison, Alton H. Clough, Oakland, Cal.

**Chicago, Ill.**—Chicago Central Electric Railroad Company has been incorporated to construct and operate by steam or electric, horse and dummy railroads. The capital stock is \$1,200,000. Single share, \$100. The promoters are: Geo. W. Waterman, Wm. R. Odell, Chas. A. Boos.

**Battle Creek, Mich.**—The Citizens' Street Railway Company, of Battle Creek, Mich., capital stock \$100,000, has been incorporated. Those interested are: Loren N. Downs, New York City; Hale P. Kauffer, T. N. Rowley, Kalamazoo, Mich.

**Jersey City, N. J.**—The Eastern Tramway Construction Company has been incorporated with a capital stock of \$2,000. The promoters are Howard Ellis, Ridgewood, N. J.; Jno. E. Bowles, Geo. H. Wright, New York City.

**Kansas City, Kan.**—The Kansas City Traction Company has been incorporated. The capital stock is \$1,000,000. The promoters are: B. S. Coler, Brooklyn, N. Y.; Wm. J. Smith, Wm. H. Lucas, Kansas City, Mo.

**Girardville, Pa.**—The William Valley Street Railway Company, capital stock \$100,000, has been incorporated. The promoters are: Chas. A. Barnhard, Moses Mervine, Geo. C. Hachel, Girardville, Pa.

**Kansas City, Mo.**—The Kansas City Traction Company has been organized with \$100,000 capital stock. Those interested in the company are: Wm. I. Smith, Jas. Lillis, Wm. D. Lucas, Kansas City, Mo.

**Akron, O.**—The Akron, Bedford & Cleveland Railroad Company has been incorporated with a capital stock of \$300,000. The promoters are: John F. Sieberling, E. A. Sieberling, Jas. Christy, Jr.

**Terre Haute, Ind.**—The Terre Haute & Brazil Electric Railway Company, capital stock \$16,000, has been incorporated. The promoters are: Max Joseph, C. E. Miller, J. G. Elder, Terre Haute, Ind.

**Ironton, O.**—The Ironton Street Railroad, Light and Power Company, capital stock \$100,000, has been incorporated. The promoters are H. A. Marving, Leo Ebert, R. Mather.

**Chicago, Ill.**—The Cook Elevated Railway has been incorporated; capital stock, \$10,000,000; incorporators: Mark Sands, James E. Gaule, and Carl H. Leopold.

## NEWS OF THE WEEK.

**Norristown, Pa.**—The Philadelphia & Rosemont Electric Railway Company is endeavoring to secure a right of way from Philadelphia to Bridgeport by the way of Bryn Mawr, Ardmore and other villages. It is stated that there will be little or no opposition to giving the company a right of way in Bridgeport. The company is to conduct a high-speed line, and promises to land Bridgeport passengers at Fourth and Market streets, Philadelphia, in half an hour, the fare for the round trip to be less than 50 cents. In view of the intention to maintain a speed of 35 miles an hour, as permitted in its charter, the company will avoid public highways as much as possible, and construct the road principally through fields.

**Chicago, Ill.**—The Lake Shore Electric Railroad Company has recently been organized. The capital stock is \$10,000,000, and the company proposes to build an electric railway that will connect the most important towns that lie between Chicago and Milwaukee. The engineering corps, it is stated, is now engaged in surveying for the route. Most of the right of way has been secured. D. A. Louderback is at the head of the enterprise and several prominent real estate men are associated with him as incorporators, but it is stated that the stock is largely held by the capitalists who are behind the Northwestern Elevated Railroad.

**Bay City, Mich.**—Walter S. Eddy, of Saginaw, Warren Y. Soper and Thomas Ahearn, of Ottawa, Ont., recently asked the Common Council for a franchise to run a double track electric railway from Twenty-third street north to Fourth avenue, by way of Garfield and Washington avenues. They represented that they are about to form a corporation for the purpose of building the Saginaw & Bay City Street Railway through the townships of Saginaw and Koochville, in Saginaw county, and Frankenlust and Monitor townships in Bay county. This company is not identified with the Saginaw company.

**Bay City, Mich.**—It is announced that the Saginaw valley cities will be united by an electric railroad next season. The moving spirit in the enterprise is the Saginaw Electric Street Railway Company, which recently secured the right of way to Zilwaukee and Carrollton on the west side of the river. The distance from Carrollton to West Bay City is about 10 miles. The right of way for this distance has been secured and a surveyor has laid out a route between the Cincinnati, Saginaw & Mackinaw and Michigan Central railroads.

**Baltimore, Md.**—The Baltimore Traction Company has decided to abandon the cable on Gilmore street, and on Fayette, west of Paca, and electric trolley will be substituted. The capacity of the Charles street power station is to be materially increased. These changes are the result of a statement from President Brown, showing that the company would save greatly by the proposed change. President Brown estimates that the saving by the proposed trolleying of the road over the cable will approximate \$20,000 per annum.

**Brooklyn, N. Y.**—An application has been made to the State Board of Railroad Commissioners by H. M. Thompson, former secretary and treasurer of the Brooklyn City Railroad Company, for an official investigation of the affairs of that company, the Brooklyn Heights Railroad Company, which leases it, and the Long Island Traction Company, which owns the latter corporation. He alleges that the annual reports are incorrect and misleading, and desires the Commissioners to make official examination of the books.

**Camden, N. J.**—Another electric railway is asking for entrance into Camden. The new system is the New York and Philadelphia Traction Company, which is to erect an electric line from New York to this city, with lines running down from Trenton on both sides of the Delaware. The company is an outgrowth of the Consolidated Traction Company, which is already in possession of trolley lines aggregating 190 miles in operation in the northern part of New Jersey.

**Youngstown, O.**—William J. Flower, an ex-employee of the street railway company, has brought suit for \$10,000 damages. During the late strike Flower was arrested on a warrant sworn to by Manager Anderson, the defendant in the present case, charging him with tampering with the company's wires. Flower was in jail less than six hours, and was released by the company withdrawing the charge.

**Dunkirk, N. Y.**—Ralph B. Day, of Central avenue, has served a notice upon M. M. Fenner, president of the Dunkirk & Fredonia Street Railway Company, objecting to the laying of the "T" rail for the track now being laid on Central avenue in front of his premises, upon the ground that such style of rail is an obstruction to the passage of carriages and is not in accordance with the law.

**Chicago.**—The permits asked for by the West Chicago and North Chicago Street Railroad and the Chicago City Railway Companies to change a great part of their respective systems from horse

to electric power were issued last week by Commissioner of Public Works Jones on the recommendation of the Law Department. The three companies will begin reconstruction at once.

**Philadelphia, Pa.**—Judge Pennypacker has delivered an opinion in the case of the People's Passenger Railway Company against the Union Passenger Railway Company and the Philadelphia Traction Company, refusing the plaintiff's application for a special injunction restraining the defendants from constructing and operating a street railway across the Girard avenue bridge.

**Niagara Falls, N. Y.**—The company which proposes to build an electric railway on the American side from Niagara Falls to Lewiston, a distance of seven and a quarter miles, has obtained most of the right of way. The company hopes to have the line in operation next summer. Capt. John M. Bunker, of Buffalo, is president of the company, and H. Sellers McKee is vice-president.

**Chicago, Ill.**—The West Chicago Street Railroad Company has taken out a permit for the construction of a one-story and basement powerhouse, at No. 47 Western avenue, at a cost of \$120,000. The same company has taken out a permit for a one-story and basement brick carhouse at Nos. 1991 and 2003 West Madison street, at a cost of \$75,000.

**Electric Light Convention.**—The action of the executive committee of the National Electric Light Association at a meeting held in New York, Sept. 11, in selecting Cleveland as the place for holding the next convention, has been confirmed; so it is now definitely settled that Cleveland, O., is the place, and Feb. 19, 20, 21, 1895, the dates of the next convention.

**Marlboro, Mass.**—A new street railway is contemplated between Marlboro and Westboro, passing through Southboro. The distance will be about seven miles. The following gentlemen are interested: J. O. Burdett, A. M. Bridgman, L. V. Price, E. B. Harvey and E. C. Bates, W. C. Blake and W. D. Burdett, Marlboro.

**New York, N. Y.**—The New York Bank Note Company is suing the Kings County Elevated Railway Company in the Supreme Court to recover \$16,567, which is alleged to be due upon the refusal of the railway company to carry out a contract entered into for the printing of 200,000,000 of tickets for the railway.

**Chicago, Ill.**—Judge Windes has issued an injunction which will prevent the construction of the Northwestern Elevated road. The writ was issued on the petition of a property owner on the proposed line, who claims the company does not intend to conform to the terms of its franchise.

**Kansas City, Mo.**—The newly formed Kansas City Traction Company, which proposes to build an electric street railway from the terminus of its line across the West bottoms to the Union depot, has been granted a franchise to construct its road as far east as the State line.

**Milwaukee, Wis.**—The recent convention of the Amalgamated Association of Street Railway Employees voted that in case of a difference between employer and employee each union must submit its strike resolutions to the executive council before declaring a strike.

**Chicago, Ill.**—An ordinance has been introduced in the Council compelling the street railway companies to sweep the streets on which they operate car lines, from curb to curb, three times each week. There is no danger that the measure will be adopted.

**Turtle Creek, Pa.**—The borough council has granted franchises through the borough to two rival street railway companies. The Second Avenue Traction Company is one of the corporations favored. Their ordinance was passed first.

**Detroit, Mich.**—Attorney-General Ellis has denied the request of the city of Detroit that he commence quo warranto proceedings in the Supreme Court against the Citizens' Street Railway Company of Detroit.

**New Orleans, La.**—On Nov. 9 the Orleans Street Railroad Company will decide whether it will introduce the electrical system. It is stated that there is no doubt that the improvement will be made.

**Philadelphia, Pa.**—The People's Traction Company is to build a one-story stone addition, 40 by 308 feet, to the car shed at Germantown avenue, near Carpenter street. It will cost about \$30,000.

**Pittsburgh, Pa.**—A fire broke out in the store room of the Standard Underground Cable Company, at Sixteenth and Pike streets, on Oct. 24, and a loss of about \$2,500 was caused.

**Philadelphia, Pa.**—The Philadelphia Traction Company is running smoking cars on almost all its trolley lines. About every fifth car is a smoker.

**Camden, N. J.**—The City Council after a bitter contest has passed ordinances granting a franchise to the West Jersey Traction Company.



Quincy, Ill.—The motorman that run down and killed a woman a short time ago was acquitted by a jury. He was charged with manslaughter.

## PERSONALS.

Mr. Charles A. Sheldon has resigned as assistant division superintendent of the Michigan Division of the Lake Shore & Michigan Southern Railroad, to accept a position with the Consolidated Car Heating Company, Albany, N. Y. He will have charge of the Compressed Gas Lighting Department of the Consolidated company. Mr. Sheldon is a graduate of Yale, class of '90, and has been with the Lake Shore road since graduation, four years ago, having risen through several grades to the responsible position of Assistant Division Superintendent. He has shown great ability in railroad matters and his many friends will be glad to learn of the important position which he now assumes with the Consolidated Car Heating Company.

Mr. John H. Burtis, of Brooklyn, has been appointed a Commissioner of Charities and Correction. Mr. Burtis was instrumental in organizing the Brooklyn Elevated Railroad Company, and was its president for three years. He also was president of the Coney Island & East River Railroad Company, later merged into the Brooklyn, Flatbush & Coney Island Company.

Mr. Willard A. Smith, who has been identified with the *Railway Review*, of Chicago, and who was chief of the department of transportation of the World's Fair, has been elected second vice-president of the Malleable Castings Company, of Cleveland, O., and will represent that company in Chicago.

Mr. Fred. S. Kenfield, of Chicago, and Miss Amy Sweeney, were married at the home of the bride's parents in Rock Island, Ill., on Oct. 24. Mr. Ken-

field is one of the publishers of the *Street Railway Review*. We extend our best wishes and congratulations to Mr. and Mrs. Kenfield.

## TRADE NOTES.

**Sales of the Sterling Company.**—Among the street railway companies that have recently been furnished fare registers by the Sterling Supply Manufacturing Company, of New York, are these: Yonkers Street Railway Company; Rutland (Vt.) Street Railway Company; Newark, Passaic & Rutherford Railway Company; New Orleans Traction Company; Nassau Electric Railway Company, Brooklyn. The same company has recently received contracts to furnish sandboxes for the Columbus Avenue line of the Metropolitan Traction Company, of New York, and the Consolidated Traction Company, of Jersey City; the latter order amounts to 120 sets. The company has been given the contract for fenders for the cable cars on the Columbus Avenue line of the Metropolitan Traction Company, of New York; and the entire equipment for the North Hudson County Railroad Company, of Hoboken.

**Electric Heaters.**—It speaks well for electric heating that the Consolidated Car Heating Company, of Albany, is able to announce in Part XII. of its catalogue that its electric heaters "are in successful operation on about 1,000 cars belonging to the best managed and most profitable street railways in the United States and Canada." When electric heating has been introduced to this extent it cannot be longer regarded as experiment, as some street railway companies profess to believe it. The catalogue of the company contains data of the most interesting character. It will be ready for delivery in about two weeks.

**Nassau Electric Railway Power Station.**—The new power station for the Nassau Electric Railway Company, at Brooklyn, N. Y., will be 102 feet

wide and 150 feet long, and will be constructed entirely of iron and steel, the whole designed and built by the Berlin Iron Bridge Company, of East Berlin, Conn. The roof will be covered with the latter company's well-known patent anti-condensation corrugated iron roof covering. Randolph & Clowes, of Waterbury, Conn., have placed the contract for the extension of their muffle-room with the same company.

**New Boston Railway Supply Company.**—A new electric railway supply house commences business this week under the name of the Thompson-Brown Electric Company, 97 High Street, Boston. Mr. Thompson is not widely known in the electrical field, though those who know him speak very highly of him as a business man and a gentleman. Mr. Maylin Brown, his partner, is well known everywhere as a bright, pushing, successful handler of electrical supplies. These two gentlemen will be assisted by the pioneer electrical supply man, Mr. F. G. Petingell.

**The McGuire Manufacturing Company, of Chicago,** has received orders within the past two weeks for 690 of its Columbian magazine cast iron street car heaters, and 14 of its Columbian combination snow sweepers. These orders would seem to indicate that electric railways in the colder regions expect to do business during the coming winter.

**The Sterling Supply and Manufacturing Company, of New York,** has just issued a new catalogue in which its street railway supplies are illustrated and described. The Sterling fare registers, fenders, sandboxes, etc., have gained marked popularity, and managers will do well to examine the catalogue.

**Opening of a Boston Store.**—The well appointed store of the Thompson-Brown Electric Company, 97 High Street, Boston, was opened formally Oct. 25. A large number of friends and prospective customers accepted the company's invitations on the occasion and they were hospitably received.

# RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Oct. 23, 1894.

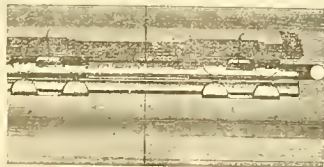
527,766. **Metal Brush for Dynamos;** Wilhelm von Braucke, Thmertetbach, near Westig, Germany. Filed July 2, 1894. The brush consists of a large number of thin threads or wires of copper or copper alloys laid loosely side by side, and held together by a metal wire-cloth.

527,785. **Rail Bond;** William A. Granten, Hartford, Conn. Filed June 7, 1894. The bond consists of a body having a turned or threaded shank with a hollow end, and with a plural number of wire grooves, the outer walls of the wire grooves being formed by outward extending ears, and a bonding and a supplementary wire, grasped by the ears. (See illustration.)

527,813. **Life-Guard for Street-Cars;** John F. Ryan, Toronto, Canada. Filed Dec. 9, 1893. To the hangers or brackets, the side bars secured, springs are secured to the brackets and bearing on the side bars. There is a foot lever, or pedal and levers or rods connect the pedal with the life-guard frame, with a hand lever for locking the pedal.

527,810. **Support for Trolley-Wires;** Frederick C. Fisk, Buffalo, N. Y. Filed March 1, 1894. The support for trolley-wires consists of twin parts riveted together and having in their contacting inner faces similar inclined grooves which register with each other so to form an inclined passage that extends entirely through their length. A sleeve is adapted to surround and carry the line-wire and is provided with inclined flanged wings adapted when brought together for sliding and wedging engagement with the inclined passage between the twin parts. The whole is adapted to be secured to an insulating bell.

527,857. **Transformer System for Electric Railways;** Maurice Hudin and Maurice Leblanc, Paris, Assignor to the Société Anonyme pour la Transmission de la Force par l'Electricité, same place. Filed Nov.



No. 527,785.

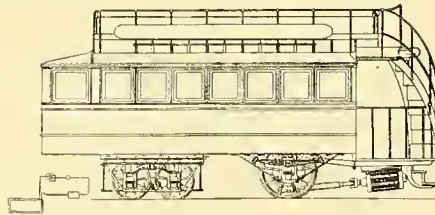
16, 1892. Patented in France, Nov. 5, 1890, No. 209,323. This is the improvement in the art of electric transmission of power from a primary circuit or line to a secondary circuit by electric induction, whereby the intermediation of a closed magnetic circuit between the primary and secondary is dispensed with. This consists in generating in the primary circuit an alternating current of high frequency, and suppressing the self-induction of the secondary coil which is within inductive proximity to the primary. (See illustration.)

527,873. **Closed-Conduit Electric Railway;** James F. McLaughlin, Philadelphia, Pa. Filed April 5, 1894. There is a traveling electromagnet above the conduit; a circuit closing trolley in the conduit carries an armature for the magnet. There are lugs or projections in the conduit between the magnet and armature, constituting stationary polar extensions of the magnet.

527,874. **Closed-Conduit Electric Railway;** James F. McLaughlin, Philadelphia, Pa. Filed May 24, 1894. Electromagnets are hung from a motor car and

are pivoted to tilt in the direction of the line of travel and also at right angles thereto.

527,894. **Automatic Safety Grip for Inclined Railways;** Orison M. Smith, Duluth, Minn., Assignor of two-thirds to M. J. Davis, E. J. McLaughlin, H. Bridgeman and N. F. Russell, same place. Filed May 19, 1894. This is the combination with a car, of a fixed and a motor cable of substantially pear-shaped gripping jaws having eccentrically disposed journals, yielding



No. 527,857.

bearings, a box having slots in which the journals work and the curved arms connected with the shafts of the jaws.

527,920. **Trolley Wire Support;** Montraville M. Wood, Chicago, Ill. Assignor to the Wallace Electric Company, same place. Filed April 30, 1894. This support comprises a rigid arm adapted to be secured to a pole, post or the like, and an end portion thereon adapted to support a flexible span wire, the span wire in substantially the same axial line as the supporting arm.

527,927. **Electric Motor for Railway Cars;** Norman C. Bassett, Lynn, Assignor to the General Electric Company, Boston, Mass. Filed June 28, 1893. The electric motor is centered upon an axle of the vehicle, and trunnions are upon the outside of the motor vertically in line with its center of gravity. Longitudinal yokes are supported by the wheel-base of the vehicle to which yokes the trunnions are pivotally connected.

527,947. **Method of and Means for Controlling Electric Cars;** Harry P. Davis, Pittsburg, Pa., Assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed March 29, 1894. This is the method of changing from parallel to series arrangement in street cars driven by two electric motors and consists in throwing a resistance in series with one of the motors only, then putting a resistance in series with the second motor; cutting out the second motor, and then throwing the second motor in series with the first motor. (See illustration.)

527,990. **Electric and Gravity Pleasure-Railway;** Charles A. Idler, Atlantic City, N. J. Filed June 26, 1891. The pleasure railway comprises a structure having down and up-grade circles, and a terminal and starting station common to both, top and bottom intermediate rails, an electrically propelled car having grooved wheels engaging rails and automatically establishing and breaking a circuit through the car with a source of energy in the travel of the same over certain of the circles and serving as a means for preventing derailment of the car in its travel over certain of the other circles of the structure.

528,005. **Switch-Actuating Mechanism;** Adam Matz, Cincinnati, O. Filed May 11, 1894. The mechanism combines the following instrumentalities: A switch tongue, a pivoted tripping-lever therefor and connected thereto, a locking-pawl for the lever, under spring ten-

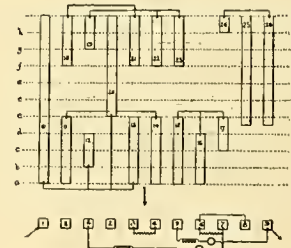
sion, a tripping dog, carried by the car, and means on the car connected to said dog, for throwing the same, into or out of engagement with the trip lever, or pawl.

528,019. **Brake;** Christen C. Ongsgord, West Duluth, Minn. Filed May 1, 1894. This is the combination of a car, a propelling cable connected thereto, a stationary cable by which the car passes, a grip on the car and operating in connection with the stationary cable, said grip being connected with a drum mounted on the car-axle, a clutch for fixing the drum to the axle and having a normal tendency toward the drum, and a third cable connected to the clutch and operating to hold it out of engagement with the drum, the last-named cable being adapted, upon the breaking of the propelling cable, to break and release the clutch, thereby operating the grip to bind with the stationary cable and stop the car.

528,048. **Car-Fender;** Henry P. Weale, Boston, assignor of two-thirds to George L. Richards and Henry E. Turner, Malden, Mass. Filed April 27, 1894. The life guard comprises in its construction a support swiveled to the car so as to swing in a horizontal plane, a fender pivoted to the support so as to swing in a vertical plane, a vertically movable operating piece on the car, and suitable connections between the operating piece and the fender, and carried by the swiveled support, the connections having provisions for producing upward movement of the fender by depression of the operating piece, and for permitting horizontal swinging of the swiveled support while the operating piece remains stationarily located on the car.

528,057. **Car-Fender;** Sylvanus D. Wright, New York, N. Y. Filed Dec. 20, 1893. The fender comprises a movable screen frame, means for lowering the same, and spring-pressed side wings loosely connected with the sides of the said screen frame and adapted to be unlocked on the downward movement of the screen frame.

528,067. **Steam-Motor for Cars;** James A. Baryhydt, Lima, O., Assignor to George W. Disman, same place. Filed July 10, 1894. A condensing apparatus is



No. 527,947.

located beneath the firebox of the boiler and comprises a casing having one end open to the atmosphere and its other end communicating with the firebox. There is an inclined body of pipes and headers for conducting exhaust steam alternately in opposite directions and around which the air in the casing circulates and passes to the firebox to supply a superheated natural draft and assist in the condensation of the exhaust steam.

528,101. **Trolley-Wire Switch-Plate;** Gustavus A. Huben, Springfield, O. Filed Feb. 23, 1894. A metallic frame has an enlarged mouth or opening. The trolley wire enters this, and elastic cushions are arranged on each side of said trolley wire.



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**Interference with Street Railway Traffic.**

We publish in this issue a timely article by R. D. Fisher on the laws relating to the interference with the operation of street railways by teamsters and pedestrians, a subject in which much interest has been taken of late, though it is deserving of even greater attention. If rapid transit on surface lines is to mean anything, obstinate teamsters must be compelled to desist from the outrageous practice of blocking cars as they now do in so many cities with perfect impunity. There is law enough to prevent this abuse, were it enforced, even in the absence of any specific legislation on the subject. It may be said, as Mr. Fisher points out, that the companies have the right, by implication at least, to an exclusive right of way and any interference or interruption by indifferent or obstreperous teamsters or others will not be upheld by the law.

**Storage Battery Traction.**

The popular prejudice against trolley wires, the obvious advantage of independent car units, and the expense of maintaining wires overhead all would combine to cause street railway companies to favor the storage battery, if it were deemed a practicable and economical means of street car propulsion. The results of storage battery traction, however, have been such that the street railway men of the country as a class are opposed to the expenditure of another dollar for further experimentation. They have become settled in the conviction that the street car traction is by all odds the kind of work for which storage batteries are especially unsuited. The belief that they may prove of use in central stations is growing, and we expect they will eventually be common adjuncts in railway power stations, but writers like Mr. Pedro G. Salom, who believe in the storage battery for street car propulsion, will find it hard work to make converts. An article from his pen, which appears in this issue, is interesting, and shows that the author has the courage of his convictions, but we fancy that when he predicts that the trolley system is bound to yield to the storage battery few will believe his prophecies.

**Street Railway Unions.**

The question of a union organization among the street railway employees of the City of Philadelphia has been attracting a vast amount of interest and attention in that city during the last week or two. An association of this sort has been formed as was noted in our last issue, but after the organization had been perfected, one of the companies announced that its employees, if they joined it, did so at the risk of discharge from its service. Since that time a discussion in regard to the attitude of the company has been in active progress. Judging from what we have read of the remarks of those who favored the organization, we are inclined to think that the controversy has been carried on in a much more temperate way than might have been expected. At a recent meeting of the advocates of the union, several gentlemen of prominence, whose character is above reproach, made addresses. Altogether apart

from the merits of the controversy, it is interesting to note how some of these gentlemen considered the matter of forming the street railway union. The Rev. William I. Nichols remarked that he thought the organization was calculated to better the condition of the men and said, therefore, "When I saw the companies trying to stop the organization I felt it was tyrannical interference." The Rev. Dr. Joseph May expressed sympathy with the movement and added, "To organize to promote common interest is an essential right of freedom. You are heroic to do it, for you are pitted against a strong and powerful corporation. You risk your bread. I respect you for it. Twelve hours a day is too long for a motorman or conductor to work." Ex-Councilman Thomas Walters said, "I want better service, sober men, educated men, and so I am in favor of an organization." Other speakers addressed the men in the same general strain. There is undoubtedly, much to be said on both sides of the question. If it were known that the union was to be what the speakers in their faith assumed it would be, certainly no fault could be found with it, but who can hope for such a union? If they believed that unions would lead to an improvement in the service through the employment of "better men, sober men and educated men," street railway companies would not only not oppose such associations, but would gladly welcome them. Their experience, however, has not led them to expect such results. When we recall what unions of street railway men have done within the last year or so, we cannot entertain much hope that the Philadelphia organization will promote the interests of the men and of the companies, as most certainly it would do if the views of its advocates are to be believed. Street railway companies, perhaps, it may be said, are sometimes tyrannical, as one of the speakers asserted, but they are never so arbitrary, so unreasonable, so obstinate, so opposed at intervals to the enforcement of the law of the land and to the rights of the individual, as unions have seemed to be on almost every occasion on which they have asserted themselves. The interference of local unions during the last two years has seemed to be almost uniformly unfortunate and disastrous to the membership as well as to the interest of the companies. The strikes that have been declared, with one or two exceptions, have proved unsuccessful, and deservedly so, for they were undertaken without reason. If they have accomplished any particular good we would be glad to mention the fact, but no particular instance occurs to us. It is not surprising, under such circumstances, that at the recent convention of the Union Street Railway men at Milwaukee, a resolution was adopted making it much more difficult for local unions to institute strikes. This action was taken, of course, because of the lamentable lack of wisdom which the local unions had displayed. Inasmuch as it has appeared that these unions, while professing to do so much for their members, actually cause them so much injury, and apparently are looking for opportunities to attack the employing companies, it is not to be wondered at that the Philadelphia company desires to save itself a world of trouble by preventing, if possible, its employees from participation in such organizations.



### PROBABLE ELECTRICAL EQUIPMENT OF THE KINGS COUNTY ELEVATED ROAD.

All companies now projecting elevated railways propose, as far as is known, to install electrical plants for the operation of their lines. Nothing has yet been done, however, toward the equipment of the existing elevated lines, although from time to time rumors have been in circulation that the companies had determined on definite course of action in this respect. The STREET RAILWAY GAZETTE is able to make an announcement herewith in regard to the equipment of one of these roads which may be thoroughly depended upon although it is not official. The Kings County Elevated Railway Company, of Brooklyn, will without a doubt be the first of the existing aerial roads to install an electrical system. The matter has been under advisement for a considerable time, and it is believed that a definite decision has been reached.

In making this decision the directors have, of course, been influenced by a general desire to improve the service on their road, but the real cause that has led to the decision to discard the steam equipment is to be found in the necessity of reducing the operating expenses. It is believed that a material reduction will follow the adoption of an electrical system.

Since the surface electric railways were introduced in Brooklyn the receipts of the elevated roads have materially decreased, as has been noted repeatedly in these columns. The reduction has become extremely serious, so serious in fact that economical measures were found to be imperative or the companies would soon have been obliged to face a condition in which the income would have simply paid operating expenses without provisions for fixed charges. The directors of the Kings County Elevated in their investigation came to the conclusion that the problem would best be solved by the introduction of an electrical system. Just how long before the preliminary work will commence cannot be predicted, but it is likely that by spring signs of activity will be plainly visible.

### RAPID TRANSIT ADOPTED IN NEW YORK CITY.

New York City at the last election voted in favor of rapid transit by an overwhelming majority. Accurate figures have not yet come to hand, but it appears that the proposition for the municipal construction of a rapid transit system was adopted by a vote of four to one. In the upper part of the city, where the residents have been especially clamorous for an improvement in transportation, the vote was even more decidedly in favor of rapid transit.

The law provides that the rapid-transit commissioners, as soon as the necessary formalities have been complied with, must proceed with the work of giving out contracts for the construction of the proposed rapid transit railroad system in accordance with the plans already adopted or amended plans.

The new rapid transit act provides that as soon as the vote has been canvassed by the Board of County Canvassers, the Board of Rapid Transit Commissioners must file with the county clerk a statement of the total number of votes cast in favor of municipal construction of the proposed rapid transit road and the number of votes cast against municipal construction, and the said proposed rapid transit railway or railways shall be constructed by the city at the public expense if it shall appear by the statement filed with the county clerk that there is a majority of the votes cast in favor of municipal construction. In that event it is the duty of the rapid transit commissioners within 30 days after the official declaration of the said vote to proceed to construct the said railway or railways, and to make and let all contracts required for the performance of the work necessary to be done and performed in and about the construction thereof. Under the law, therefore, it would appear that the work of constructing the

proposed rapid transit railroads must be begun before Christmas.

Judge-elect Henry R. Beckman, one of the counsel for the Rapid Transit Commission, said that this clause did not mean that the Commission should begin the actual construction of the road within 30 days. In the first place the Commission would not be obliged to act until an official report of the results of the election was received from the Board of Canvassers.

"Routes and changes in places must be decided upon," said Mr. Beckman, "and consents of property owners must be considered. The contracts, which would be considered part of the construction, must be studied with great care."

This was all contemplated in the clause of the statute relating to the beginning of the construction of the road within 30 days, according to Mr. Beckman. If this view is correct, it may be a long time before the first spikes in the new rapid transit road are driven.

Alexander E. Orr, of the Rapid Transit Commission, made this statement:

"We are now going to have rapid transit, and we will move right along to reach that end. We will hold a meeting of the commission next Tuesday and will then discuss plans and routes again. I do not know what will be the exact order of progress, but the work will be moved along as fast as possible. One of the first subjects to be considered at the meeting on Tuesday will be the report of the chief engineer upon the systems of rapid transit in European and American cities."

### ELECTRIC POWER FROM NIAGARA.

Frank W. Hawley, vice-president of the Cataract General Electric Company, was recently asked what effect the action of the constitutional convention would have upon the Niagara power transmission scheme. He replied that it would have no effect, as there was sufficient water flowing over the Falls to furnish all the electric power that the State of New York could consume.

Speaking of the use of electricity on trunk lines he said:

"You may quote me as saying that at the end of ten years electricity will have superseded steam as a motive power upon the Central-Hudson and West Shore railroads; that storage battery locomotives will have been constructed, which will greatly reduce the cost of transportation of persons and property, and add greatly to the comfort of traveling. The locomotive will stop at the transforming station; the exhausted storage battery will be lifted out by means of an adjustable electric crane, and a charged battery substituted, detaining the train thus but a moment, and not as long as the present detention in procuring coal and water supplies."

Mr. Hawley believes that the building of electric roads will be greatly stimulated by the completion of the plans already adopted by the Niagara Power Company. "Good roads will not be so necessary to public convenience when numerous lines of electric railroads, under the impetus of cheap power, have reached out from the great trunk lines crossing the State into the adjacent districts," said he. "These roads will not only be suitable for the carriage of passengers, but for the movement of produce, and where to-day the farmer is compelled to leave his fields, which need his attention, and drive miles to market his crops, they can then be shipped from his very door at a trifling expense, and quickly reach their destination at a great saving to himself. These lines will increase in number and extent as power is generated in different favorable localities."

### OHIO VESTIBULE LAW AFFIRMED.

The Supreme Court of Ohio has approved the law which makes it compulsory on electric street railway companies to equip their motor cars with storm fronts during winter months. Some of the street railway companies opposed the law on the ground that it was unconstitutional. Most of the companies throughout the State have determined to conform to the law, so that its approval is a matter of no great significance.

THE POPULARITY OF TROLLEY CARS.—People generally enjoy riding in an open electric car through the suburbs in a warm day, and would probably pay more for transportation under these conditions than they would give for greater speed in steam cars.—*Boston Herald*.

### SUIT AGAINST A BROOKLYN COMPANY.

Patrick H. Flynn, one of the stockholders of the Brooklyn City Railroad Company, of Brooklyn, N. Y., has begun a suit against the Brooklyn Heights Railroad Company in which he makes charges against the officials of the latter company. Mr. Flynn declares that there is a surplus of \$700,000, which he is desirous of having divided. He also wishes to prevent any Brooklyn City Railroad real estate from being sold to take up collateral trust notes. It is also alleged that certain officials have acted with intent to defraud the stockholders. The Brooklyn City Railroad Company is leased to the Brooklyn Heights Company, and a suit has been brought to set aside that lease. It is alleged that when the lease was made it was set forth in that instrument that the Brooklyn Railroad Company should (with the exception of the surplus) expend the money on hand, amounting to several millions, in continuing the equipment of the road. It was agreed that \$3,000,000 of the stock and a like amount of bonds should be sold and the proceeds used to complete the furnishing of the road with electric appliances.

Flynn alleges in his complaint that the persons who engineered the deal were in a scheme to get control of the Brooklyn City Railroad Company and to divert part of its earnings into their own pockets. He alleges that they got control of the Brooklyn Heights road, capitalized at \$200,000, and had the Brooklyn City Railroad lease to it. The syndicate then proceeded to equip the road with electricity, and in so doing made contracts at fraudulent and improper prices with corporations in which the members of the syndicate were stockholders and directors. There, it is alleged, they spent all the money of the Brooklyn City Railroad Company and also the surplus, which was \$700,000. The money was so squandered that it was not sufficient to finish the equipment of the road, and they intend to issue trust notes of the Brooklyn Heights for \$3,000,000 and to secure these by pledging the property of the Brooklyn City Railroad and selling that which is no longer necessary. The money thus raised is to be used to take up the trust notes, which were at 80 cents on the dollar. Then the Brooklyn City Railroad will be charged with expenditures far in advance of the actual cost of the construction.

The suit is brought to adjudge the expenditure of the surplus unlawful; to enjoin the pledging or selling of the Brooklyn City road's property, and to adjudge the sums spent so far as contracts excessive.

### DEATH OF FRANCIS J. CALLENAN.

Francis J. Callenan, treasurer of the Union Traction Company of Rutherford, N. J., was instantly killed last Sunday while attempting to board an Erie train at Rutherford. Mr. Callenan was standing on the platform when the train slowed up at the station. He had a large book under his arm which interfered with his free movement, but, according to his custom, he attempted to board one of the rear coaches before it came to a stand-still. The platform was wet, and Mr. Callenan slipped, fell and rolled under the car wheels. Mr. Callenan was known as a promoter of electric railway enterprises in New York State. He was 42 years old and was born in Utica, N. Y. He began railway life in the office of the Midland Line, in Utica, and afterward became secretary and treasurer of the Utica City Railway, which position he held for years.

He built the People's Line of Syracuse, and bought the Oswego Street Railway Line. Afterward he moved to Rutherford and managed his interests from his office in Wall street, New York City. He organized the People's Railway Company of Brooklyn. He was elected on Nov. 2 to the treasurership of the newly organized Union Traction Company, which is to build an electric railway from Newark to Hackensack. To Mr. Callenan's efforts the organization of the company were largely due.



**PHILADELPHIA TRACTION COMPANY.\***

A rather novel feature in the car equipment of the Philadelphia Traction Company is the engineer's test car, which is furnished with testing instruments, and is used to inspect the lines and to make various car tests. This car, which is numbered "999," and whose motors and trucks are identical with the regular 13-foot car, is painted a

placed above the shelf. The tubing shown on the right side is a large U-tube filled with mercury, with which the grades can be determined, and on the left side of the rear door is a column in which a counterweight moves and indicates the height of the trolley wire. Fig. 2 is a diagram of the connections of the instruments on the shelf. *A* is the ammeter; *B*, a switch for short-circuiting the ammeter; *C*, a double-throw

which is also supplied with a full complement of tools and materials for making repairs on the lines, in the conduits or on disabled cars, and also carries screw jacks, ropes, etc., to provide for accidents. Fig. 5 is a view of the tower wagon with the platform raised. The design is very ingenious, and these tower wagons are probably the most complete in every detail that have ever been constructed. They are

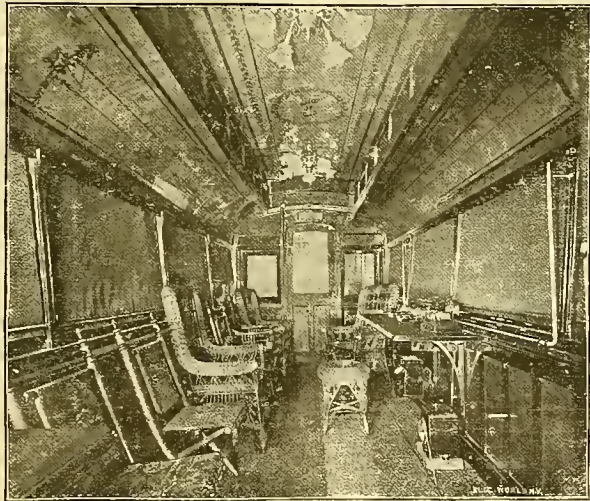


FIG. 1. INTERIOR OF TEST CAR.

dark red color to distinguish it from the other cars on the lines, and has a special folding step, which is opened or closed by the opening or closing of the platform gate. The purpose of this is to prevent

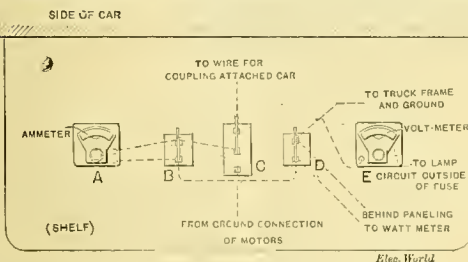


Fig. 2. Arrangement of Circuits in Test Car.

any passengers from attempting to board the car while it is in use.

The interior, shown in Fig. 1, is handsomely finished and provided with easy-chairs. The instruments are arranged on and below a shelf shown on the right hand side. On the shelf is a Weston 600-volt voltmeter and 100-ampere ammeter and

switch for the purpose of connecting the ammeter in the circuit of a car coupled to the test car; *D*, a short-circuit switch for the watt-meter; and *E*, the voltmeter, connected between the trolley wire and ground. The ammeter circuit is arranged on the ground side of the motors; that is, it is put between the ground connection of the motors and the ground, in order that no shock can be obtained by any one touching the instruments. This car has been used considerably by the Board of Directors, and it has become so popular that they have ordered a "Directors' Car," to be built by Pullman

Fig. 3 is a view of the electric street sprinkler which is rather a new feature in electric railway work. It is used on the suburban roads, where so much dust is raised by the cars going at a high speed, and has worked very successfully during the past season. It is equipped with two 30-H. P. motors, and holds 2,700 gallons of water, and can run 15 miles an hour when sprinkling.

Fig. 4 is a view of one of the six tower-wagons used by this company. They were designed by

kept ready at all times for immediate service, and the company is contemplating the installation of a general alarm and call system extending over all of the lines, by means of which the tower wagons can be summoned by the motorman or conductor without the delay of telephoning. The plan is to place call-boxes at short intervals along the road, which will connect with the main station, the signal being sent there first and then transmitted to the station nearest the trouble.

**CONSOLIDATED TRACTION COMPANY'S FRANCHISE INVALID.**

The Supreme Court of New Jersey has declared invalid an ordinance passed by the Board of Public Works in Jersey City last July giving a franchise to the Consolidated Traction Co. Property owners protested against the grant and suits were begun to have the franchise set aside, with the result that the court sustained their view. The decision will have a far-reaching effect. The ordinance embraced 21 sections and 10 routes.

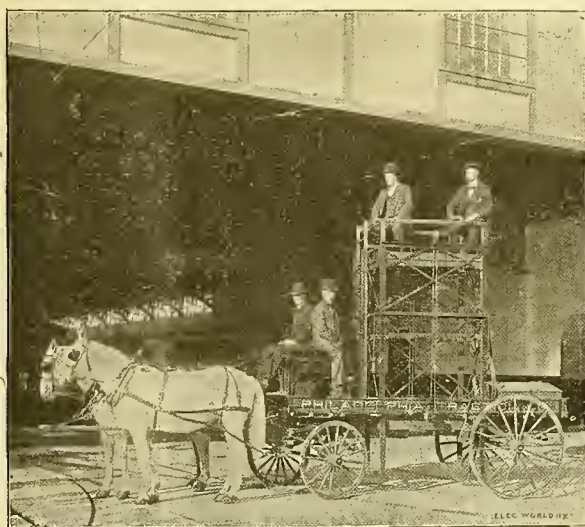


FIG. 4. TOWER WAGON.

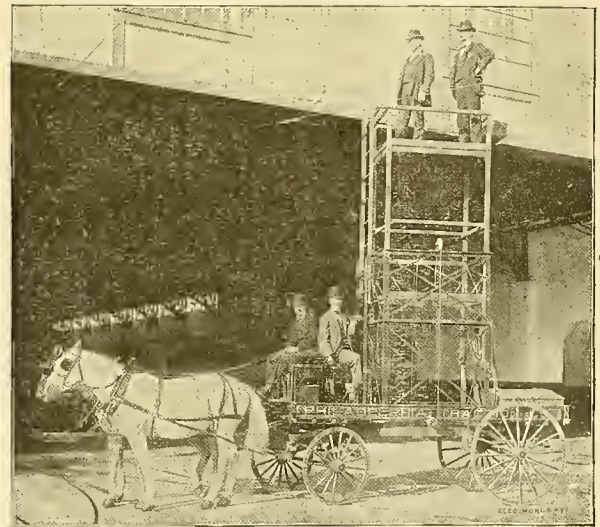


FIG. 5. TOWER WAGON WITH PLATFORM RAISED.

the switches for controlling the circuits. Below the shelf is a Thomson recording wattmeter and a Boyer railway speed recorder, the dial of which is

\* From an article on the "Electric System of the Philadelphia Traction Company," by Hermann S. Hering, *Electrical World*, Nov. 10, 1894.

Mr. J. E. Lloyd, the assistant engineer, and consist of a telescoping framework of iron which can be raised by means of a windlass to suit the height of any trolley or guard wire in the city. It is supported on a wagon with a large wheel base,

In its decision the Supreme Court mentions the *Theberath* case, and gives as a reason for invalidating the ordinance that it did not specify the location of the tracks, but left it to the discretion of the company. Last year the Legislature passed a



law requiring street railway companies to obtain the consent of a majority of property-owners before a track could be laid or the trolley system introduced. This law excepted from its provisions streets where locations had already been granted and the work of construction actually commenced.

**NEW BROOKLYN BRIDGE TERMINAL STATION.**

The accompanying engraving shows a side elevation of the new station of the New York and Brooklyn Bridge, and a floor plan of the tracks. The facilities at the present time are lamentably inadequate. There are but two platforms—one on each side—in the stations in Brooklyn and New York, and during rush hours they are crowded almost to the danger point. That persons are not pushed from the platforms down to the tracks in front of the cable trains seems at times to be almost a matter of good luck.

In the new building on the New York side which is shown in the engraving, there will be four platforms, each 230 ft. long and 20 ft. wide.

The trustees tried to devise a plan of a loop arrangement so that the train could come in, discharge passengers and swing on around ready to take in passengers, but there were laws preventing the corporation from extending the bridge structure sufficiently. The double-platform scheme was, therefore, adopted. What will look like a single track, but will really be a double track sand-

is, but the tide of people will not be shunted to one side as at present. It will flow right along, and the people will climb the stairs up to the level of the train at the rear, middle or front end, according to their preferences. Instead of the narrow wooden staircase which now goes up the side of the Pulitzer Building, there will be a broad iron staircase. There will be another staircase from William street, and at Rose street there will be elevators which will carry the people up 36 feet and leave them a climb of 15 feet. It has not been settled definitely, but the chances are that a small charge will be made for the ride in the elevator. Access from Rose street will give the bridge many more patrons from the Swamp, who now take the Wall street and Fulton ferries.

As they come to New York from Brooklyn, in addition to the present exits through the bridge structure to the Third avenue elevated and across Park Row, another iron bridge will be built across the roadway on the uptown side.

The ticket offices will be on the broad main floor with plenty of room between them and the ticket-choppers' boxes.

**TROLLEY MAIL SERVICE IN PITTSBURG.**

The postoffice authorities of Pittsburg and Allegheny have determined to avail themselves to a greater extent of the local street railway systems for the distribution of the mails. A recent conference was held at which there were present: Postmaster John C. O'Donnell, of Pittsburg, and J. M. Masten,

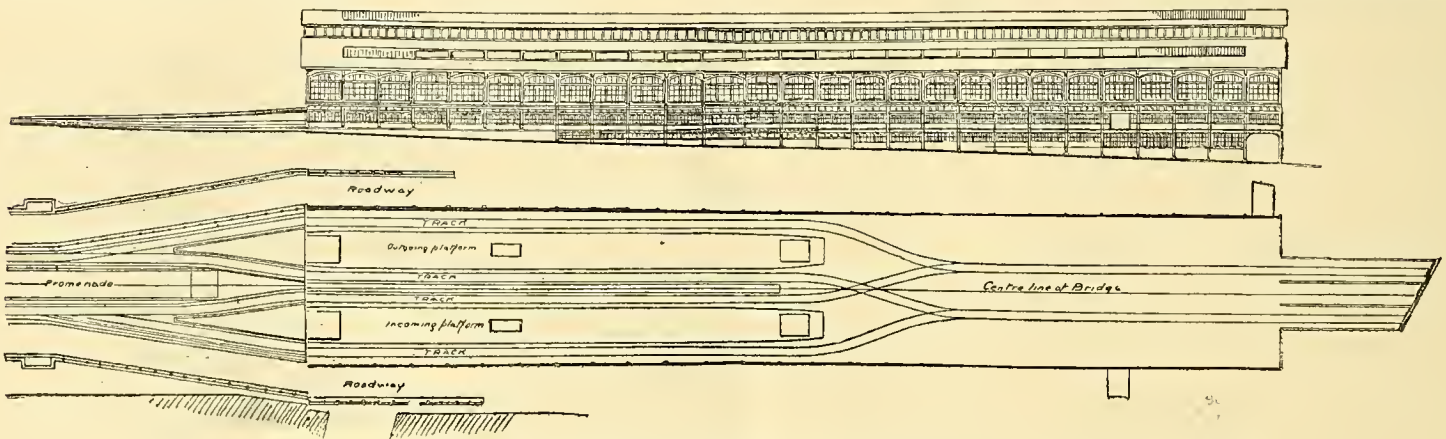
**STORAGE BATTERY TRACTION.\***

BY PEDRO G. SALOM.

The use of storage batteries for electric traction, and more particularly for operating street cars, has been so thoroughly discussed and so universally condemned by electrical engineers and practical business men engaged in the operation of street car lines, that it requires some courage, in the face of such a widespread belief, to urge that these gentlemen can all be mistaken, and yet a careful study of the problem, extending over a period of eight years, compels the author not only to dissent from their views, but to assert that in his opinion storage battery traction in the streets of our great cities will be well nigh universal. All the wires and poles must come down, and the costly investment in underground feeders and mains be dispensed with. We are led to these conclusions by the following considerations:

Assuming, for the sake of argument, that electric storage traction is practicable, what are the problems that confront the engineer? The first and most important is the life of the battery. Then come the capacity, the rate of discharge, the weight and size of the elements, the loss of power in the various transmissions between the prime mover and the axle; the distance or total length of line, the grade and curve, and the speed.

In traction work there is only one reliable method of determining the life of the battery, and that is on the basis of car mileage. It is nonsense to talk about batteries lasting eight months or 18 months, unless there is a record, at the same time, of the amount of work accomplished, measured in electrical horse power hours. The highest record yet obtained, of which the writer has any reliable knowledge, is that of a single set of 108 accumulators making over 6,000 miles. This record was made under the most trying and unfavorable circumstances. Assuming that the bat-



SIDE ELEVATION OF THE NEW YORK & BROOKLYN BRIDGE STATION AND FLOOR PLAN OF THE TRACKS.

wiched, will be run across the bridge. There will be two cables running. One will pull one train over to New York, and 45 seconds later the other cable will pull another train on a track three inches nearer to Governor's Island. The reason two cables are used is to avoid switching into the two tracks at the New York end. The first train goes to the outside incoming track, and 45 seconds later the second train arrives at the inside incoming platform and the passengers get off. The train will be switched by an engine, as at present, and the outside incoming train becomes the inside outgoing train, and vice versa. One of these days the switching will all be done by the cable, but the grip on the bridge cars is not capable of dropping one rope and picking up another.

At present the trains run on 90 seconds headway. When the new terminus is completed they will run on about 45 seconds' headway, which will give two trains for one. That ought to accommodate the present travel for a while. But the great advantage will be in the increased ease of access. As it is now, there are only narrow little alleys through which the great throng going home to dinner in Brooklyn creeps and struggles.

The trains are switched on the level so near that of the passage along which the people walk, that the track takes up nearly all the floor space. Then the tracks will be raised nine feet above their present level and the incoming multitude will have a platform 87 feet wide, while the trains will be overhead and out of the way.

The bridge across Park Row will stay just as it

assistant superintendent of Railway Mail Service; John G. Holmes, president of the Citizens' Traction Company, and George B. Hill, representing the Pittsburg, Allegheny & Manchester Traction Company and the Allegheny Traction Company.

Mr. Holmes offered to give the same facilities for the transportation of the mail to the Lawrenceville station as were given by the Duquesne Traction Company to the East End station. He also said his company would carry the mail to the East End in case of a tie-up, from any cause, of the Pittsburg and the Duquesne lines. Mr. Holmes further suggested that mailboxes be put in the cars of his line. Letters could be deposited in them at all points along the line, or handed to conductors, and thus secure a speedy delivery to the central post-office. For the first year no recompense would be asked for this. If the system is a success after that then a small remuneration would be asked. He agreed to carry special delivery boys free on the Citizens' line.

George B. Hill extended in behalf of his company the same advantages for the Allegheny suburban mail service as have been given in Pittsburg. All other companies will do likewise, it is said.

**GOOD SERVICE PAYS.**—The patronage of a street car line depends largely on the manner in which the road is operated. Where the citizen has a choice of two or more lines within a few blocks he will ordinarily take the one with the best service. Many prefer walking to riding on a line with a poor equipment or a poor service.—*St. Louis Republic.*

tery could make 100 miles per day, this would mean that the positive plates of the battery would have to be renewed every two months; if 50 miles per day, then the life would cover a period of four months; at 25 miles per day, eight months, and so on. It can thus be readily understood that the bare statement that a battery would last six or eight months does not convey a correct idea of the real life of the battery.

Let us see what it would cost to run 6,000 miles with a single set of accumulators, or, since two sets are always employed, one being charged while the other is in service, we will make a calculation on a basis of 12,000 miles.

216 positive groups at \$2.50.....	\$540.00
Credit 2,592 pounds lead scrap at 3 cents.....	77.76

Balance.....	\$162.24
\$162.24 ÷ 12,000 = 3.85 cents per car-mile.	

If positive groups were renewed at \$1.25 per group, instead of \$2.50 each, which it would be perfectly possible to do, leaving out the question of patents and royalties, then the cost per car-mile would only be 1.6 cents.

What amount of work is represented by these 6,000 miles, so far as the accumulators are concerned? It was found by keeping the most careful record on the Fourth Avenue line at New York, that the amount of energy consumed per car-mile was about one and one-half electrical horse-power hours. That is to say, that after making a round trip of 11½ miles, it required about 17 electrical horse-power hours to replace the energy drawn from the batteries. Six thousand miles would, therefore, require 9,000 electrical horse-power hours, and since a battery of 108 cells has a capacity of 54 electrical horse-power hours for each total discharge, if we divide 9,000 by 54 we get 166 total discharges that are required of the battery, before the positive plates break down.

\* Abstract of an article in *Cassier's Magazine* for November.



Any one who has had any extensive experience with storage batteries knows that this is a very conservative estimate of the amount of work that a good battery will perform.

It may be asked, have there been no improvements in late years with a view of diminishing the number and weight of batteries required to

cents more per car-mile than the trolley, and the demand for its introduction will be irresistible.

The public are not interested in the cheapest and most objectionable method of transit, especially where they derive no benefit from the economies effected, but they are interested in and entitled to a safe, reliable and absolutely unobjectionable

Sterling fare registers are made. To produce registers which shall be delicate enough in mechanism so that their accuracy can be depended upon, and yet be sufficiently strong enough to resist all the abuse to which they are bound to be subjected in service, requires a first-class machine equipment. In this department all the facilities that can be advantageously employed in the manufacture of this important part of a car equipment are provided.

The fender department, Fig. 2, is located on the same floor, and provision is made for turning out life-saving devices on a large scale. Within the last few months the company has been awarded several large contracts for fenders, and this department has been kept unusually busy. Large equipments of Sterling fenders have recently been constructed for the Broadway and Third Avenue cable roads in New York City. On the same floor located the offices, storerooms, stockrooms and assembling-rooms.

In the rear of the fender department is located a large room which is devoted to the manufacture of car trimmings, a new feature of the business that has already proved successful.

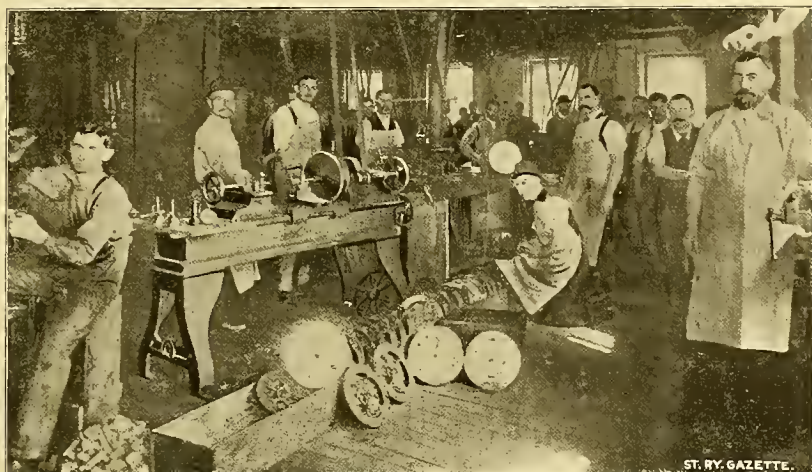


FIG. 1.—REGISTER DEPARTMENT OF THE STERLING COMPANY.

propel a car? We regret to have to answer no, and this brings us to the consideration of the limitations of storage batteries. We have said that it requires about 1½ E. H. P. hours per car-mile, and that 108 accumulators are used and necessary for a 12-mile run, and they have a capacity of 54 E. H. P.-hours, or three round trips.

Why is it not possible to use a battery with one-third the weight? Simply because the weight of battery required is not according to the total amount of work to be done, but according to the rate at which it is to be done. Let us go back to our 12-mile run again. This requires 1½ E. H. P.-hours per car-mile, or 1,119 watt-hours, and since the electromotive force is about 225 volts, this would be equivalent to nearly 5 ampere-hours per mile, or 60 ampere-hours for the round trip, and since the trip consumes two hours' time, this is an average rate of discharge of 30 amperes all the time.

Of course, it is very much greater than this at times, when the car starts, or is going up steep grades, when the battery is frequently called upon for a rate of discharge of over 100 amperes. Now, if we were to use a small battery of less total capacity there would not be sufficient area of active material exposed to develop such a current, the electromotive force would drop and the car stop running. This is the trouble with all thick plate batteries in traction work. The amount of surface area exposed is comparatively small for the weight of battery.

It seems to the writer, in view of the facts just stated, and which are indisputable, that the introduction of storage traction for surface roads in large cities is inevitable. The trolley may be introduced at the present time, pending the solution of the difficulties under which storage batteries have come into disrepute, but that it can obtain in the long run, against the many and obvious advantages of the storage system is unlikely. Let

method of transit, which is cheaper than horses at the present time, and which may, in a few years, from the further knowledge and experience gained by actual use, almost, if not quite, compete in cost with the trolley.

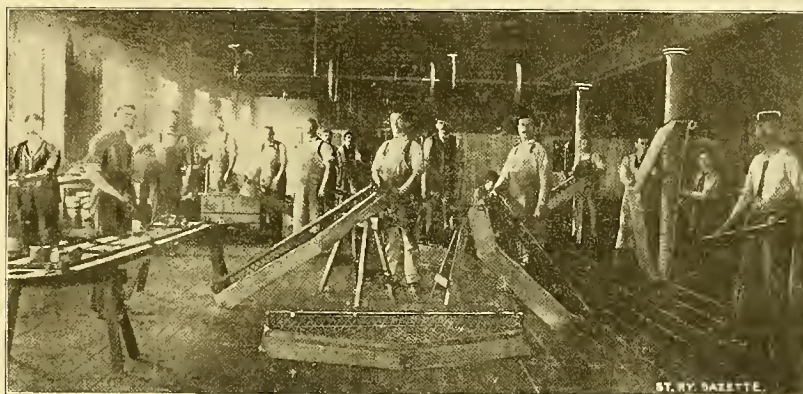


FIG. 2.—WHERE THE STERLING FENDERS ARE MADE.

**FACTORY OF THE STERLING SUPPLY AND MANUFACTURING COMPANY.**

The illustrations which are presented herewith are reproductions of photographs taken in the factory of the Sterling Supply and Manufacturing Company, of New York City. The building in which the company's manufactory is located is situated at the corner of Bank and Hudson streets.

travel and transportation of material and merchandise. A street is impressed by law with the right of the public authorities and those whom the power may be delegated to use it for all such excavations and structures on, above and below the natural surface of the soil, as may be necessary or proper for any legitimate public purposes which not materially impair its primary use or efficiency. It is the use made of the street which denotes its character. It includes its whole surface and so much of the depth as is or can be used not unfairly for the ordinary purposes of the street.

*Rights of the Public in the Street.*—The legal rights of the public in the streets are of two-fold character: *First*, those directly represented by governmental agencies invested with the power to control them and regulate the public easement therein to any modified, new or improved use calculated to further the objects of the acquisition; and, *second*, the rights possessed by individual members of the general public and of common carriers to free and unobstructed passage. These rights, and the abuse of them, whereby traffic is greatly interfered with, will form the basis of this article.

The primary and dominant purpose and use for which the streets are dedicated and established being for travel and transportation, the query arises as to whether any superior right of way exists. In the earlier cases, a wide divergence of opinion was expressed concerning the relative rights of cars and private vehicles to the use of that portion of the streets occupied by the tracks,



FIG. 3.—OFFICE OF THE STERLING COMPANY.

the public once understand that there are no insurmountable difficulties connected with the storage system, beyond the fact that it costs a few

The company requires two large lofts for manufacturing purposes.

Fig. 1 illustrates the department in which the



some of the courts holding that their rights were equal, and that drivers of ordinary vehicles might with impunity, through mere caprice or for convenience, drive across, upon and along the tracks at any rate of speed they chose, while in others it was decided that the right of way of the street car was practically exclusive, and that any use of the tracks, when not actually necessary for the purpose of crossing, was a trespass, and in case of a collision was such negligence on the part of the private driver as would absolve the street car company from all liability for the consequences of a resulting accident, unless attributable to malice or sheer recklessness. But it is believed that neither of these positions is correct, for they both ignore an essential element of the then new and the now difficult problem of correctly defining and wisely regulating such a joint use of the streets that the relative rights of persons lawfully traveling or hauling at the same time and upon the same street in vehicles and drays, driven at different rates of speed, one class being confined to fixed tracks, the other having the freedom of the street, easily stopped and readily turned to the right or left to avoid obstacles, prevent collisions and to avoid delay and inconvenience to travelers in the cars. The experience of the age has resulted in establishing the rule, now well high universally recognized by courts, that the street car has, and from the necessities of the case must have, an uninterrupted right of way upon that portion of the street upon which alone it can travel paramount to that of ordinary vehicles, and while that superior right does not prevent others from driving across or along its tracks, but by so doing they must not interfere or delay the progress of the cars. While this better right is not an exclusive right, it can and ought to be enforced against all who needlessly and wantonly impose vehicles whether moving or standing to the free and unrestricted exercise of rapid transit upon and along the right of way.

Other travelers or users of the street must yield the right of way. This is not only recognized as a common law duty, but supplemented in many States by statute, while many cities regulate the same by ordinances, which require the drivers of private vehicles to immediately leave the track upon the approach of a car, and impose a penalty for failure to do so. The driver of a heavy loaded wagon must leave the track when so warned by the ringing of the gong, where it is possible to do so, or without any warning or request when it is apparent that his stubborn indifference and failure to do so would impede the progress of the car and delay passengers. The same rule applies to pedestrians. The mere convenience of a teamster whose wagon trespasses while unloading cannot amount to such a necessity as to justify his obstructing or delaying the cars. A proper enforcement of these rights will defeat a recovery by any person, who has, in disregard of the rights of a street railway company placed himself in a position of danger by reason of his heedless indifference, even if the injury was caused in part by the failure of the motorman to exercise ordinary care. This superior right of a company against private vehicles ought not and does not justify the servants thereof to assert it recklessly.

The marvelous increase of street railways in the cities of the land within the last few years, while it has added greatly to the convenience of the public, has also added elements of danger. As we have observed, their cars have the right of way and it is the duty of the citizens, whether on foot or in vehicle, to give unobstructed passage to the cars. This results from two reasons: First, by reason that the car cannot turn out or leave its track, and secondly, for the convenience and accommodation of the public. Patrons of street cars are often in haste and a slight interference occasions an anxiety altogether unpleasant. Some may be en route to a station with a view of taking passage on a train, while others are of necessity required to meet their destination within a given time. Hence the convenience of an individual,

who seeks to cross, or indifferently drives along and upon the track, must give way to the convenience of the public. It would be an unreasonable inference of the law to hold that a carload of passengers should be delayed by the unnecessary obstruction of the tracks by either a moving or standing vehicle.

The law implies that a car is not to be stopped at every minute to let a footman pass, or a vehicle cross or leisurely turn out. The latter are required to sacrifice a second, when necessary, to let a car pass uninterrupted. The only duty incumbent upon the company and their motormen is that they be on the alert at all times and places to see that citizens are not run down and injured. But even then the motorman is authorized to presume that no rational being will remain on the track where the car is rapidly advancing, and he who crosses the track when the car is at a distance within which it cannot be checked takes upon himself the risk of any accident which may be the consequence of his act. And where an indifferent teamster permits a vehicle to stand so near the track that it is struck by a passing car, both he and the car driver supposing that the car could pass without interruption, if an accident ensue, the indifferent teamster cannot recover, for the error of judgment is mutual—both are guilty of contributory negligence.

A cart or carriage about to meet a railway car must yield the whole track, and there is no obligation incumbent upon him turn to the right any more than to the left. If the right is obstructed he must turn to the left to avoid collision or interference with traffic. Where a driver is guilty of imprudence or carelessness in getting into such a position he cannot recover for injury unless it be proven that the car driver was wantonly careless or the brakes were out of order. An individual who sees fit to drive upon the rails is bound to exercise more care than he would in driving upon the common pavement, not only to avoid collision but to prevent interference with the usual speed of a car. A street railway company is entitled to the unrestricted use of its rails for the progress of its cars within that limit of speed which the law allows them; and that, as between them and the driver of any other vehicle who may be upon their track in front of one of the cars, the latter being unnecessarily there, must exercise great care to see that the approaching car is not impeded, and if, through negligence or willfulness on his part in this respect, he suffers injury, no damages are allowable, even if the car-driver is also in fault.

In order to secure the greatest degree of safety and freedom from interruption to travelers upon street cars it is necessary that certain rules should be observed by all who use such ways. In some of the States there are statutes prescribing the law of the road, but they are simply the legislative enactments of what had already become a universal and established custom of the country. In the preparation of this article we have omitted to cite authorities notwithstanding they are in abundance to support the rules and customs set forth herein.

#### QUESTIONS AND ANSWERS.

##### PULL OF A MAGNET.

(1) How does the pull of a magnet upon its armature vary with the distance? Is it not inversely as the square of the distance? (2) Why does the sudden jerking off of the armature weaken a permanent magnet?

##### ANSWER.

(1) No, it is not inversely as the square of the distance. It would be so if our magnetic pole were a mathematical point or its equivalent, and if at the same time the lines of force radiated from that point in straight lines, but as a matter of fact neither of these conditions is even approximately true. The old textbooks on magnetism about, if not quite, universally stated that magnetic attraction followed the law of inverse squares, and some of the newer ones also do; but it is entirely wrong. Prof. Silvanus Thompson in his "Lectures on the Electromagnet" says on this subject; "Now, in

the case of an electromagnet pulling at its armature at a distance, it is utterly impossible to state the law in that misleading way. The pull of the electromagnet on its armature is not proportional to the distance, nor to the square of the distance, nor to the cube, nor to the fourth power, nor to the square root, nor to the three-halft root, nor to any other power of the distance whatever, direct or inverse, because you find, as a matter of fact, that, as the distance alters, something else alters too."

(2) The idea that the sudden jerking off of the armature from a permanent magnet causes it to lose its strength is another fallacy which has no foundation in fact. Professor Thompson finds as the result of a series of carefully conducted experiments that the strength of a permanent magnet is actually increased by this sudden removal of the armature. Its strength is apt to be lessened, however, by snapping the armature on, the action of the snapping being to shake the magnetism out of the steel. In his book on "Street Railway Motors, Their Construction, Operation and Maintenance," Mr. Perry describes how magnetism may be shaken into a bar, how the direction of magnetization may be reversed by similar shaking, and how it can be entirely shaken out of a bar, in a manner that well illustrates how a magnet may be thus injured.

##### DECREASING TENDENCY TO SPARK.

Is there no practical way of winding an electromagnet so as to lessen the tendency to spark upon breaking of the circuit?

A. J., Milwaukee, Wis.

##### ANSWER.

We have already referred in these columns to the use of the copper spool or the interposition of tinfoil between the coils as a preventive of sparking. Another method which comes more strictly within your question as to how to wind an electromagnet to give the least spark is to make up your coil of a number of separate coils, in parallel with each other, taking care that no two of these coils are of the same length. In this case the *time constants* of the various coils will differ and the result will be that the extra current, instead of running out all at the same time, as would be the case were there but one coil, will run out of each coil at a different time; the total force of self-induction will not rise so high in any of the multiple coils, and will therefore be less able to jump the same air-gap. When it is practical to carry this method of multiple-winding far enough, sparking may be almost entirely prevented where otherwise it would be highly developed.

##### IMPROVEMENT OF THE MANHATTAN ELEVATED.

Russell Sage is quoted as affirming the report that plans had been drawn for a double-decked structure for the Manhattan Elevated Railway of New York, and for the operation of the road by electricity. He said:

"I have been thinking about a double-decked structure for two years. It has been examined by engineers of this country and Europe, and has been pronounced feasible. Mr. Westinghouse says that electricity could be substituted as a motive force without difficulty.

"The upper structure could be constructed of light steel and used for express trains. The uprights could be placed by the side of those now in use, and would not disfigure the streets. The frame work could be very light, much lighter than the present structure, because by the substitution of electricity there would be no necessity to use heavy locomotives."

Mr. Sage appeared to be much pleased with the scheme, and said that express trains could be run at 40 miles an hour by electricity. He was asked if the law would permit the construction of an additional structure, to which he replied that the courts would take care of that.

"I would much rather," he said, "have nothing written about the matter now, for it will be regarded as a campaign measure. The elevated road is a wonderful system of transit. It is not inadequate. Why, we are running empty cars all day long.







desire to declare was earned. Our auditor claims that a report of that kind should be made up from the books, so that the books should be compelled to verify everything in the report. Shall we put in the August account the expense for removal of snow and ice? It looks odd, but that is what we are doing. I regret the committee is not present so that we might be able to have an explanation. It seems to me it is just as the committee stated, that there is too much here. Take that one item of roadway and railway—what enters into roadbed? Ties, rails, spikes, joint plates, paving, sand, stone, labor. They ought to come under one head, and that is what is required by the railroad commissioners of New York. They do not object to our dividing it as much as we want in our books, but in the report submitted to them it must all come under one head.

Mr. DYER, of Augusta: I do not suppose it would be possible to get a form to fit every case. I imagine that a small road, if you carried out that plan entirely, would find it expensive, because they would be compelled to have a storekeeper, who would charge up these different things we use each day. I think it is the custom, as a rule, with small roads, to charge up their bills each month as they come in, as if they had been used. It is not correct, but the expenditure for the man to take charge of the store room and keep accounts of the material used, would be in some cases almost as much as the cost of the material.

Mr. McNAMARA: That is what we find it necessary to do. We have not a large road, but we have a storekeeper, and he charges the several accounts with the material as it is used. There is no other way to determine what you have used in any particular month in the year, as the writer of the paper suggests. We do not pay our storekeeper such a large amount, but we find he does good work for us, and it pays.

Mr. PAYNE: Undoubtedly all of the larger roads do pursue the course recommended by the committee, but the suggestion in regard to the cost of removing snow is rather new. It never occurred to me to charge up by the month during the year the cost of removing snow during the winter months. It is uncertain what the cost will be. This year you may have very little or no snow or ice, and if you undertake to make the charges next year on what you have expended in 1893, you might fall short or over, and our company has never adopted that method, although I can see if there is any uniformity in the account expended, it would be the proper thing to do.

Mr. McNAMARA: I may say that the repairs to roadway and railway are reported in the winter months when we make no repairs. The question is, which is the best way to get at the proper amount. We find, taking the average of three winters—we do not include the "blizzard"—they do not vary very much in the amount of expense involved. The important question is, how shall roads determine questions of this kind? Perhaps every road is to determine it for itself.

#### NEW ENGLAND NOTES.

(From Our Boston Correspondent.)

It is reported that some of the General Electric Company's employes will be removed from Schenectady back to Lynn before long, where it is proposed to remove the manufacture of the big railway generators, and other special apparatus; of course, this news is welcomed in Lynn, though very few persons place any credence in the report, so conflicting and unreliable have been the reports of late.

During the howling wind, rain and snow storm which prevailed throughout New England Monday night the trolley lines suffered least of any of the electrical interests. Fearful havoc, however, was wrought among the telephone, electric light and telegraph wires. Boston was very nearly cut off from the outside world for a time, thousands of poles and hundreds of miles of wire being blown down. Not since the famous blizzard of March 12, 1888, has there been such a storm.

So brisk has been the demand for the use of the two elegant parlor cars for private parties since the West End Railroad introduced them a few weeks ago, that there is a possibility of others being built ere long.

For several days and up to late last Friday night, what looked as if it might be a bitter and protracted strike between the West End Railroad and its employes was in the air in Boston, and the traveling public got nervous lest they should have to walk to the city Saturday morning and for some following days. There were rumors around that the Union would order the entire system to be tied up, but better counsels prevailed at the eleventh hour. The men have felt for some time past that the directors were not living up to an agreement signed some time ago. This, coupled with many minor grievances, including the "laying off" of an old hand by a subordinate official for a trivial offense, had raised the men's ire and they were de-

termined to resist. They appealed to the directors, and the latter listened in a very conciliatory mood and promptly modified some demands, while holding tightly onto others. The wiser of the men appreciated the action of the directors and counseled moderation, the result being that the differences were adjusted.

#### CANADIAN NOTES.

(From Our Ottawa Correspondent.)

Ottawa, Ont.—Judgment was given in the Exchequer Court here this week in a case of considerable interest to street railway companies throughout Canada. The Toronto Street Railway Company, during 1891, 1892 and 1893, imported a quantity of steel rails for the transformation of their system, weighing 69 pounds per lineal yard. Under the customs act of 1887 steel rails for use on railways were free, but the customs authorities charged a duty of 10 per cent., or \$56,000, on these, while the railway claims that they should have come in free and brought action for \$56,000. Judge Burbridge this morning gave judgment in favor of the respondents and upholding the decision of the customs department with costs. He reasoned that it was a difficult thing to administer a rational policy where what was one man's manufactured product was often another man's raw material. He held that during 1887 the legislature was endeavoring to encourage railway building, there being no less than 31 railways in the act of that year, but that this interest clashed with their endeavor to promote in Canada the manufacture of iron and steel. Canadian manufacturers were, however, unable to make heavier than a 15-pound rail, so that the act was made to read "steel rails for railways not less than 25 pounds per lineal yard free." He referred to the proceedings of Parliament and held that it was the intention to promote railway building, so the heavy rails were made free. But street railways, of course, opened up no country and in their case the legislature intended to protect Canadian makers of iron and steel rails by charging the duty of 10 per cent. The case will probably be appealed to the Supreme Court and from there to the Privy Council.

Aylmer, Que.—Next Monday the Aylmer Town Council will deal with the proposed electric railway from Hull to that place. The promoters of the scheme are sanguine of the success they will meet with at the hands of the Aylmer Council.

London, Ont.—All the street cars in the city have been fitted with automatic registers which count the actual number of passengers carried by each car during the day.

Montreal, Que.—John P. Mullarkey, the new General Manager of the Montreal Island Belt Railway, takes charge of his position Nov. 2.

#### FINANCIAL DEPARTMENT.

Financial Notes.

Sale of the Lincoln (Ill.) Electric Railway.—The electric street railway of Lincoln, Ill., has been sold to W. H. Patterson, of Bloomington, for \$75,000.

Chicago, Ill.—Jenney Electric Conduit Company has been incorporated: capital stock, \$5,000,000. Promoters, L. A. Farnsworth, Jos. M. Hill, Chas. S. Marsball.

East St. Louis, Ill.—The St. Louis & Illinois Construction Company has been incorporated with a capital stock of \$20,000. The promoters are Wm. Berry, Jno. Dean, Wm. H. Clancy.

Doylestown, Pa.—Delaware & Schuylkill Traction Company has been incorporated: capital stock, \$50,000. Promoters, Wm. Jenks Fell, Faulkland, Del.; Robt. C. Fulton, Samuel A. Hamilton, Philadelphia, Pa.

New Issue of Stock.—It is stated that the directors of the North Chicago Street Railway Company are considering the advisability of increasing the capital stock. It is reported that \$1,000,000 of new stock will be issued.

Rutherford, N. J.—The Union Traction Company has been incorporated. The capital stock is \$1,500,000. The promoters are Geo. S. Forbush, Brookline, Mass.; Francis J. Callanet, Edwin T. Gallows, Rutherford, N. J.

Baltimore Traction Earnings.—The Baltimore Traction Company earned during the month of October \$89,989. This is over \$6,000 in excess of the sum earned during October, 1893. The net increase during the month was \$12,490.

Lake Street "L" Litigation.—Underwood & Green, the builders of the Lake Street Elevated Railroad of Chicago, have begun a suit against John A. Roche, president of the company, for an accounting in a \$35,000 loan transaction.

Pennsylvania Steel Company.—The business of the Pennsylvania Steel Company, both at Steelton and Sparrow's point, is said to be very large and steadily increasing, and those interested in the

property declare its future assures a sharp advance in prices of its securities.

Philadelphia Traction Dividend.—The directors of the Philadelphia Traction Company have declared a semi-annual dividend of \$2 per share, payable Dec. 1. This rate is the same as that declared six months ago, but is 50 cents per share greater than that declared in November of last year.

Philadelphia Traction Earnings.—It is announced that the Philadelphia Traction Company's earnings for the month of October were \$78,813 in excess of those of the corresponding month of 1893. This almost \$4,000 more than the estimate made by President Widener early in October. The average increase in earnings during the last four months has been over \$60,000.

North & West Chicago Electrical Apparatus.—It is announced that the contract for furnishing generators and motors to the North and West Chicago Street Railroad Companies has been awarded to the General Electric Co. The contract at the start calls for the delivery on or before March 1, 1895, of 600 motors and 3,600 H. P. generators, at which time the power-house which will supply the several lines will be completed.

Eighth Avenue Road Report, New York.—The report of the Eighth Avenue Railroad of New York City for the quarter, just filed with the State Railroad Commission, shows: Gross earnings from operations, \$204,511; operating expenses, \$145,652; net earnings, \$58,858; other incomes, \$6,907; gross income, \$65,766; fixed charges, \$23,750; net income, \$42,016; cash on hand, \$26,131; profit and loss, surplus, \$29,000.

Detroit, Mich.—The Rae Electric Manufacturing Company, Limited, has been organized. The object of the corporation is the manufacture of various electrical working devices, dynamos, motors, etc. The stockholders are Frank B. Rae, F. H. Date, John Heffron and B. H. Scranton. F. B. Rae is chairman of the corporation, with F. H. Date as secretary and B. H. Scranton as treasurer.

West Chicago Dividend.—The directors of the West Chicago Street Railroad Company have just declared the regular dividend of 2½ per cent., payable Nov. 6. There have been a great many predictions that the dividend rate would not be maintained, as it has been asserted that the dividend has not been earned. The action of the directors, however, has disproved these reports. Mr. Yerkes alleges that there is no probability that the dividend will be decreased. The earnings of the company are steadily improving.

Report of the Worcester & Milbury Railway.—The annual report of the Worcester & Milbury Street Railway Company, of Worcester gives the following figures: Receipts of the year, \$40,860.47; operating expenses, \$25,777.06; salaries, office and fixed charges, \$8,075.53, leaving the net gain for the year of \$7,007.88. There were paid in dividends during the year \$6,361; 876,817 passengers were carried and the cars ran 204,945 miles. During the previous year the total income of the company was \$46,175.28, the total operating expenses \$34,078.23. Dividends were paid amounting to \$4,500; the cars were run 169,511 miles and 953,390 passengers were carried.

To Sell Real Estate.—The South Side Rapid Transit Company of Chicago, or, as it more commonly called, the Alley "L," has decided to sell all or most of the real estate which it has acquired and which it does not need for any purpose. This property was secured when the company obtained its right of way. At this time the company found it in some cases more economical to buy large plots of land than simply to secure the narrow strip that was needed for its right of way, with the purpose of disposing of that part not needed at some future time. The money realized from the sale of the real estate will be sufficient to pay the interest on its bonds.

Feeder and Main Case.—In the United States Circuit Court for the District of New Jersey, at Trenton, Oct. 26, Judge Edward T. Green, in pursuance of the decree of the Circuit Court of Appeals, against the complainant, and on motion of Kerr & Curtis, solicitors for the defendant, Westinghouse, Church, Kerr & Co., ordered that defendant have judgment against the complainant, the Edison Electric Light Company, for the sum of \$42.65, amount of costs taxed in the United States Circuit Court of Appeals, and have execution therefor; also that defendant have judgment against the complainant, the Edison Electric Light Company, for the further sum of \$6,411.57, amount of costs taxed in the Circuit Court, and have execution therefor.

Report of the Worcester, Leicester & Spencer Road.—The annual report of the Worcester, Leicester & Spencer Street Railway Company contains the following figures: Receipts of the year, \$77,063.30; operating expenses, \$50,847.25; the salaries, office expenses and fixed charges, \$14,286.14, leaving a gain for the year of \$12,728.96. The company has paid in dividends during the year \$18,750, has carried 1,586,843



passengers and has run the cars 296,490 miles. From the last year's report of the company it is learned that the total income for 1892-93 was \$95,298.79 and the total operating expenses \$74,335.53. There was \$11,250 paid in dividends, 1,695,218 passengers were carried and the cars were run 351,851 miles.

**Metropolitan Traction Statement.**—In answer to inquiries the Metropolitan Traction Company, of New York, has issued a short statement of its assets. The capital stock Oct. 1 was \$27,301,650, against which were cash and accounts of \$3,362,632.16 and investments of \$23,939,017.84, a total of \$27,301,650. The Metropolitan Street Railroad is earning 5 per cent. upon these investments. The traction company owns \$3,000,000 Columbus avenue first mortgage bonds, \$3,000,000 capital stock, \$5,000,000 Lexington avenue first mortgage bonds and \$5,000,000 capital stock. When these lines are completed the company will own 143 miles of surface railroad. No income account for the past year is given, though the 129 miles in operation show an increase in earnings for September over September last year of \$50,000.

**Knapp Electrical Works' Receivership.**—Receiver Lucas, of the Knapp Electrical Works, Chicago, appeared in court last week and asked for a general order to sell the tools and machinery of the Knapp Electrical Works. The creditors' association opposed the issuing of the order unless it were conditioned so that three-quarters of the inventory price should be realized. The receiver represented that much of the shop material was considerably worn and that it would be impossible to secure 75 per cent. of the scheduled value for it. The judge finally entered an order authorizing the sale, provided the receiver realized an average price of 50 per cent. of the inventory value. Mr. Lucas had obtained a previous court order allowing him to sell the stock and merchandise at not less than 75 per cent. of the estimates in the inventory.

**Stock Jobbing Alleged.**—D. F. Lewis, president of the Brooklyn Heights Railroad Company, has been quoted as follows regarding the demand made by H. M. Thompson, the former secretary, for an investigation of that company's affairs on the ground of alleged irregularities: "I had heard some time ago that Mr. Thompson had been approached by parties who would be most likely to approach him, but I understood later that he had dropped this matter. Evidently he has not done so. I have not yet seen a copy of the complaint, and I don't know that I would discuss it if I had. I look upon it as a stock jobbing scheme, or worse. I think that the Railroad Commission will consider this matter in a dignified way. I believe our report is correct, and I believe it can be justified to a cent. It has not been questioned by the Railroad Commission, and ordinarily, if it had the appearance of incorrectness, it would have been questioned, in my opinion."

**Worcester Consolidated Railway Report.**—The gross earnings of the Consolidated Street Railway Company of Worcester, Mass., during the year which ended Sept. 30, 1894, were \$348,895.86, against \$337,657.32 the previous year. The operating expenses were \$284,214.92, leaving a net income from operation of \$64,680.94. The income from other sources has been \$6,103.69, making a total income above operating expenses of \$70,784.63. The charges on income during the year have been interest accrued on funded and other debts, \$27,621.42; taxes, \$15,613.56; rentals paid other companies, \$2,243.51; making a total of \$45,478.52, and leaving a net income for the year of \$25,306.11. The total number of passengers carried during the year was 7,293,410, against 7,192,883 last year. The number of miles run during '93-'94 was 1,434,887 against 1,208,854 the year previous. During the year \$22,617.21 was expended for new feed wire put up, \$11,186.75 on new buildings, \$10,979.86 on the rebuilding of 81 electric cars, and \$14,472.31 on the electric equipment of the same, \$70,021.05 on the betterment of track, macadamizing and paving and other special work, making a total of \$129,277.18. During the year there were 19 accidents, one of them resulting fatally. Five passengers were injured, one employee and 12 other persons.

## NEW INCORPORATIONS.

**Fall River, Mass.**—The Fall River & Providence Street Railway Company has been organized by F. S. Stevens, R. T. Davis, Frank Breakman, W. F. Thomas and Benjamin Cook.

**Philadelphia, Pa.**—The Columbia, Ironville & Mountjoy Street Railway Company has been incorporated with a capital stock of \$300,000. The promoters are W. H. Boyer, Samuel R. Russell, Anthony H. Dilman, Philadelphia, Pa.

**Bethlehem, Pa.**—The Bethlehem & Nazareth Electric Street Railway Company has been incorporated with a capital stock of \$100,000. The promoters are Ashton C. Borhek, Albert Brodhead, Abraham Schropp, Bethlehem, Pa.

**Bennington, Vt.**—The Woodford Electric Railway Company has been organized by William J. Turk, C. W. Crispell, C. C. H. Mason, D. A. Gorton and H. H. Martin. The line which the company proposes to build will run from Bennington to Wilmington.

**St. Louis, Mo.**—Several gentlemen have recently organized the St. Louis & South Western Street Railway Company. George C. Fox will be president; A. E. Weiss, secretary; and J. M. Wiener, treasurer. The company proposes to build an electric road to points in South St. Louis and Forest Park.

**Berea, O.**—The Cleveland & Elyria Electric Railroad Company has been incorporated; capital stock, \$200,000. The company proposes to construct an electric railroad between Cleveland, Elyria, Wellington and Oberlin, and furnish electric light, heat, power, etc. The promoters are F. T. Pomeroy, Berea, O.; M. A. Sprague, A. W. Bishop.

**Norristown, Pa.**—The Norristown & Perkiomen Electric Railway Company has been incorporated with a capital of \$150,000, to build and operate a line of railway through the eastern section of Montgomery County. The road is projected from Upper Providence to Worcester, thence along the public road, known as the old Germantown and Perkiomen Turnpike, to Norristown, and thence to Penn Square, to Plymouth, and to an uncertain point, returning to the place of beginning. The incorporators of the enterprise are Thomas H. Reagan, Arthur W. Depue, Paul W. Smith, Harry E. Parsons and James J. Reagan.

## NEWS OF THE WEEK.

**Boston, Mass.**—The annual meeting of the West End Street Railroad Company will be held Nov. 27 at noon.

**Milan, Ill.**—It is probable that a new electric railway will be constructed to carry both passengers and freight.

**Oconomowoc, Wis.**—Thomas Marston is the projector of an electric road for Oconomowoc. A franchise is now pending before the city council.

**Niagara Falls, N. Y.**—The Niagara Falls, Whirlpool & Northern Electric Railroad is now ready for operation. Trial trips have already been run.

**Bloomfield, N. J.**—The Suburban Traction Company having obtained the trolley franchise between Bloomfield and Orange, the electric cars will begin running on Dec. 1.

**Ballston, N. Y.**—Fred B. Barnes has been granted a franchise for an electric road from Ballston to the village line. It is stated that the road will be in operation by August next.

**Hingham, Mass.**—The selectmen have been petitioned to grant a franchise to Sidney Cushing, Edward F. Wilder and others for an electric railway from Hingham to Weymouth.

**New York, N. Y.**—In the special term of the Supreme Court this week Judge Beach gave judgments against the Elevated roads for \$48,000 in suits instituted by 14 property owners.

**South Orange, N. J.**—At a recent meeting of the Village Board of Trustees the Maplewood & South Orange Railway Company was granted a franchise to operate an electric road in the streets of the village.

**Chicago, Ill.**—An ordinance has been introduced in the city council granting a franchise to the Chicago Electric Transit Company. The company desires to obtain the right to operate in the north division of the city.

**East Wareham, Mass.**—At a recent meeting of the East Wareham, Onset Bay & Point Independence Street Railway Company, a committee was appointed to investigate the matter of equipping the road with electric motors.

**Irvington, N. J.**—The New York and Philadelphia Traction Company has asked for a franchise to run a trolley line on Springfield avenue, beginning at the Irvington Village line and running west to the South Orange township line.

**Upper Sandusky, O.**—It is announced that George B. Kerper, of Cincinnati; M. Frost, of Tiffin; and M. McCarthy, of New York, are considering the advisability of building an electric railway from Upper Sandusky to Tiffin via Sycamore.

**Nashville, Tenn.**—The car barns of the Nashville Street Railway Company on Wharf Avenue were burned on Nov. 4. Several motor cars were destroyed by fire. The loss on the building and contents is about \$22,000. The company is fully insured.

**Cincinnati, O.**—An electric car on the Fairmont line was run into by a locomotive on Nov. 3 and five persons were seriously injured. The accident occurred at the Beekman street crossing of the Narrow Gauge Railroad, and it is said that the

motoman saw the locomotive coming and endeavored to cross in front of it.

**Worcester, Mass.**—At a meeting last week of the stockholders of the Worcester, Leicester & Spencer Street Railway Company, and the Worcester & Millbury Street Railway Company, it was voted that the two companies should be consolidated. The action will now be submitted to the Railroad Commissioners for approval.

**New York, N. Y.**—Judge Ingraham in the New York Supreme Court, Special Term, has held that the extensive building of the "Huckleberry" trolley system in northern New York city is not justified, and that the section of the act of 1894 favoring it is unconstitutional and void. He leaves it to the appellate court to decide whether the original act of 1863 is sufficient to protect the road.

**Asbury Park, N. J.**—The Supreme Court of New Jersey has set aside the franchise of the Asbury Park and Belmar Electric Railway, and forbade it running tracks through Neptune City, Belmar and Avon. Mr. Batchlor, of Philadelphia, who controls about \$1,000,000 worth of property along the line, made objections to the Supreme Court, and won the case. The railroad company has taken the case to the Court of Errors and Appeals.

**Philadelphia, Pa.**—Eight new trolley cars for the Electric Traction Company, which were being transported to this city from St. Louis by the Reading Railroad, were badly damaged on Wednesday while passing under a bridge across the tracks of the Reading Railroad on the way to the Third and Berks streets station. The cars were carried on private flat cars. It seems that during the trip one of the cars had become displaced, and in passing under the bridge, which is rather low, it struck the bridge and was wrecked, and the other cars, against which it was jammed, were badly damaged. Some of the cars are completely wrecked, while others are badly strained and have their springs broken.

**Plymouth, Mass.**—In the Superior Court on Nov. 7, John C. Sanborn, superintendent of the Plymouth Division of the New York, New Haven & Hartford Railroad, and Christopher T. Bailey, a railroad policeman, were each sentenced to four months in the House of Correction, and Angus L. Frazer, foreman of the Old Colony Railroad blacksmith shop; Emery H. Bryant, roadmaster, and John Bolen, section foreman, were sentenced to two months each in the House of Correction for inciting and being implicated in the Abington riot in August, 1893. The defendants, acting in the interest of the railroad corporation, attempted to prevent workmen employed by the electric railway from laying tracks across the Old Colony road.

**Rutherford, N. J.**—The Union Traction Company has elected the following officers: President, George H. Forbush, of Brookline, Mass.; vice-president, Henry G. Bell, of Rutherford; secretary, Henry C. Ellis, of Brookline; treasurer, F. J. Callanen, of Rutherford, whose sudden death is announced elsewhere in this issue. The directors are the president, vice-president, treasurer: John S. Forgotson, of New York; E. T. Galloway, of Rutherford; Theodore G. Hoster, of East Rutherford, and Henry C. Broking, of Carlstadt. An application for a franchise for an electric railway through Rutherford will be made at once, the aim of the company being to operate a railway from Newark to Hackensack. The main office of the company is to be at Rutherford.

## PERSONALS.

Mr. Charles Desmond has taken editorial charge of the *Stationary Engineer*, of Chicago.

Mr. Daniel Coolidge, vice-president and general manager of the Johnson Company, of Johnstown, Pa., was in New York this week.

Edwin L. Watson has been elected president of the Worcester, Leicester & Spencer and Millbury Street Railway companies, of Worcester, Mass., to fill the vacancies caused by the death of Samuel Winslow, who was also president of both companies.

H. Ward Leonard, of H. Ward Leonard & Co., of New York, will sail this week for Europe. It is reported that the main purpose of Mr. Leonard is to make an examination of the Heilmann electric locomotives which are now being built in France, for use on one of the steam railroads in that country. Mr. Leonard's company has taken a contract from the Johnson Company for building an electric locomotive to be used in electric railway welding work. It will be a fully equipped, portable, central station, so that it will be unnecessary to use current from the trolley wire, and thus will resemble the Heilmann locomotive. Mr. Leonard may adopt some of the ideas of the inventor of the Heilmann locomotive and may suggest to the latter improvements derived from his own practical experience, to be embodied in the two new Heilmann locomotives.



TRADE NOTES.

The Consolidated Car Heating Company, Albany, N. Y., has just awarded the contract for an addition to its factory, which will practically double its capacity. Its rapidly increasing business in electric heating appliances and the requirements of its compressed gas lighting business have necessitated increased facilities for manufacturing.

Large Electric Heater Contract Awarded.—The West End Railway of Boston has ordered 149 cars equipped with the electric heater manufactured by the Consolidated Car-Heating Company, Albany, N. Y. This is, perhaps, the most important order yet given in electric heating, and was obtained by the Consolidated Company only after most rigorous practical tests in competition with electric heaters offered by five other companies.

The E. P. Allis Company, of Milwaukee, has been awarded the contract for four 1,000-H. P. engines, which are to be installed in the power station of the Metropolitan West Side Elevated Railway Company, Chicago. The cost of the engines will reach \$100,000. In order to complete the work as soon as possible the company has increased its force of workmen by about 300, so that at the present time about two-thirds of the whole force is at work.

The Lunkenheimer Company's Catalogue.—The Lunkenheimer Company, of Cincinnati, has just issued a new catalogue which is thoroughly illustrated by cuts of its various specialties. The catalogue also contains full descriptions of the company's brass and iron valves, lubricators and steam specialties generally. There is a great deal of interesting matter in the book, which contains over 100 pages, and those who receive a copy will do well to keep it on hand for purposes of reference.

Mr. W. W. Whitcomb, president of the Composite Brake-Shoe Company, of Boston, was in New York this week and favored us with a call. Mr. Whitcomb speaks very encouragingly of the progress the company is making, and while here showed us a telegram from home advising him of an order for 1,300 shoes from a large company in one of the western cities, which together with other orders received from the same company makes a total of 4,100 shoes from that road alone since last April. The Composite brake-shoe is gaining rapidly in favor, and the claims of the company that it will last several times longer than any other shoe in the market are substantiated by repeated orders from different street railways who have adopted this shoe in preference to any other.

Preservation of Metals.—At the Montreal meeting of the American Society of Mechanical Engi-

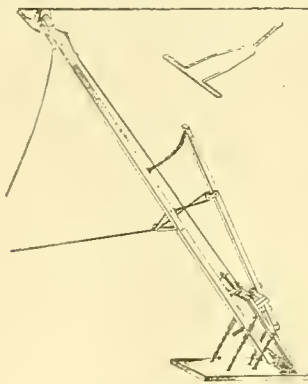
neers an interesting paper was read on methods for preserving metal used in pipes, roofs, bridges, poles, construction work, etc. In conclusion, the whole question of how best to protect iron and steel from corrosion in all the varying conditions that the wants and uses of to-day demand seems to resolve itself into several "don'ts," as the best method of answering it, to wit: Don't have any scale on the metal. Don't paint it with anything but pure linseed oil and oxide of lead or graphite paints. Don't forget that frequent inspection and care are very necessary. Don't let the cost and interest accounts be the governing factors in the case of protecting any metal structure on whose continuity and strength human life and safety depend. In comparing the two paints recommended, it may be well to add that a properly made graphite paint should prove more durable and a better protector than oxide of lead. Graphite has a strong affinity for metal surfaces, and experienced painters claim that even where light colors are desirable graphite paint should be used as a priming coat. Again, graphite is impervious to the action of heat, cold, sea air, acid or alkali fumes, which are more or less destructive agents to lead paints. The Joseph Dixon Crucible Company, Jersey City, N. J., have manufactured a pure linseed oil and graphite paint for over 25 years, and have some very convincing testimonials of its value.

RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Oct. 30, 1894.

528,149. Trolley-Catcher; Woodson D. Cobb, Fort Worth, Tex. Filed May 29, 1894. The pivotal trolley wheel has a spring actuated supporting frame and a catch for connecting the pole to the frame. A trip is arranged at the free end of the pole for engagement with trolley wire upon the dismounting of the trolley wheel from said wire, connections being provided between the trip and said catch. (See illustration.)

528,201. Armature for Dynamo-Electric Machines and Method of Making Same; Thomas H. Hicks, Detroit, Mich. Filed July 14, 1893. This method of winding an armature core with conductor-bobbins consists of winding each bobbin with two layers of coils formed of the same conductor and arranging

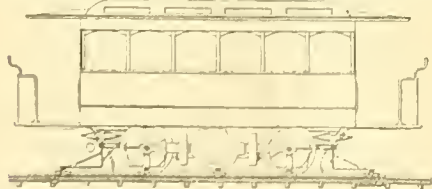


No. 528,149.

the terminals of each bobbin in the outer layer of coils. The under layer of all of the bobbins is wound before winding any of the outer layer.

528,268. Ohmmeter; Arakelyan H. Armen, Lynn, Mass. Filed April 21, 1894. There is a Wheatstone bridge in the lower part of the box and a rheostat in its higher part, containing a coil and a magnet without the casing, and there are an index and projecting pointer above the rheostat in the case.

528,283. Automatic Boiler-Cleaner; John H. Barr, Roanoke, Ind.; John M. Barr, administrator of said John H. Barr, deceased. Filed July 10, 1893. There is a trap for the inflow of water from the boiler to the outflow pipe connected thereto consisting of a cone-shaped receiver. An inclosing case for the receiver is adapted to form a space for the flow of water and steam around the receiver, and is provided with apertures ar-



No. 528,339.

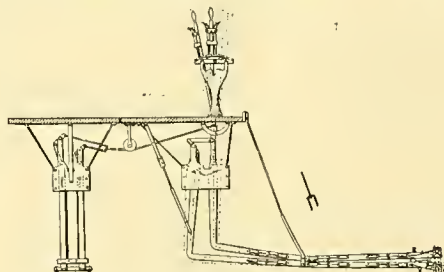
ranged at different and graduated heights forming the only ports to said space. A bottom for the inclosing case is placed below the rim of the receiver, so as to permit water and steam to pass freely into the receiver.

528,298. Car Fender; William G. Kerr, Providence, R. I. Filed Jan. 22, 1894. Guides are adjustably secured to a car-body, shanks being movable in the guides. Slide arms are pivoted to the shanks to move vertically. Means are provided for supporting the fender in the plane of the shanks, and a device for depressing the forward end of the fender.

528,313. Cable-Gripper; James Whitall, Chicago, Ill. Filed May 16, 1891. A suitable frame or support carries a cam, and a gripping jaw is engaged by the cam and capable of moving relatively thereto in the direction of the length of the cable. The jaw, having a yield-

ing friction pad, is adapted to engage the cable, and rollers are adapted to engage and bite the cable when the friction pad is compressed.

528,330. Conduit System for Electric Railways; Jobo B. Liao, Cleveland, Assignor of one-half

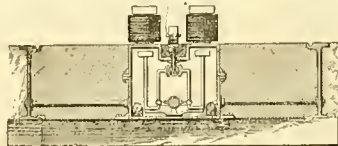


No. 528,379.

to Oliver S. Kelly, Springfield, O. Filed Dec. 9, 1893. The system comprises a slot rail formed of beams having a groove therein, a conductor in the bottom of said groove, and a channel iron in the top of said groove, and contacting boxes arranged between said beams, and also provided with grooves to form a continuation of the grooved slot rail. (See illustration.)

528,353. Ratchet Mechanism; William H. Young, Jr., Philadelphia, Pa. Filed May 31, 1894. This patent relates to car brake mechanism, and comprises the handle, brake shaft, the brake cam shaft, ratchet wheel on said cam shaft, a pawl and means for throwing the pawl into and out of engagement with the ratchet wheel by the action of the brake shaft.

528,359. Gripper for Cable Railway; Benjamin Brownstein, Philadelphia, Pa. Filed June 19, 1891. This is the combination of grippers consisting of sections joined together to move laterally. There are oppositely arranged spring-actuated jointed rods on the sections

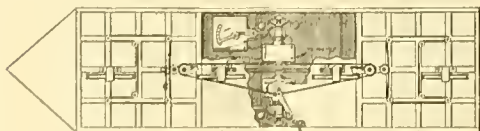


No. 528,379.

to restore them to alignment, and a lever to operate the jaws. (See illustration.)

528,379. Closed-Conduit Electric Railway; James F. McLaughlin, Philadelphia, Pa. Filed May 11, 1894. This is an electric railway with a closed conduit in which a main or supply conductor is housed. There is a sectional working conductor composed of sections in the conduit and exposed sections seated in the top of the conduit and electrically connected to the section in the conduit. Magnetically operated switches are pivoted to the main conductor, formed with switch plates in operative relation to the underground sections of the working conductor and with armatures close to the top of the conduit. (See illustration.)

528,381. Cable Grip; George C. Ormrod and John H. Charles, Ashbury Park, N. J. Filed Jan. 21, 1891. This cable grip comprises a vertically movable slide frame



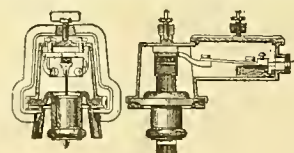
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having opposite spring members at its lower end, jaws carried by the spring members to engage a cable, inclined blocks on the outer sides of the spring members, and vertically movable rollers arranged to run on the blocks.

528,407. Elevated Railway Car; Albert L. Widdis, Detroit, Mich. Filed April 8, 1893. The car has a series of compartments, and mail bags are adapted to fill said compartments, means being at hand for successively dropping the bags out of said compartments. (See illustration.)

528,438. Safety Device for Electric Cars; John M. Kelly, Rochester, N. Y. Filed Nov. 21, 1892. This is a fender hinged at its rear end to the car, with a pivoted catch adapted to be connected with a free or forward end of the fender; the catch is located in position and is adapted to be operated by the foot of the motorman when he wishes to drop the fender.

528,145. Secondary Battery; John E. Rhelts, Salem, Ind. Filed Nov. 22, 1893. This secondary battery has a series of negative and positive electrodes each consisting of a flattened leaden receptacle having ends and bottom closed and its side walls perforated. The alternate members of the series are provided with opposite ends with integral lugs projecting from their upper ends and forming two series of binding posts. The central lugs of each series are provided with two



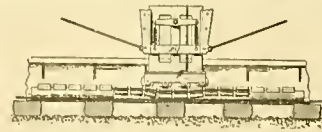
No. 528,477.

bolt holes, and the remaining lugs of the respective series are bent inward laterally and bolted to the central lugs by bolts passed through the lower bolt holes.

528,477. Supply System for Electric Railways; Charles H. Harkins, St. Louis, Mo. Filed Dec. 9, 1893. Claim reads: "In an electric railway, independent switches located at intervals along the track and each comprising a housing having a contact point which is in electric connection with a main conductor, and each housing having a flexible portion adapted to yield laterally with relation to said contact point, an arm secured to and carried by the flexible portion of the housing, and a brush secured to the flexible portion of the housing and adapted to be engaged by a plate on the moving car, whereby there is imparted to said arm a laterally swinging vibration to bring it into engagement with said contact point." (See illustration.)

528,492. Car-Brake Ratchet-Handle; John Seiberger, West Troy, N. Y.; filed April 18, 1894. This is an improvement in a ratchet brake handle for use on street cars.

528,494. Closed Conduit for Electric Railways; William E. Stearns, Berlin, Conn., Assignor, by direct and mesne assignments, of one-third to David L. Bradt, John P. Cozzolin and Frank O. Plummer, Worcester, Mass. Filed April 7, 1894. A compressible resilient insulating envelope has an electric conductor inclosed in it, and a traveling trolley plate has a down-



No. 528,494.

wardly extending perforated oil-slip portion for shedding water; the plate carries a series of trolley wheels cooperating with the conductor. (See illustration.)

528,500. Sanding Device for Railways; Charles H. Andrews, Lebanon, Pa., Assignor, by direct and mesne assignments, of sixteen-twentieths to Thomas Williams, Clinton J. Barr, John E. Kaudenbush and Simon P. Licht, same place. Filed June 7, 1894. This is the combination of a tank or receptacle mounted upon a frame having a shaft-bearing at one end and a spout at the other, of a spiral conveyor bearing at one end in the spout the other end being formed into a shaft which bears in the opening in the opposite end wall of the frame. A stirrer is mounted in the tank or receptacle and has peripheral projections which are engaged by the spiral conveyor.



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*As the STREET RAILWAY GAZETTE is published 52 times a year, and is the only weekly publication devoted to Street Railway Interests, its value as an advertising medium will be apparent to Manufacturers and Dealers in Street Railway Apparatus and Supplies of every description. We will take pleasure in quoting rates for advertising space.*

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Superiority of a Weekly. On Monday last the unfinished roof of the new car house that the Trenton Passenger Railway Company is erecting collapsed, and the structure was badly damaged. The accident was a mysterious one, and no satisfactory explanation has yet been found. We are able in this number to present illustrations of the damaged building. We mention the fact merely to cite it as one of the cases that demonstrate the superiority of a weekly street-railway paper as compared with a monthly in the matter of presenting news while it is fresh.

Indianapolis Company Sustained. The attempt to invalidate the franchise of the Street Railway Company of the City of Indianapolis has signally failed. The court finds that the company has rights which the municipality cannot disregard. Judging from the fact that the stock has of late increased in value, we fancy that the investing public passed on the question and anticipated the decision. Municipalities have not been very successful of late in their efforts to trample on street railway companies. The City of Detroit found itself badly beaten a few days ago in an attempt of this sort, and now the Indianapolis company feels so confident of its position that it proposes to make large expenditures of money in new construction improvements.

Elevated and Surface Railways. The annual report of the Manhattan Elevated of New York, a summary of which appears in our financial department, shows that in the last year the company carried 24,000,000 passengers less than during the previous twelve months. It is not difficult to discover where the business went. During the same period the Metropolitan Traction Company's business increased between 11,000,000 and 12,000,000, and the traffic of the Third avenue road grew materially. The loss of business by the Manhattan has caused a vast amount of comment, and the increase is generally ascribed to the fact that the surface lines have introduced exceedingly liberal systems of transfers. Residents in the uptown districts find that they can ride to and from their offices about as quickly on surface cars, by availing themselves of the transfer privileges, as they can when they patronize the elevated trains, situated perhaps at some little distance from their offices or homes.

Storage Battery Traction. An esteemed correspondent of the STREET RAILWAY GAZETTE writes that he considers an editorial paragraph on the storage battery traction in our last issue rather harsh toward those who are working to develop the accumulator for purposes of street-car propulsion. It is certainly not our intention to discourage those who are endeavoring to produce results of value in any department of the street railway field, and it is true beyond a doubt that no class of workers has tried more faithfully to reach success than those who have put money and time into storage-battery railway enterprises. Up to this time, however, the results have been so uniformly disappointing that street-railway men, as a class, have ceased to be interested in them, and have quite generally formed the opinion that the storage battery cannot be applied with success to purposes of traction. However, there are still many

workers in the field who entertain a different opinion, who are confident that the problem is soluble, and that success is near at hand. For these we wish all the good fortune that can possibly attend their laborious and persevering efforts. We have been informed that two Eastern street railway companies propose soon to introduce storage battery cars, and no one will be more ready than we shall be to chronicle that they are successful in operation.

Street Railways in Those who have followed the news from Canada that has appeared in the weekly letters from Ottawa in the STREET RAILWAY GAZETTE, have noticed that there is great activity in electric railway work on the other side of the line. A great deal of construction is under way, far more is projected, and the greatest interest seems to be taken in transportation enterprises. It is possible that when the American Street Railway Association meets in Montreal next fall, the supply men, who are always in evidence at such gatherings, may find that Canada offers a far more promising and lucrative field than they had ever realized. The progress in electric railway work that has been made in Ontario and Quebec since the last meeting of the National Electric Light Convention in Montreal has been little short of marvelous. At that time Montreal had absolutely nothing to show in the way of improved rapid transit facilities. The street car system was decidedly out of date, and as far as could be judged from limited observation, it was exceedingly poor, even for a horse railroad. The cars were small, the service infrequent and the track construction abominable. At that time there was talk of improvement in the street railway facilities of the city, but many of the conservative residents seemed to think an electrical equipment an exceedingly doubtful expedient. The grades are steep, and during a considerable portion of the year the blanket of snow and ice covering the streets made it necessary to abandon horse cars and substitute sleighs. This notion has since disappeared, as since that time an electric railway system that will compare with that which can be found in any American city has been installed, and improvements are constantly being added. Ottawa has a splendid system of transportation for a city of its size. This city, in fact, introduced electricity successfully before the attempt was made in Montreal, and its operation demonstrated conclusively that a road operated by electric power could be kept open throughout all the rigors of a Canadian winter. The street railway system in Toronto has reached magnificent proportions, and new roads are constantly swelling the list of rapid transit lines throughout Canada. Only a few days ago a new electric railway at Hamilton was opened to the public. Canada offers a splendid opportunity for the operation of electric roads by electricity, for the reason that the power can be economically generated from the scores and even hundreds of waterfalls throughout Ontario and Quebec. The time cannot be far distant when a great many of the waterfalls, whose power is now going partially or wholly to waste, will be utilized in driving electric generators, and a part of their current will doubtless be used for transportation purposes.



### SPECIAL SERVICE ON STREET RAILWAY LINES.

The street railway mail service in the city of Pittsburgh was started on Nov. 12. The first road on which trolley mail cars were in operation was the main line of the Duquesne Traction Company, and mail was delivered from the main postoffice to one of the stations in East Liberty. According to the present schedule there will be 14 deliveries from the main office and 11 to the main office. It is stated that the system will soon be extended to all the branch postoffices of Pittsburgh, Allegheny and the adjacent towns to each by the electric lines.

It is proposed to introduce into the Pennsylvania Legislature bills that will enable street railway companies to enlarge their field of their usefulness. It is thought by some that great opposition will be made to a provision allowing the companies to carry freight, but it is thought that the same objection would not be urged against granting them the privilege of carrying express in cities. Such a service would involve the construction of special cars, but those who have looked over the subject are inclined to believe that the expenditure would be justified, as it is a fact that in every large city the hauling of baggage alone is an extremely large and lucrative business.

Plans have been drawn for an ambulance car to be operated on the St. Louis lines, and it will be constructed by the St. Louis Car Company. Already an ambulance car is in operation in the city, but it is not equipped in as elaborate a style as such a vehicle should be, but the new car, it is stated, will be a model in every respect, and will be far more useful than the ordinary lumbering ambulance.

### GETTYSBURG ELECTRIC RAILWAY LITIGATION.

The jury of seven appointed to assess the damages that should be awarded to the Gettysburg Electric Railway Company for its land that is to be taken by the government recently fixed upon \$30,000 as the proper amount. The company, however, is not satisfied with the award, as it claimed it is insufficient to compensate it. Exceptions have been filed to the report of the jury of award. In these it was submitted that the act of Congress approved Aug. 1, 1888, under which the condemnation proceedings were instituted, provides for the acquisition of real estate by the United States by condemnation only for the erection of public buildings or for other public uses. The taking of the trolley company's land for the purposes of a national park, it is claimed, is not authorized under this act, as there is nothing said about condemnation of property belonging to private persons. It is also stated that the strip of land sought to be condemned is over 6,000 feet in length, and is an integral part of the right of way of one of the branches of the company's road, and that the effect of its condemnation would be to cut the branch in two, destroy its continuity and prevent its further operation. The acts of Congress approved Aug. 1, 1888, and March 3, 1893, and the joint resolution adopted June 6, 1894, it is urged, were not intended to authorize the Secretary of War to procure for the United States by condemnation any land which had been already devoted to a public use.

A number of other reasons are given why the condemnation of the land should not hold good, and it is asserted that a large amount of the testimony presented at the hearings was irrelevant and inadmissible.

### CONSOLIDATED CO.'S NEWARK FRANCHISE.

In the last issue of the STREET RAILWAY GAZETTE mention was made of the fact the Supreme Court of New Jersey had handed down a decision declaring invalid an ordinance adopted by the Board of Public Works of Newark, giving the company a franchise to certain streets in that city. The franchise related to five miles of street in the center of the city of Newark. David Young, the

manager of the company, is quoted as stating that if the decision is not reversed it would injure the company to the extent of \$100,000 in anticipated revenues from the proposed extension of tracks. The company's attorney has been instructed to prepare an appeal to be presented at the next session of the Court of Errors and Appeals.

### THE TRIMBLE CAR FENDER.

A car fender possessing several novel features has recently been patented by James A. Trimble, of New York, and is shown in the accompanying engravings. It consists of two folding arms or



Fender Folded.

guards attached to the under side of the car platform and designed to fold back of the line of the platform out of the way of the drawbar and bumper.

This arrangement does not interfere with the use of trailers or the storing of cars close together in the carhouses. The folding arms are connected together by a net of canvas about three feet wide and extending the full width of the track.

The fender is normally carried folded, and at a height of 8 inches above the rails. In case of accident the motorman, by touching a trip conveniently located on the platform, with his foot, releases powerful springs which instantly throw the fender out to its extended position. There being no rigid bar or iron pipe across the front of the fender, the danger of bruising or breaking of ankles is obviated.

In the extended position, the fender is carried about 2 inches from the ground, and is so arranged that on striking an immovable object, such as a high paving block, it will rise over the obstruction.

The weight of a body falling on the net or canvas draws the movable sidearms toward the center, and forms a pocket in which the person is securely held until the car is stopped.

The device is especially simple, and in recent trials has given excellent satisfaction.

### CREDIT WHERE CREDIT IS DUE.

Our esteemed weekly contemporary, the STREET RAILWAY GAZETTE, has good eyes. It published the address of Governor Northen, of Georgia, welcoming the street railway delegates to Atlanta, and seeing the kindly allusion in it to the *Electrical Review*, of course, included it in full. All of our other contemporaries failed to see this paragraph in the Governor's address, or we are sure they would have published it, too.—*Electrical Review*.

To be sure. We are always glad to print a good word for any of our esteemed contemporaries. The practice of suppressing the name of a journal

upon all occasions on the theory that it may gain an advantage from the gratuitous advertisement is pretty small business, and it forms no part of the policy of the STREET RAILWAY GAZETTE. We laid a small wager that the GAZETTE would alone be liberal enough to print the allusion in question, and we are wearing the hat.

### INDIANAPOLIS CITIZENS' COMPANY WINS ITS SUIT.

The Citizens' Street Railroad Company of Indianapolis has been victorious in its litigation with the City Railroad Company of that city. The question to be determined was whether the former company, which controls the street railway system of Indianapolis, has had any right to use the streets since last January. The city took the position that the franchise expired at that time, and it had granted a franchise in 1893 to the City Railway Company giving it the right to operate in the city. Litigation was instituted on behalf of the City company to enable it to secure rights in the streets in which it was alleged that the operating company was a trespasser. The Citizens' company alleged that the franchise was a perpetual one under an Indiana statute.

The hearing in the suit took place last July before Judges Woods and Baker in the United States Circuit Court. The decision in favor of the Citizens' company was given by Judge Woods. He denied the power of the Council to terminate the life of the Citizens' company, even for what advantages to the municipality there might be in the City company's franchise; and held that it is not a question of perpetuity of charter, but of amendment, alteration or repeal by the Legislature, which alone has sovereign power. The Council had only the powers of an agent of the State. Its acts could not bind the State, and therefore the other party to its contract could not be bound by any contractual arrangement. Judge Baker filed a dissenting opinion, finding that the franchise did not expire until 1901. The decision of Judge



Fender in Position.

Woods prevails, as he is the ranking judge. In the course of his opinion he says:

In short, whatever power is dependent solely upon the grant of the charter, and which could not be exercised by unincorporated private persons under the general laws of the State, is abrogated by the repeal of the law which granted these special rights. Personal and real property acquired by the corporation during its lawful existence, rights of contract, or choses in action so acquired, and which do not in their nature depend upon the general powers conferred by the charter, are not destroyed by such repeal; and the courts may, if the Legislature does not provide some special remedy, enforce such rights by the means within their power. The rights of the shareholders of such a corporation to their interest in its property are



not annihilated by such a repeal, and there must remain in the courts the power to protect those rights. In that case, which concerned a street railway franchise, the repealing act contained express provision for compensation to be made by the corporation which was authorized to "enter upon and use any part of the tracks of any other street railroad," if the corporations interested could not agree upon the "compensation to be paid therefor"; so that the effect of the repeal without provision for such compensation was not before the court. Nevertheless, the principle declared, I think, must be accepted as sound. The unrestricted right



DAMAGED CAR HOUSE IN TRENTON.

of repeal being reserved by the Legislature, a repeal must be regarded as valid and effective, whether or not accompanied with provisions for the just disposition of the corporate property rights. If such provision is not made, "there must be in the courts the power to protect those rights." But without statutory provisions to that effect, it is not perceived how a court could compel a new company to take the tracks and equipment of the company whose franchise had been terminated.

If, therefore, the right of the Citizens' Street Railroad Company to occupy the streets of the city and run its cars upon existing lines has ceased, and under its contract the City Railroad Company has a right—not, of course, to take possession of and use the tracks of the other company—but to put its own tracks in the place thereof, then we are confronted with a case either of indirect confiscation or of the destruction of property. The Citizens' company must either remove its tracks, destroying their value, or it must accept such price as the City company shall choose to give—and that is equivalent to confiscation. While an enactment to that effect would perhaps not be invalid, a construction which leads to such results should not prevail when a reasonable interpretation is possible which involves no wrong or hardship either to the parties or to the public. The decision in *Louisville Natural Gas Company vs. State ex rel. Reynolds*, 135 Ind. 49, overruling *city of Rushville vs. Rushville Natural Gas Company*, 132 Ind. 573, is, I think, not without significance in respect to the interpretation of the statute now under consideration. The power given street railway companies by the statute to mortgage their property and franchises indicates a purpose that the franchise should be a continuing one. Of what value is a mortgage on a franchise which is to expire before or near the time when the mortgage will be enforceable? The doctrine that parties may, by their conduct, put an interpretation upon their contracts is not applicable where adverse public interests are involved. The public is not bound by the acts of officers contrary to law, no matter how long maintained and acquiesced in. According to *Reiner vs. Oxley*, 80 Ind. 580, to which reference has been made, parties may interpret their own contracts "so long as their interpretation does not result in a contract which for some reason is in itself unlawful."

The case will be appealed to the United States Supreme Court.

Of the significance of the decision, Augustus L. Mason, president of the company, says:

"The practical bearing of the decision is that it puts the company in a position to get the money needed for new improvements. Many miles of track need to be relaid. Some suburbs have been urgent for extended lines; more cars are needed. These things take cash counted by the hundreds of thousands of dollars, and I believe the decision of the court brings them nearer. This is the trust reposed in the company to give the people complete and adequate facilities, and the decision of the Federal court now makes it easier for this public trust to be faithfully discharged."

#### NEW YORK RAPID TRANSIT.

The Rapid Transit Commissioners of New York gave hearings on Tuesday and Wednesday to those who desired to suggest changes in the route of the proposed road. None of the recommendations possessed any great significance. Ex-Mayor Abram S. Hewitt made this point:

The idea of operation which I have in mind is a consolidation of all the roads—the rapid transit system which you are to build, the surface roads and the elevated roads. It would seem to me to

#### TROLLEY MAIL SERVICE.

George F. Stone, second assistant postmaster-general, in the annual report of the Post Office Department, refers as follows to trolley mail service:

The electric car line is becoming each year a more important factor in mail transportation. Service is now in operation on 47 such lines at the rates fixed by law for the carriage of mails on steam roads. The routes thus far established are comparatively short, the longest being but 18 miles in length. Consideration is now being given to the feasibility of utilizing electric and other rapid motor street car lines to facilitate the transportation of mails in the important cities between the main post office and branch offices, and to and from the railway stations. A plan of this kind would probably include the running of a special car over the several street lines for the exclusive use of the mail service, not only for carrying locked pouches, but in which a certain amount of distribution would be possible.

#### PROBABLE ELECTRIC RAILWAY LEGISLATION IN PENNSYLVANIA.

Now that the Republicans have complete control of all the executive and legislative departments in the State of Pennsylvania, it will be interesting to learn what disposition they will make of the several important measures that will be introduced in the legislature next year by interests representing street and electric railways. The *Stockholder* has already called attention to three of the most important of these bills—the right to consolidate, the right of eminent domain, and the right to carry general merchandise, or, in other words, to engage in the transportation of freight. Messrs. Quay, Magee and other leading politicians favor some of these bills, notably the right of consolidation, and it is believed they will favor any legitimate legislation which will enhance the value of street and electric railway companies. Their approval of such bills is equivalent to their enactment into law, and if they are introduced, as announced they would be, there is every likelihood that before next summer electric railway companies in this State will enjoy almost as great privileges as steam railroads.—*Philadelphia Stockholder*.

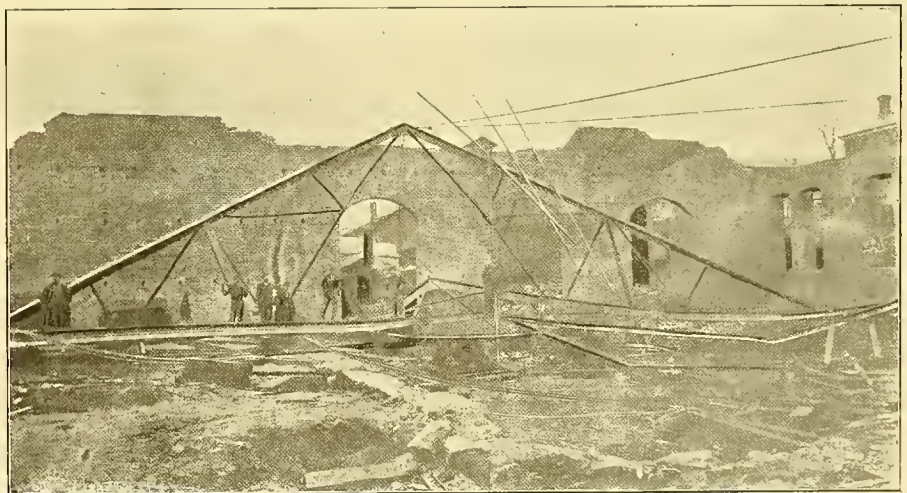
#### BARN OF THE NORTH EAST COMPANY, KANSAS CITY, BURNED.

The car barn of the North East Street Railway Company of Kansas City, Mo., was burned November 7th. The loss was about \$20,000, which is

be one of your first duties to provide for some terms for transfers for the whole of such a system. I have no interest in any of these roads. I believe that you will have no trouble in arranging for these transfers. If it were to be done it would have a great effect upon your ideas of routes for the rapid transit lines. In such a case you would perhaps have no need to go above the Grand Central Station on the east side, nor to build a west side route.

#### ROOF OF A TRENTON CARHOUSE COLLAPSES.

Shortly before noon on Monday last the roof trusses of the Trenton Passenger Railway Company's new carhouse suddenly fell, carrying away part of the partition wall and causing about \$10,000 damage. The new carhouse is located at Lalor and Second streets, and covers a plot of ground about 100 x 300 feet. The south end of the building will be used for storing cars, and that portion north of the partition wall, measuring about 75 x 92 feet, will be fitted up as a repair shop and will be completely equipped with



INTERIOR OF THE CAR HOUSE IN TRENTON.—SITE OF REPAIR SHOP.

modern machine tools and appliances for making all necessary repairs. This part of the building was nearest completed, the side walls being finished and all of the roof trusses in position. These trusses were six in number, about 25 feet high and 94 feet span. All six trusses fell at the same time and toward the Lalor street or south end of the building. At the time there were 12 men at work, but fortunately only one was seriously hurt. The cause of the accident is in doubt, as the work throughout appears to have been done in a thorough and careful manner,

fully covered by insurance. Thirteen motor cars, of which eight were new and the others old, were destroyed. Two new car bodies were saved.

It was supposed that the building was fired either accidentally by a tramp or maliciously by a discharged employee. The night foreman and an assistant by chance discovered the northeast corner of the building in a blaze. The men found that the barn had been set on fire from beneath and that the house was ablaze on the exterior at that corner, and that a large pile of oak wood used for repair purposes and stacked up over the exposed



place was on fire inside from the flames eating through the floor. The two men fought the fire with buckets and turned in an alarm.

The place is outside of the fire limits, and the nearest water supply is 1,300 feet distant. The street leading to the barn was in such bad condi-



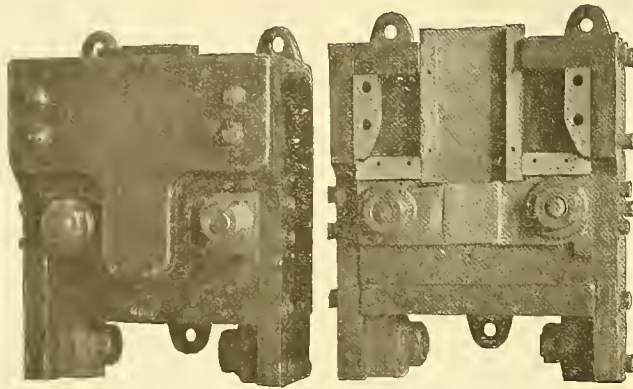
Fuse Intact and Fuse Blown.

tion that the fire department could not respond promptly, and reached the place too late to be of effective service.

A temporary service on the road was organized by Receiver Gillham, who borrowed cars from local companies. The barn will be rebuilt at once.

**PROTECTION FROM ARCING BY MAGNETIC BLOW-OUT.**

An interesting experiment was recently made at the Kent Avenue Station of the Brooklyn City



MAGNETIC BLOW-OUT FUSE CARRIERS.

Railroad Company to test the efficiency of the magnetic blow-out principle in the fuse carriers which form part of the General Electric Company's generator equipments. Previous to the test there had been, on the part of the railroad company, no little scepticism as to the value of the magnetic blow-out principle, and the test was made with the view primarily of proving the correctness of the claims of the manufacturing company, that the apparatus would cope with almost any demand made upon it.

The test was made on the company's dock, behind the station, under the supervision of Mr. Walter A. Pearson, superintendent of the station. Six water rheostats of large capacity were connected into the circuit in series, in order to regulate the load, and the conductors were brought directly from two of the four 1,500 k. w. multipolar generators. The fuse blew at 4,400 amperes at 550 volts, an equivalent in horse power of 3,243 H. P. The result of the test was a complete demonstration of the efficiency of the magnetic blow-out on a very powerful and destructive arc. The cut shows the down fuse and one of similar capacity intact. It will be seen that the action of the magnetic blow-out must have been instantaneous, and, perhaps, the most remarkable feature is the small amount of metal blown.

The magnetic blow-out principle is a special characteristic of all apparatus manufactured by the General Electric Company which has to deal with possible arcs. It is successfully embodied in the well-known K car controller as well as in the lightning arresters, fuseboxes, etc. It is claimed

to be the only known method of preventing destructive arcing, and is protected by undisputed patents.

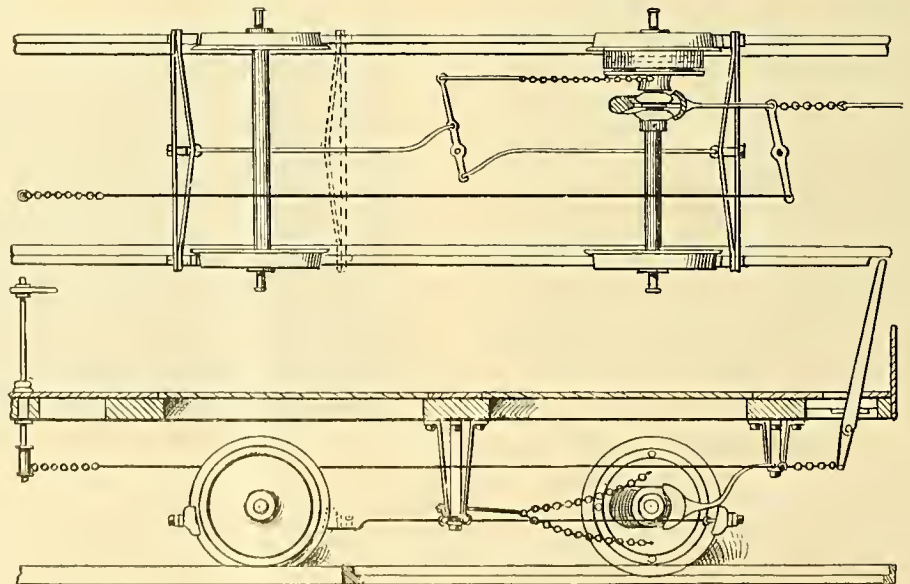
The fuseboxes in which the fuse shown in the cut was blown were exhibited at the Atlanta Convention and served to convince many who had doubted the efficacy of the magnetic blow-out principle.

**REORGANIZATION OF THE CONSOLIDATED TRACTION COMPANY OF NEW JERSEY.**

The reorganization of the Consolidated Traction Company of New Jersey, which controls the electric railways of Newark, Jersey City and Elizabeth, will take place this month. According to all reports the new board of directors will be composed of some of the strongest and influential railway men in the country. The directory will be as follows according to those who are in a position to know: William L. Elkins, P. A. B. Widener, Thomas Dolan, A. J. Cassatt, Clement A. Griscom and Frank Thomson, of Philadelphia; John D. Crimmins, J. I. Waterbury and Thomas F. Ryan, of New York; E. F. C. Young and B. M. Shamley, of Jersey City; and Gen. W. J. Sewell, of Camden.

Mr. Young, who now fills the position of president of the company, will, in all probability, remain in that office. Mr. Widener, Mr. Dolan and Mr. Elkins, it is well known, are directors of the Philadelphia Traction Company. Mr. Cassatt, Mr. Griscom and Mr. Thomson are directors of the

Pennsylvania Railroad Company, and Mr. Elkins is also a director of the same corporation. Mr. Crimmins is known the country over on ac-



ERB FRICTION BRAKE.

count of his connection with New York street railways. Mr. Shamley is a well-known railway contractor; Mr. Waterbury is president of the Manhattan Trust Company, of New York; Mr. Ryan is treasurer of the Metropolitan Traction Company;

and General Sewell, who is well known in Philadelphia, and will probably be the next United States Senator from New Jersey, is prominently identified with the lines of the Pennsylvania Railroad system in New Jersey.

**THE ERB FRICTION BRAKE.**

The accompanying illustrations represent a new friction brake for electric cars that was recently designed by Paris Erb, of Lancaster, Pa. In August last one of the cars of the Pennsylvania Traction Company was equipped with a brake of this type, and has been in regular service since that time. It is reported that the braking device has given entire satisfaction.

In the equipment of a car with a brake of this description, a friction disk of from 20 to 24 inches in diameter is attached solidly to the axle or to the side of the car wheel. The second disk or mate fits loosely on the axle so that it can revolve freely. The surfaces of these two disks are brought together by a shifter applied to the loose disk, and connecting with a lever on the platform of the car. Chains connecting with the brake levers are attached to the loose friction disk, one above and the other below a hub or drum, the diameter of which is about one-third that of the friction face. When the two friction faces are brought together by the action of the lever, by the hand of the motorman, when the car is in motion, the loose disk revolves, being carried along by the fixed disk, and as it does so it draws the chain across the hub, which thus becomes a fulcrum. A tremendous pull is therefore exerted. As the cut shows, the chains apply the brake-shoes to all the wheels.

By this brake the motion of the car is arrested both by the friction of the two disks and by the contact of the shoe on the wheel.

**A GROUNDED FEEDER.**

A curious accident happened a few days ago on one of the trolley lines in Philadelphia. In rigging up a derrick near the corner of Fourth and Arch streets, a contractor drove an iron pin, four feet long and three inches in diameter, into the ground near the car track of the Fourth and Eighth street line. A moment afterward, all the cars came to a sudden stop. After some investigation it was concluded that the spike had been driven against a feeder wire, cutting off the insu-

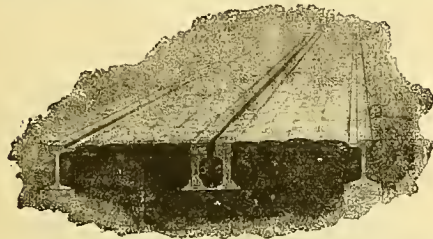
lation and coming into contact with the bare copper. When the pin was drawn out to ascertain if this was the cause of the trouble, it was found to be red hot, and after its removal the cars moved as usual.



**CONDUIT ELECTRIC RAILWAYS: IS THERE A SOLUTION OF THE PROBLEM?\***

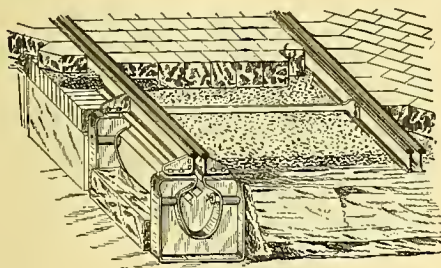
BY JOSEPH SACHS.

Scarcely a dozen years ago we did not have a single inch, I may say, of electric railway in existence. To-day there are hundreds of miles in this country alone: but, strange to say, although its advance has been most phenomenal and the success of the so-called "deadly trolley" has been



Blackpool System.

very great, there has existed a most extensive demand for a substitute for the trolley which should be free from the various objections which are inherent in the overhead wire; and although we have advanced in the construction and operation of motors and gearing and power-house machinery, we still remain at the same point that we did at the very beginning in the method of distributing the power to the motor on the car, namely, by means of an overhead bare wire. Now two substitutes have appeared to solve this problem: one has been the storage battery and the other has been the underground or conduit system. The storage-battery car does not need to be explained; you are all familiar with it, and I need only say that, although the storage battery has proved a failure in the past and a severe loss to many of those who have invested money in enterprises of that kind, yet recent successes in that direction lead us to believe that it is more than a possibility, in fact a very great probability, that we may have a very successful storage-battery system in the near future. But the point that I have under consideration to-night is not to solve the problem in that way, but to solve it by a center-of-distribution

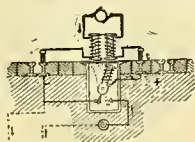


Siemens & Halske System in Buda Pesh.

method, and I say the way to solve the problem in that way is by the conduit system.

Hundreds of conduits have been tried; thousands of them, I may say. And I may also say that perhaps no other branch of electrical engineering can boast of the vast variety of systems and plans that have been developed by various promoters as the class of conduit electric railways: in fact, of all the electric-railway patents in the Patent Office to-day, over one-half are conduit railway systems. It may seem strange, but perhaps the first every novice does who takes up electrical engineering is to devise a conduit electric railway. Probably that is the very reason why so many have not been successful.

Why is it that success has not been obtained? One reason I have given you; the other is perhaps on account of some inherent difficulties which I, however, doubt and which a great many others



Siemens Surface Contact System.

doubt; and another still is the very large cost of construction and maintenance, although the maintenance would seem to be less than the trolley.

From the fact that there are in operation to-day two electric conduit systems, it would appear that we could build other systems of similar character and somewhat similar construction and have them work successfully; but up to date nothing that has been successful, on a commercial basis, has been

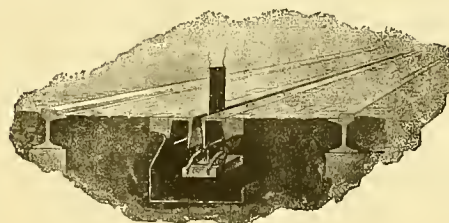
forthcoming. I think that in order to bring forth a successful system we must first study the problem most thoroughly and the real questions to be solved.

I have taken up the various systems that have been devised, and divided them into six classes, and have selected some this evening of the more important, which I shall describe to you in their various classes and show you their points of advantage and disadvantage.

We shall first take up the various open-slot continuous-wire conduits.\*

The first system which I shall show you will be the well-known Bentley-Knight system, which was, as you all well know, one of the first attempts ever made in this country to solve the rapid-transit problem by means of electricity. One illustration which I present shows the Bentley-Knight conduit as tried at Cleveland. It consisted of a very small open-slotted conduit with two wires suspended therein. The other view shows the plow. The conduit was exceedingly small, and, although this road was operated for some time, it was at last abandoned. The road was opened in 1884, and, as I say, was the first attempt at electric traction on a commercial operative basis in this country.

The Bentley-Knight people, however, were not satisfied with that attempt and got out another system. It had also a very small conduit, but in-

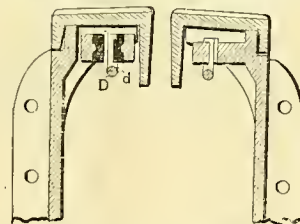


Love System.

stead of placing it in the middle of the track it was located at the side of the rail. Two wires were located therein, and the plow coming down from the car came in contact with the wires, one on each side.

Another view shows a conduit installed as early as 1885, and although the apparent conditions would be exceedingly against its successful operation, strange to say it is operating to-day and paying dividends. I have reference to the Blackpool system, or Blackpool conduit, which is operated in Blackpool, England, to-day. The conduit is exceedingly small and the two wires are supported nearly directly below the slot, yet, as I say, the conduit is in daily operation.

The system which I now describe is the far-famed Siemens-Halske system, which is in operation to-day at Budapest. The conduit is a peculiar one. It is located directly beneath the rail. The car wheel is very dissimilar to that used in this country. It is a centrally flanged one, the flange running between the two rails, the object being to keep the slots open at all times. Two wires are used, one each side of the slot, although only one is shown here. Strange to say, this conduit has been in daily operation since 1889; dividends are paid by the road, and 60 cars are operating on six miles of double track. But I doubt very much



Section of Love Conduit.

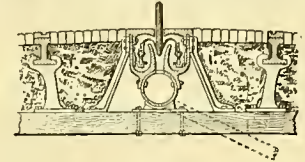
whether a conduit of that size would operate on this side.

Next we have, perhaps, the latest addition to open-slot conduits, which is proving more or less successful. I have reference to what is called the "Love conduit." The yoke you see there is a construction adopted at Chicago, where this system was first introduced. You see the promoters of this system had a better idea of the problem to be solved. We have here a large conduit and the wire placed high and dry, and furthermore about the most important thing of the system is that the wire is rendered accessible by placing above the a detachable slot rail or cover which can be raised at any time to permit inspection of the wire. It did not prove satisfactory for some reason or other, however, and when the same system was introduced in Washington another form of construction was adopted.

One trouble, no doubt, was that a cheap conduit

was wanted, which seemed to be the underlying principle of this whole matter, and for that reason the heavy yoke was replaced by a simple trough located between the tracks. This conduit, I understand, is to-day in operation in Washington, and whether fully successful or not I do not know.

Now we come to some of the possibilities and suggestions. One is the Griffin conduit, the only feature of which consists in the fact that the conduit is divided into two compartments, in one of

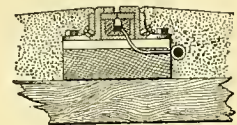


Zell System.

which the wire is located, the other being used for drainage. The advantage of this form of construction is apparent and is also borne out in the form of construction which is called the Zell conduit, in which we have a drainage tube in the center beneath the slot, the wire being supported in two separate compartments, one on each side of the drainage tube. Both of these systems, as I say, are suggestions.

Now you will please take notice that most of those various forms of open-slot conduits which I have shown you possess several points of disadvantage. First, they have the disadvantage that in nearly all the forms which have been tried the conduit has been extremely small; the wires have been unprotected and poorly located; they have been placed low instead of high; the insulators have been poor and inaccessible; and the problem seems to have been attacked from the wrong standpoint, namely, to get a cheap system to compete with the trolley.

We will leave the open-slot conduit for a while and take up what we call the movable lip or cover conduit. In this form of construction the aim has been to protect the wire by covering up the slot except when the trolley is passing. One of the best known of this kind of systems is the Van Depoele conduit, the invention of the late well-known electrician, Mr. Van Depoele. He devised a form of construction which is shown in the two accompanying illustrations, both of which have flexible lips which cover the slot of the conduit



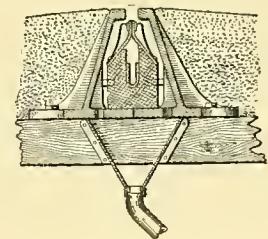
Van Depoele System with Flexible Lip.

containing the wire. The conduit in one, as you see, is very small, and there are two lips which press together over the slot which are pushed aside by the plow of the car as it comes along, but close again after the car has passed.

In another form which Mr. Van Depoele has devised he puts the same construction inside of the somewhat larger conduit.

In still another form the wire is located in a trough within the slotted conduit and covered by two shutters which are pushed aside by the plow. These shutters are made in short sections and close up again after the plow has passed.

Now we come to another system which has recently been exploited in this country, called the Patterson system. The conduit is very small and divided into two compartments. The wires are



Van Depoele System with Flexible Lip.

located in one department and there is a cover which is pushed aside by the plow. The construction needs no explanation. This system has not yet been tried.

The difficulty with these open-slot flexible cover or movable cover conduits is practically the same as with the previous class, with the additional disadvantage that we have not as yet found a flexible material that will stand the strain of every-day railway traffic, and the shutters when made of

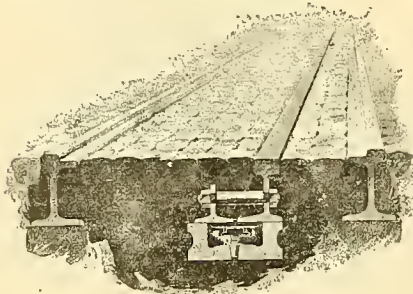
\* Abstract of a lecture delivered before the New York Electrical Society, November 1, 1894.

\* For a number of the illustrations accompanying this article we are indebted to *Electricity*, of New York.



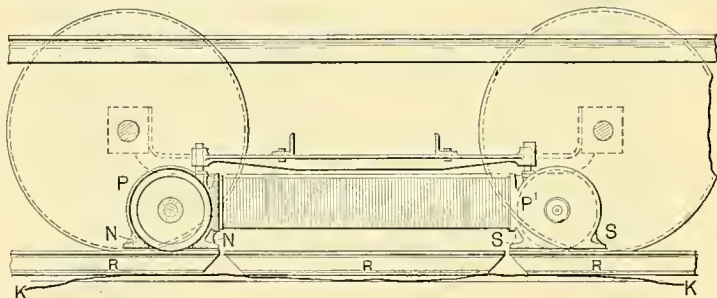
metal cause a great deal of noise and do not seem to afford much protection against injury to the wire.

The next class we come to is known as the surface contact system. It holds forth certain alluring attractions in the way of cheap first cost and dispenses with the open slot, and has therefore received a great deal of attention. The system is typified by the well-known Lineff system and has been tried experimentally. It consists of a sectional iron contact rail which is flush with the street surface. It is made in sections of six to ten feet, placed on top of the conduit, which is entirely closed, and is composed of some insulating material



Lineff System.

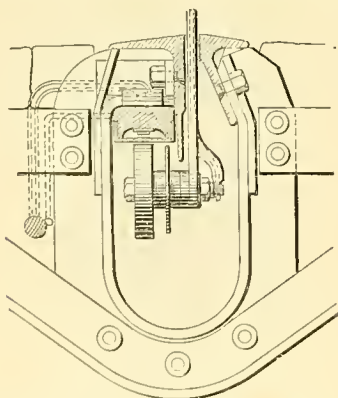
in which is laid a strip of copper attached to the bottom of which is a strip of iron, and this composite strip is connected with the source of supply. Upon the car, placed longitudinally with the track, is a magnet having a wheel at each end. When the magnet is energized the composite strip is attracted up against the rail and naturally connects that section of the rail with the dynamo; and so as the car moves along the magnet pulls up the strip and connects each successive section of the contact rail with the source of supply, and thus



LINEFF SYSTEM.

supplies the motor on the car. I will not dwell any longer on this system as I have a number of others to show you.

We have another surface contact system devised by Mr. Van Depoele, which is practically the same in principle. The contact conductor consists of a number of sections on the surface of the street; the contact device or collecting plow consists of a magnet, the poles of which are brushes. The switching device is a small car which runs upon rails in the conduit and directly beneath the sectional contacts. The lower rails form the supply conductor and the car acts as a connection between it and the section above. As the motor car runs along, the magnet beneath pulls the little car



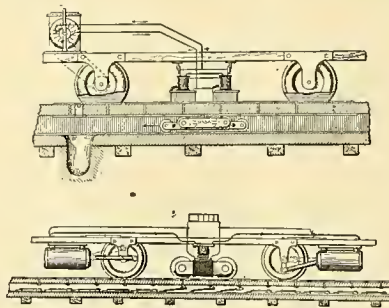
Section of Lineff Conduit.

in the conduit after it and thereby connects each successive section with the supply wire.

Then we have another system of Mr. Van Depoele's, in which are a number of levers inside of the conduit beneath the sectional conductor, and as a magnet moves along the switch levers are pulled up against the respective sections, and in that way the contact is made all along the line in each section of surface contact conductor. After

the car has passed and the magnet passed the section the lever beneath will drop back and disconnect.

We have a system of Lieutenant Patten's, which is very much the same as the Lineff system. It



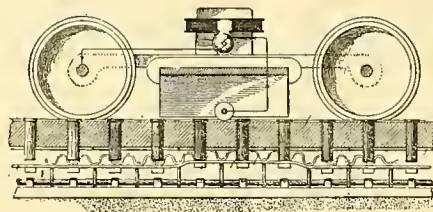
Van Depoele Magnetic Surface Contact System.

consist of a band of iron, as you see, and upon the car is mounted a magnet, the difference being that this magnet is placed transversely instead of longitudinally to the track. The band is pulled up against the rail by the magnet which forms the magnetic switching device, and also against a central contact which forms the sectional conductor.

And we have a system devised by Messrs. McElroy, Nicholson & McTighe. One of these as shown is very similar to one of the forms of the Van Depoele system. Instead of using a sectional rail contact, plates are used which are located between the track on boxes in which the switch mechanism is placed. The poles of the magnet are very long and project from the plate on one box to the next. In the box a small lever is pivoted and connected to the supply wire. When the magnet on the car is over the box the lever is attracted up against the

contact plate and connects the same with the supply wire, and the current is taken off by the long bar which forms the pole of the magnet. As will be understood, the long bar is long enough to span two contact plates.

There is another system, in which the boxes are located in the center of the track, devised by the



Patten's Surface Contact System.

inventors. Instead of having a lever an electro-magnet is used, and the current is sent down through each successive contact head and through the magnet, and the connection made between the contact plate and supply wire, just as in the magnetic switch by the magnetic plow. Instead of using a magnet at the bottom of the car, a brush or contact bar is used. The current is sent down through the head into the magnet, which then pulls up the switching device at the bottom instead of it being directly operated by the magnet on the car.

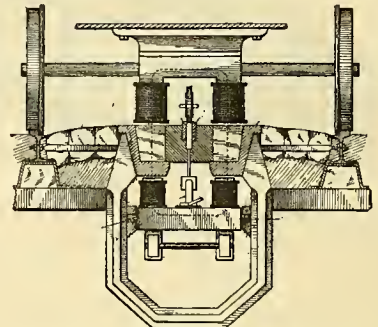
We also have a system which I have had a little experience with and which has made me a little doubtful respecting the ultimate success of the surface contact system. It is a system in which very much the same methods were adopted as in the McElroy, Nicholson & McTighe system. As in the last system described, contact plates are used, but the electro-magnets are not placed under the plates but in accessible manholes or placed upon posts along the road. A number of them controlling a section are grouped together. This shows the system. The brush, which is located under the car, is always in contact with two or more heads. The

conduit really consists merely of a small trough in which the wires are run to the various switching magnets which are all located together. The system was originally the invention of Mr. G. T. Woods.

(To be continued.)

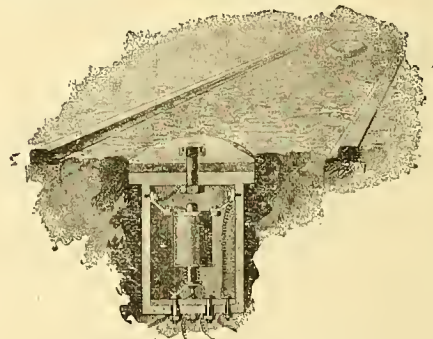
### COMPETITION OF TROLLEY LINES AND STEAM ROADS IN PHILADELPHIA.

The extension of the trolley lines to Germantown and the reduction of fares give that suburb of Philadelphia an almost unequalled transportation



Patten's Perfected Siemens System.

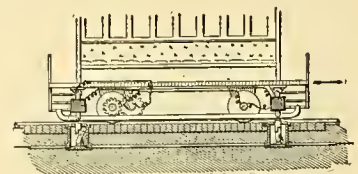
service. The residents can now reach the city by four different ways—the trolley lines of the People's Traction Company and the Philadelphia Traction Company and the Pennsylvania and Reading steam roads. The trolley lines are likely to draw a very large amount of traffic from the steam roads, for the competition is rendered serious, not alone by the frequency of the service and by the cheapness of the fare, but by the liberality of the transfer system introduced by the electric railway companies. Not only can the suburban residents ride almost ten miles into the city for five cents—that is, at the rate of about two miles for one cent—but



McElroy, Nicholson & McTighe's System.

when they reach the city they can obtain free transfers, so that without payment of additional fare can reach almost any part of the city. How the two railroad companies propose to meet this competition does not yet appear, but that they must make some concessions seems to be generally believed. A Philadelphia financial paper speaks of the subject in this way:

In the first place there is very little, if any, doubt as to the probable action to be taken by the



McElroy, Nicholson & McTighe's System

steam railroads—they will either have to reduce their fares or lose the bulk of a business which heretofore has paid them handsomely. It may all be true that the opening of the new electric lines will develop the territory through which they pass, and thus enable the steam roads to receive a proportionate share of the benefits to accrue; but it is also true that it takes time for such development, and meanwhile the steam roads must witness a diversion of their passenger traffic to the electric lines unless they can meet the inducements offered by the latter, which, at present, include lower fare and increased service. It is



already intimated that the Pennsylvania and the Reading will reduce fares, but to what extent is not known; even with the same fare as charged by the electric lines it is not certain by any means that they will be able to hold their recent proportion of the business.

#### NOTES ON ELECTRIC TRAMWAYS IN THE UNITED STATES AND CANADA.\*

BY H. D. WILKINSON.

During the period of the Chicago Exposition last year I had opportunities of looking into systems of street traction in that city, and of discussing points of immediate interest with engineers from different cities whom it was my privilege to meet.

For several weeks previous to the opening of the Exposition the scene for miles round was one of the greatest activity in the construction of street tramways, centering from all districts on the south side, and forming connections from the city main cable car line. The continuation of the elevated steam road to the Exposition along Sixty-third street was also a smart piece of work, including the erection of six stations and a pin-connected truss bridge across the Illinois Central Railroad track without obstructing traffic. Immediately this line was finished, trolley wires were strung underneath the girders, and the previous horse car lines, which had grown totally inadequate to the traffic, were converted into electric lines. The motor cars were rarely without trailers, and in the busiest times of the day two, and sometimes three, fully loaded passenger cars were hauled. The term "fully loaded," when applied to cars in America, must be understood in its most literal sense. Besides all standing and sitting room being taken up inside, the drivers' and conductors' platforms are closely packed, and people cling to the outsides wherever there is the smallest foothold. More than this, I have seen cars on busy days with people sitting on the window ledges and climbing on the roof, and the back end of the car framework weighted out of shape and scraping the ground. After seeing one motor car hauling two or three trailers, with 250 people, at the rate of 10 miles an hour, on roads with no drainage and covered with mud, I was convinced that the practice of putting two 25 or 30-horse motors on one car—which would otherwise seem a waste of material and power—was not unreasonable. The full power is, of course, not always wanted, and can be regulated by the controller to suit the traffic; but it is most important to have motors that will stand extra heavy work when required, and need no attention. During the year the number of passengers on all lines in Chicago was about 288,000,000, or an increase of 55,000,000 over the previous year.

The general type of construction in wide thoroughfares is with poles planted in the center of the road between the double track, carrying iron brackets for the support of trolley and feeder wires, and the general appearance is far from unsightly. This is specially the case when every other post supports an arc lamp or cluster of incandescents and the brackets are ornamental. Span wires are only necessary at curves and in narrow thoroughfares. The entire track construction, including rails and wires, costs about £1,400 per mile, and the car bodies, with motor trucks complete, cost about £800 per car. For a line, say, of five miles of track, with 15 cars, the power station, including building and machinery, would cost about £5,000, and real estate and car barns about £3,000—bringing the total cost of equipment to £27,000. The revenue per car-mile was from 20 to 30 cents, and the total running expenses 14 to 16 cents, or, on the average, about 60 per cent. of revenue.

The very energetic body of the American Street Railway Association is thoroughly representative, and its members, who are all engaged in tramway work, think nothing of traveling 1,000 miles to be present at their annual conventions. At these gatherings, which occupy three or four days, original papers and reports of investigations consigned to committees at the previous meeting are read and discussed. An exhibition of manufacturers' supplies is also held at the same time, and new electric cars of all kinds are put on the town lines and run on regular service. Members practically own the town during their stay; the largest hotels are full, rooms being taken by representatives of different concerns as temporary offices. The various companies and firms in the town send in invitations to visit power houses and works, books of tram tickets are distributed gratis, and the telephone companies place their lines at the disposal of members. Time will not allow me to do more than refer to the very pleasant participation I enjoyed in the last convention at Milwaukee, Wis. The papers read have appeared in our own technical press and are con-

sequently well known. The supplies comprised car bodies, trucks, motors, controllers, fuses and heaters, track scrapers and sprinklers, steel rails, points and crossings, compressed mica, and overhead line gear of all descriptions, everything that could be put in motion being supplied with electric current. Each member received a small choice souvenir of his visit, the gift of the newly elected president, Mr. Henry Payne.

I now pass on to some of the questions which are absorbing attention, and to describe what I saw of the working of different systems.

The directions in which improvements are sought comprise chiefly—

1. Better construction of roadbeds and tracks;
2. Better provision for the return circuit;
3. More uniform distribution of potential along the route.

Further, in the power-house, the chief questions are in the driving, governing, and safety devices, the best proportion of power between engine and generator, and the problem of flywheel inertia.

Beyond these there are the questions of practical and economic systems of delivering energy to cars in cities and crowded portions of towns, such as by the storage battery or underground conduit; and for long-distance transit the use of synchronous or of two or three phase motors with transmission of current by underground feeders at high tension.

Some of these questions have given rise to much discussion in America, and most of them have more or less a bearing upon the development of electric traction in our own country. It appeared to me, therefore, that I could in some measure further the progress of the industry in this country by making such observations and inquiries on the present working of tramways in the States and Canada as affected the immediate future; and I looked forward, on my return to the duty as well as the pleasure of bringing the results of these investigations before the members of this Institution.

During the summer of last year I visited the cities of Detroit and Milwaukee, and in November—on the completion of my official duties at the Exposition—the cities of Toronto, Montreal, Buffalo, Cleveland, Cincinnati, Pittsburg, Washington, and Philadelphia; making also a complete examination of the electric railroad recently erected on the Canadian side of the Falls. From the officials of the various companies whose lines and plant I investigated I met with the greatest courtesy and cordiality, and the expressed wish, not only on the occasion of my visit, but at any future time, to furnish such information as might be desired.

With regard to roadbed and track construction there is not much to be said, as the general conditions in America differ considerably from those in our own country. In many cities, and especially in the suburbs of large Western cities, the rails are allowed to project above the roadbed one inch or two inches, making very rough travel for other vehicles. In fact, the iron road is counted of the first importance in inducing people to live farther out of town and build on the prairie, while the road for the use of ordinary vehicles is of only secondary consideration. After a few years, as property goes up in the district, a better foundation is put in, and the roads are leveled up to the metals by paving blocks or glazed bricks. Whole suburbs spring into existence in the wake of the electric tramway. Enterprise in promoting schemes is chiefly due to estate-holders seeking to raise the value of their property, and it is remarkable that municipal corporations have given away important concessions for very trifling sums. These concessions after a few years generally become very valuable, and bring a good return to those who have sunk capital and taken risk; but it is now becoming more usual for corporations to look ahead and put in clauses that shall let some percentage of the profits come in for the improvement of the streets.

Practice in the Western cities of America is chiefly with T, flat or step rails, spiked down to wooden cross-ties or sleepers; but on the best lines and in most Eastern cities the channeled girder rail as used in England has been adopted on account of smoother travel, less noise and a flush road surface. The English construction of concrete foundation has been followed on some lines, using a 9-inch or 10-inch girder rail. The tendency now in the States is to put in very heavy girder rails (90-pound or 100-pound) spiked to wooden sleepers placed at about two feet centers, which allows a good deal of spring in the track, and tends to loosen the bond contacts. Some 72-pound channel girder rails I saw in progress of laying had grooves 1½ inches wide by 1 inch deep. The height and base both measured 6 inches. There was first an 8-inch foundation of concrete, upon which the sleepers (6 by 8 inches) were laid at 2 feet 3-inch centers and then grouted in. Sand was then tamped round the base of the rails to the depth of 2 inches, upon which the paving blocks were laid. The points and special work were of cast steel.

The question of returning the current direct to the power-house with as little leakage and loss in voltage as possible, is one of the most important in street railway problems. Excluding for the

moment insulated returns, the paths open for the return current from the cars to the power-house are:

1. By the rails and return feeders.
2. By supplementary wires.
3. By the earth.
4. By metallic pipes and cables laid in the earth.

The return feeders include not only those cables connecting the nearest point on the rails to the generators in the power-house, but cables brought in from more distant points of the line, as the configuration of the same and the load may require. In this matter everything depends on the position of the power-house with regard to the route of the line. The primary object in their use is to lessen the voltage losses at the distant portions of the line; but in some districts their use has been largely extended, in order to prevent electrolytic effects on gas and water pipes. The remedy for the latter is clearly to provide a metallic return of ample conductivity, and while on modern lines improved bonding has done much to effect this, the addition of return feeders has had the desired effect in older and badly bonded lines. In Cleveland, Ohio, for instance, I found a very extended use of return feeders, and I was informed by Mr. Charles W. Wason, Vice-president and electrical engineer of the East Cleveland Railway Company, that he had resorted to their use entirely on account of electrolytic troubles with the water pipes of the city, with the result that the action ceased, and, in addition, about 25 per cent. of the voltage was saved. Some idea of the advantage of a saving in volts, apart from the consideration of speed of cars, can be gained from the fact that the current reached 3,000 amperes, and that for, say, 50 volts lost on the line every 1,000 amperes means a continuous loss of 70 H. P. The return feeders in this city are carried overhead, and are connected by riveted joints to the rails at about every 500 feet. In Buffalo, also, I observed an extensive use of return feeders, carried underground with the outgoing feeders within the city limits, but overhead farther out.

Coming now to bonding, I have seen many different specimens of this work, and have some samples here to-night for the members' examination.

[The author described at length styles of bonds that he had seen in use in the United States.]

Some of the older lines in the States, laid before the value of good bonding was appreciated, show an enormous loss of voltage from this cause. I was informed that on an old line in Richmond, Va., the bonding was done by No. 6 iron wires, and the same bonds used for a recent extension of 2½ miles, with the result that of 500 volts put into the line not more than 210 appeared at the distant end. The matter was investigated in consequence of bad working, and good copper bonds substituted for the iron wire, with the result that the loss was reduced to five per cent.

Bond wires are subject to corrosion by electrolytic action, especially in alkali soils. The wires, consequently, become thinner and conduct badly, and some of the current is shunted round the joint to earth, thus increasing the corrosion. Again, when the wires get very thin they become heated and fuse, thus throwing extra load on other feeders. I was informed that the action was prevented by painting the wires, or coating them with shellac and asphaltum. The section or number of bond wires has, of course, to be increased nearer the power station.

The conductivity of the return circuit has been increased on some lines by the use of a supplementary wire, which is usually of bare copper ¾-inch or 1-inch diameter, laid along the center of the track. Cross connections from all bond joints are made by copper wire twisted and soldered to the supplementary wire, and on double tracks the supplementary wires of each track are connected every 30 yards. I saw new lines being laid with these wires in Chicago and Detroit, but I have also seen lines freshly opened up where the supplementary wires were considerably corroded, and was informed that their life was about two years. There were so many joints in the system, the wires used were so small, and were of such poor conductivity in comparison with a well-bonded rail, that the expedient appeared to me to be temporary and unreliable. In fact, I gathered that one of the chief uses of the wire was that its presence allayed to some extent the anxiety of the city authorities, otherwise harassed by water and gas-pipe corrosion.

I next come to the earth as a return. I found that earth connections were made on most lines at their lowest points and at the power-house. Such connections were made by sinking old car wheels or driving rails or pipes in moist earth and making as good a connection therefrom to the rails as possible; but, from all I could learn not much reliance was placed on such returns. The extremes of weather no doubt have something to do with it, as hard, dry earth is a bad conductor. Even wet mud, in comparison to the rails, is a poor conductor, as is evidenced by the brilliant arcing at the wheels of cars running on a muddy rail. In

\* Abstract of an article read before the Institution of Electrical Engineers, London.



the *Street Railway Journal* for last December some tests by Mr. James D. Rostron, chief engineer of the Union Railway Company of Chester, Pa., bearing upon the conductivity of the earth as a return, were published. Mr. Rostron obtained an average of 285.5 amperes through the track and supplementary wires, 12.8 amperes through the city water mains and only 0.51 through the earth plates sunk in creeks. If this is confirmed by further tests it shows that the conductivity of the earth as a return is not high, but depends upon the presence of metallic conducting matter within it. While in Chicago, I made some tests to ascertain the approximate conductivity of the earth, and the difference of potential required to force current through pipes not metallically connected to a circuit. I laid some lead and iron pipes in earth, and at  $1\frac{1}{2}$  inches distance above them I placed two iron plates as electrodes, 6 feet apart. Each plate offered 20 square inches of surface, and the current passed partly through the 6 feet of earth from plate to plate through clay, sand and mold, and partly through  $1\frac{1}{2}$  inches of earth at either end (clay and mold), and along the pipes. I expected the resistance of the latter part would be almost nil, and, as I had 120 volts at disposal, I first put a resistance in series of four 105-volt lamps in parallel. I found, however, that the earth resistance was far more than I anticipated, and I removed three lamps with very slight increase of volts on the remaining one. The current was then half an ampere, and the earth absorbed 20 volts. A few days after, I obtained current from a 200-volt circuit, and put the four lamps on again. I then had  $2\frac{1}{2}$  amperes, with 100 volts absorbed by the earth. After keeping the current on for two weeks, the pipes were taken out, and were found to have a pitting of white scale in places at the negative ends. The scale was in white lumps, which, upon being scraped off, revealed the starting of little holes about  $\frac{1}{32}$  of an inch diameter. This proved that some of the current, if not almost all, had passed by the pipes through the 3 inches of clay and mold. While I attribute this high earth resistance to the clay, which had set hard, I am still of opinion that the earth has more resistance than is generally imagined, and that to attract current in anything but very minute amounts from a well-bonded rail to earth requires special conditions, such as deeply sunk plates, metallic connection to pipes, the ground saturated with moisture, or an excessive density of current in the bonds. I was informed by Mr. C. H. Morse, the city electrical engineer of Cambridge, Mass., that in some tests he made at Saginaw, Mich., for the gas company there, he was surprised to find that pipes were eaten away in two or three months under a return current which did not exceed 500 amperes. The soil was, however, very moist clay, and the rails were connected to earth plates.

(To be continued.)

#### NEW ENGLAND NOTES.

(From Our Special Boston Correspondent.)

The Governor is being petitioned to pardon the employees of the Old Colony road who were convicted of riot in interfering with the construction of the electric road at North Abington, as mentioned in the last issue of the *STREET RAILWAY GAZETTE*. It is likely that they will be released.

It is reported that large railway generators in the future will be constructed at the Lynn works of the General Electric Company.

Objections have been made to the proposed route of the Braintree & Weymouth Electric Street Railway by residents of Braintree and by the New York, New Haven & Hartford Railroad Company. The latter company objects to the crossing of its tracks at grade. The selectmen of Braintree, which have given a hearing in the matter, have not yet reached a decision.

The street railway companies throughout New England suffered little from the recent severe storms in comparison with the electric light, telephone and telegraph companies. The latter companies, it is stated, have about 10,000 men employed in effecting repairs.

The dispute between the West End Street Railroad Company and its employees has been adjusted, and the danger of a strike seems to be over.

In a few days electric cars will be run through East Boston to Winthrop Junction. The equipment is nearly complete.

#### CANADIAN NOTES.

(From our Special Ottawa Correspondent.)

**Toronto.**—The use of electric cars is to be tried for filling up waste land at Ashbridge's Bay.

**Toronto.**—The gross earnings of the Street Railway Company for the ten months of 1894 amounted to \$803,377.

**Ottawa, Ont.**—The Street Railway Company has made arrangements for enlarging the present car

sheds, and Messrs. Arnold & Calderon have been engaged to draw plans for the work in the spring.

**Toronto.**—The largest engine ever manufactured in Canada for generating electricity was put in motion this week at the power-house of the Toronto Railway Company. It cost \$50,000 and is 1,200 H. P.

**Ottawa, Ont.**—There are now in the process of incubation in the Ottawa district three electric railway schemes of considerable importance. These are: first, the proposal to connect Ottawa and Brockville by electric road; the Hull and Aylmer scheme; and the Buckingham project.

**St. Catharines, Ont.**—The Point Abino Street Railway Company is applying for a charter to construct a street railway in the municipalities of Bertie, Humbertstone and Wainfleet and the villages of Fort Erie and Port Colborne, in the county of Welland. The amount of capital stock of the company is to be \$100,000.

**Niagara Falls, Ont.**—Notice is given that application will be made at the next session of the Legislature of Toronto for an act to incorporate the Toronto, Hamilton and Niagara Falls Electric Railway Company, with power to construct an electric railway from Toronto to Hamilton, thence to the Niagara River at or near Niagara Falls; and also a branch line from the village of Grimsby to Smithville and Dunnville.

**Oshawa, Ont.**—Capt. Carter, whose charter for the construction of the electric street railway has lapsed, is after a new charter. He appeared before the City Council last week and proposed to go on now and begin the construction of the road within ten days, and place a deposit of \$2,000 to the credit of Mayor Cowan in the Western Bank here on that date, to be forfeited should the first section be not completed by May 31, but to be returned should the first section be completed and in operation by Jan. 1, 1895. After a good deal of talking and wrangling it was decided to further consider the matter at a special meeting of the council to be held on Tuesday, 13th inst.

#### COMMENTS AND VIEWS OF CONTEMPORARIES.

**MONTREAL CONVENTION.**—We bespeak for the American Street Railway Association a hearty welcome to Montreal and the Dominion on the occasion of this their first visit, and feel assured that while here they will find much that will prove interesting and perhaps instructive from the electrical standpoint.—*Canadian Electrical News*.

**NEED OF CAUTION.**—Dense fogs are a prolific source of danger in the operation of steam railroads, and many serious accidents have originated from this cause. They must also be taken into account in running electric street cars. They impose additional precautions upon the public also. The rule which the courts have laid down for the guidance of those about to cross a steam railroad, requiring them to "stop, look and listen," could be appropriately applied to city street railways also, particularly when fogs obscure the roadway. An accident occurred yesterday in Pittsburg by the collision of electric cars, the motorman being unable to see the road because of the mist.—*Philadelphia Ledger*.

**WHAT THE TROLLEY LINE HAS DONE.**—The trolley lines have already provided clean, comfortable, commodious cars, which are run more frequently and at greater speed than the old horse cars; they have multiplied the conveniences of transfers, and they have reduced from a double to a single fare the charge made on one of the longest lines leading to the suburbs. There are great advantages arising from the use of electricity for street car propulsion, and no one doubts that they will be multiplied in the future by extensions of the several lines and by the adoption of new electrical and other inventions intended to increase the comfort of riders or to relieve the system of its few objectionable features.—*Philadelphia Public Ledger*.

**GOOD ROADS AND TROLLEY LINES.**—When the railroad came into existence, two generations ago, the effort to secure good common roads in America was abandoned, because it was fancied that with the development of the railroad the common road would not be needed. But experience has shown that the greater the travel on the railroads the greater the travel on the common roads, and hence that the latter are really a greater necessity than ever. And we will learn the same lesson from the extension of the trolley system, for travel begets travel. How unwise it will be, therefore, just as we are on the eve of securing for ourselves and our children a good system of country highways, to give them over to these private corporations for a use quite foreign to that for which we improved them.—*Harper's Weekly*.

**SHOULD ALSO PURCHASE MR. PERRY'S BOOK.**—It is somewhat remarkable that so little stress has been laid upon this point in the current discussion

of the trolley service. Whatever he may be in point of fact, the motorman should not be simply the horsecar driver "broken in" for trolley work by a few lessons in handling electric levers and brakes. It requires little intelligence to drive a pair of street-car horses; it requires a great deal to handle electric machinery properly. The motorman cannot know too much about electricity and the complicated action of "short circuits," "cut outs," "grounds," "crosses" and other phenomena with which he is likely to have to do, and, not only this, but he must exercise superior ability quite apart from any electrical connection. As his car moves more swiftly than a horse car, so he must have a keener eye for obstacles, must be prepared to act more quickly in an emergency, must keep his attention on the strain all the time, instead of drowsily letting his team drive itself, as a car driver often can and does do.—*Philadelphia Bulletin*.

## FINANCIAL DEPARTMENT.

### Financial Notes.

**Manhattan Directory.**—At the annual meeting of the Manhattan Railway Company, of New York, Nov. 15, George Bliss was elected to the directory to take the place made vacant by resignation of J. Pierpont Morgan.

**Sale of the Saginaw Road.**—The horse-car line known as the City of Saginaw Railroad, at the head of which was ex-Governor Jerome, was sold on Nov. 12 to the Union Street Railway Company, and will be equipped with electricity. All the street car lines of the city will now be under one management.

**Central Cross-Town (New York) Report.**—The Central Cross-Town Railroad Company reports, for the quarter ended Sept. 30: Gross earnings from operation, \$125,318; operating expenses, \$94,161; net earnings, \$31,156; other income, \$1,190; gross income, \$32,547; fixed charges, \$36,254; net income, \$3,092; cash on hand, \$22,288; profit and loss (surplus), \$10,723. The net income for the same quarter last year was \$6,313.

**Third Avenue (New York) Annual Meeting.**—The Third Avenue Railroad Company held its annual meeting Nov. 14. This is in part a statement of the operations of the company: Received from car passengers in 1894, \$2,607,804.83; in 1893, \$1,653,539.33; increase, \$354,265.50. Gross income in 1894, \$964,472.28; in 1893, \$557,607.45; increase, \$405,864.83. Net income in 1894, \$635,004.54; 1893, \$309,068.15; increase \$325,936.39. Surplus, \$75,004.54.

**Second Avenue (New York) Report.**—For the quarter ended Sept. 30, 1894, the Second Avenue Railroad Company, of New York City, reports: Gross earnings from operation, \$284,593; operating expenses, \$190,853; net earnings, \$93,740; other income, \$625; gross income, \$94,365; fixed charges, \$44,169; net income, \$50,196; cash on hand, \$77,661; profit and loss (surplus), \$61,459. The net income for the same quarter last year was \$55,099.

**Vallamont Traction (Williamsport, Pa.) Under New Control.**—On last Saturday the management of the Vallamont Traction Company's system was formally taken charge of by Manager E. H. Davis, of the Lycoming Improvement Company. This company now has under its direct management the Williamsport Passenger Railway, the Lycoming Electric Company, the East End Passenger Railway and the Vallamont Traction Company. The Southside Railway will also be turned over to the same management after it has been opened for travel. Manager Davis will have charge of these combined interests.

**Manhattan Quarterly Statement.**—The report of the Manhattan Railway Company for the quarter ended Sept. 30 shows that the traffic is still being cut down by the competition of surface lines. The following are the figures:

	1894.	1893.	Changes.
Gross earnings.....	\$2,049,810	\$2,379,420	Dec. \$329,610
Operating expenses....	1,250,635	1,300,806	Dec. 50,171
Net earnings.....	\$799,175	\$1,078,614	Dec. \$279,439
Other income.....	37,500	35,000	Inc. 2,500
Total income.....	\$836,675	\$1,113,614	Dec. \$276,939
Fixed charges.....	660,227	644,699	Inc. 15,528
Surplus.....	\$176,448	\$468,915	Dec. \$292,467

**Investigation of Brooklyn Roads.**—H. M. Thompson, of New York, former secretary of the Brooklyn City Railroad Company, recently filed a complaint with the State Board of Railroad Commissioners alleging that the reports of the Brooklyn City Railroad Company, the Brooklyn Heights Railroad Company and the Long Island Traction Company were not correctly made, and asking that the books of these companies be examined. The companies mentioned, which are practically under one management, have filed an answer with the Railroad Commissioners demanding an investigation. The board has decided to grant their request and Secretary Charles R. Defreest will commence an examination of the books at once.



The board will not give out either the complaint or the answer.

**People's Traction Company in Control.**—At a meeting last week of the Chestnut Hill and Spring House Turnpike Company, at Flourtown, Pa., the road passed into the control of a syndicate of Philadelphians, representing the People's Traction Company, whose purpose is to lay a trolley road on the turnpike from the convent at the foot of Chestnut Hill to Fort Washington. The following officers were elected: President, Daniel Williams; secretary, Charles O. Kruger; treasurer, Stephen Crothers; managers, Stephen Crothers, H. C. Moore, William Shelmire, R. N. Corson, Charles N. Welsh, Daniel Yeakle, J. Levering Jones, John Faber Miller, James M. Gregg, Jr., D. D. Yeakel and J. C. Guldin. The office of the company will be removed from Flourtown to Philadelphia.

**Report of the Ann Arbor & Ypsilanti Road.**—The annual report of the Ann Arbor & Ypsilanti (Mich.) Street Railroad Company shows the road carried over 80,000 passengers during the year just closed, and the receipts paid all operating expenses, including the maintenance of track and rolling stock, which are in first-class shape. For eight months there was no street car connection at the Ann Arbor end. Now that the electric cars are running, business is rapidly increasing. The express business is increasing to the advantage of the United States Express Company, the railroad company and especially to the citizens of Ann Arbor, who have been getting better service and cheaper rates than formerly. The officers were re-elected as follows: President, J. E. Beal; vice-president, H. P. Glover; secretary, J. T. Jacobs; treasurer, D. L. Quirk.

**Report of Rome (N. Y.) Railway.**—The quarterly report of the Rome City Street Railway Company to October 1, 1894, shows the gross earnings to have been \$3,168.23, and the income from other sources \$89.58, making the total receipts for the quarter \$3,257.81. The operating expenses were \$2,264.93; gross income, \$992.88. The company has been compelled to pay back taxes on gross earnings for seven years under the statute of 1880, amounting to \$418.61. The net earnings of the Rome City Street Railway Company for the quarter were \$512.01. The earnings of the quarter were about \$600 in excess of the earnings for the same period last year. The operating expenses of the past quarter include \$200 paid for horses and \$150 for expense of obtaining consents to change the motive power. It is the opinion of the directors and stockholders that a change of motive power is very desirable, and that the earnings of the property can be doubled by making such change.

## NEW INCORPORATIONS.

**New York, N. Y.**—The American Iron Car Company has been incorporated with a capital stock of \$5,000. The company will manufacture passenger and electric railway cars, etc. The promoters are Carroll Sprigg, Mr. Gates, Henry Briderman, E. L. Pierson, New York city, N. Y.

**Tacoma, Wash.**—The Atlantic & Pacific Improvement Company has been incorporated. The capital stock is \$500,000. The company proposes to buy and sell personal property and real estate; build and operate steam and electric railways, saw-mills, brickyards, etc. The promoters are Chas. B. Mortice and Jno. R. Mortice.

**Jersey City, N. J.**—The Mannesmann Tube Company has been incorporated with a capital stock of \$10,000,000 to manufacture tubes, iron, rails, pipes for steam, water and gas, construct railways of all kinds. The promoters are Robert Mannesmann, Bayonne, N. J.; Emil Kipper, Adams, Miss.; Chas. Howard Williams, New York city, N. Y.

**Mount Vernon, O.**—The Mount Vernon & Walhounding Electric Railway Company has been incorporated. The capital stock is \$50,000. The company propose to build a railway to be operated by electricity or other motive power other than animal between Mount Vernon and Walhounding, O. The promoters are Fred. T. Botzum, W. F. Bullinger, A. D. Bunn, Desault B. Kirk, H. D. Critchfield, Harry C. Devin.

**Cleveland, O.**—The Cleveland and Elyria Electric Railroad Company has been incorporated by Messrs. F. T. Pomeroy, M. A. Sprague, A. W. Bishop, C. W. D. Miller, Leon M. Coe, Will Christy and A. H. Pomeroy. The capital stock is \$200,000. It is proposed to construct and operate an electric railway, single or double track, which shall carry packages, freight, United States mail, express matter and baggage, as well as passengers, and have the privilege of furnishing electricity, to be generated by either steam or water power, for light, heat or power along its line. The route will begin in the city of Cleveland and run westerly through the counties of Cuyahoga and Lorain to Elyria, with branches to the cities of Wellington and Oberlin. The headquarters of the company are to be at Berea.

## NEWS OF THE WEEK.

**New York, N. Y.**—Work has begun on the Thirty-fourth street extension to Lexington avenue.

**Elizabeth, N. J.**—The wires for the electric railway are now strung, and the track construction is complete.

**Chicago, Ill.**—The Thirty-ninth street cross-town line of the Chicago City Railway Company is now operated by electricity.

**Philadelphia, Pa.**—It is stated that the operation by electricity of the main line of the Hestonville road will be begun about Nov. 20.

**Newark, N. J.**—The Consolidated Traction Company is now constructing a large repair shop. This will be complete in all respects, and all necessary appliances will be introduced. The side walls are now being built.

**Niagara Falls, Ont.**—The Niagara Central Railroad has been sold to the Hamilton Electric Radial Railway Company. The purchase price is stated to have been \$400,000, and the company will make some extensive improvements in the road.

**Baltimore, Md.**—The Baltimore Traction Company has secured the controlling interest in the Gwynn Oak road, and Gwynn Oak Park will be operated the coming season by the company. Extensive improvements are contemplated at the park.

**Montreal, Que.**—The roof of the Montreal Street Railway Company's unfinished building on the corner of Craig street and Place d'Armes, fell in on Nov. 9, killing two men and seriously injuring several others. The loss on the building will be heavy.

**New York, N. Y.**—Fire was discovered in the cupola of the Third Avenue cable station at Sixty-fifth street on Nov. 10. Books and papers belonging to the company, and the clock on the front of the building, were destroyed. Damage was done to the general offices in the upper part of the building. The origin of the fire is not known.

**St. Louis, Mo.**—Contracts for the construction of seven miles of the Kirkwood Electric Railway have been awarded to the Penney-Myers Construction Company, and the work will be commenced at once. The road is to be built eventually from St. Louis to the suburban town of Kirkwood, 14 miles from the city. The road will carry freight as well as passengers.

**Newark, N. J.**—According to an ordinance of the City Council, all the cars of the Consolidated Traction Company were to be equipped with fenders by the 1st of November. The company, after considerable experimentation, decided to equip its cars with Darrach and Field fenders. About 100 of each type are now in service, and they appear to be doing their work well.

**Brooklyn, N. Y.**—The Nassau Electric Railroad Company was recently stopped in the construction of a line on Marcy avenue, by an injunction secured by property owners who proved that the necessary consents had not been obtained by the Company. Since that time the company has secured the consent of the owners of the requisite frontage and construction will soon be resumed.

**New York, N. Y.**—The transfer system of the Metropolitan Company has been developing with a most marvelous rapidity within the last few years. In 1888 only about 1,000,000 transfers were issued. In the following year the figures were doubled. This year the increase has progressed to such an extent that over 1,000,000 transfers were issued during the month of October. The company now has 15 transfer stations.

**Philadelphia, Pa.**—The Commissioners of Fairmount Park have sanctioned the grant of a franchise to William Wharton, Jr., for an electric and gravity road in the Park. The amendment to the license provides among other things, that no roads shall be crossed at the grade, but by stone bridges. Iron bridges were not regarded with favor, as several of the commissioners thought that the rumbling of cars over them would tend to frighten horses.

**Philadelphia, Pa.**—The Electric Traction Company, of Philadelphia, will equip the cars of the Lombard and South streets line with the Robins life-guard. About 20 cars are run on the line and each will be equipped with the new fenders. This line was selected, President Sullivan said, because it runs on narrow streets and through a very thickly populated section. In summer especially, the children of the neighborhood almost live in the streets.

**Clarksboro, N. J.**—The citizens of Clarksboro and the adjoining towns and villages propose to organize a trolley company to build a road from Swedesboro to Woodbury, and from Mullica Hill to the Delaware River, taking in the towns of Mullica Hill and Paulsboro. A meeting has been held and a temporary organization effected by the election of John S. Somers, of Clarksboro, president, and ex-

Assemblyman James J. Davidson, of Swedesboro, secretary.

**Connecticut State Street Railway Association.**—The annual meeting of the Connecticut State Street Railway Association will be held at New Haven, Conn., Nov. 21. The officers of the association are: President, H. H. Wood, Derby; vice-president, H. S. Parmelee, New Haven; secretary, R. A. Fosdick, Stamford; treasurer, E. S. Goodrich, Hartford; executive committee, A. M. Young, Waterbury; G. A. W. Dodge and J. A. Kelsey, New Haven.

**Chicago, Ill.**—The stockholders of the Metropolitan West Side Elevated Railroad Company have recently voted to make several extensions to their road. At a recent meeting resolutions were adopted providing that the company build branch lines to the northern limits of the city, to the village of Blue Island and to the town of Cicero. The company does not, however, intend to commence this construction until that part of the road this is now under construction is finished.

**Philadelphia, Pa.**—The Street Railway Committee of City Councils will report favorably the bill granting trolley privileges to the Philadelphia Suburban Passenger Railway Company over about 35 miles of streets in the Twenty-first, Twenty-second, Twenty-third, Twenty-eighth and Thirty-third wards. The committee voted to report favorably the bill giving trolley privileges to the Philadelphia, Narberth & Bala Passenger Railway Company in the Thirty-fourth ward.

**Oakland, Cal.**—Judge Ellsworth has affirmed the decision of Justice Clift in favor of ex-Motorman Robert Corman against the Oakland, San Leandro & Haywards Electric Railway Company for the recovery of his \$25 deposit left with the company when he entered their employment. The company discharged Corman after his car had run into a buggy, and refused to give him back his money, although the company did not have to pay out anything as damages. The motorman recovered costs as well as his deposit.

**Toledo, O.**—Dr. Gardner, president of the much-talked-of Toledo, Monroe & Detroit Electric Railroad, says that the money necessary to build and equip the road has been secured, and that the work of construction will begin this fall. Besides the road running north and south of Monroe to Toledo and Detroit, the company, it is announced, will build lines in Monroe from the city boundary at the west to the piers, thus opening up and facilitating travel to the popular resort. The company already has a franchise at Monroe granting the use of certain streets for their line.

**Mantua, N. J.**—The construction of the extension of the Camden, Gloucester & Woodbury Electric road to Mantua was commenced a few days ago, when the grading of the route by the citizens was begun, and the work will be pushed forward rapidly with the hope of having the line in operation by the latter part of next month. The citizens here are greatly pleased at the prospects of having trolley connections with Philadelphia, and are lending their aid and money to help the project along. While the railroad company will not have to pay for the grading of the road, yet the extension will cost them in the neighborhood of \$30,000.

## PERSONALS.

**Mr. Robert N. Wallis** has been elected treasurer of the Filchburg & Leominster Street Railway, vice B. F. Wallis, who resigned on account of poor health.

**Mr. E. P. Vining**, formerly traffic manager of the Union Pacific Railroad, and arbitrator of the Western Passenger Association, is to take full charge of the consolidated street-car lines in San Francisco.

**Mr. J. Hood Wright**, of the banking firm of Drexel, Morgan & Co., of New York, died suddenly from heart disease last Monday. Mr. Wright was interested in a considerable number of electrical enterprises.

**Mr. Abbot P. Smith**, who recently resigned the position of general manager of the Union Street Railway Company, of New Bedford, was presented by the employees of the road a solid mahogany desk, a brass lamp and stand.

## TRADE NOTES.

**The Shawmut Fuse Wire Company**, of Boston, has just issued a new descriptive catalogue and price list of its fuse wire and fuse links. The catalogue contains an article on fuse wire and its use, which will be found to contain many facts of interest and value.

**Pullman Contracting Office Discontinued.**—A communication from Pullman's Palace Car Company, Chicago, states that the office of contracting agent having been abolished all communications relating thereto should be addressed to the general manager's office.



**The Graham Equipment Company**, of Providence, R. I., has received several large orders for trucks of late, and reports that the prospects for business are excellent. The company's truck appears to be giving great satisfaction wherever it is in use.

**Westinghouse Boston Office.**—The office of the New England agency of the Westinghouse Electric and Manufacturing Company, formerly located at No. 620 Atlantic avenue, Boston, Mass., has been removed to Exchange Building, No. 53 State street, Boston, Mass.

**Okonite Wire in Brooklyn.**—The City of Brooklyn, N. Y., is replacing all the old cables and wires of the Police Telegraph Bureau with the Okonite Company's products. Mr. F. C. Mason, the efficient superintendent of telegraph, has without doubt the most compact and complete system of any municipality in the country.

**Work of the Berlin Iron Bridge Company.**—The new machine shop for the American Hard Fibre Company, at Newark, Del., is now completed. It was designed and built by the Berlin Iron Bridge Company, of East Berlin, Conn., and is 50 feet wide by 326 feet long, the roof being made of steel and covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron roof covering. The New England Electrolytic Copper Company, at Central Falls, R. I., has just completed an addition to its works made entirely of iron and steel and furnished by the Berlin Iron Bridge Company.

**Electric Heaters in Trenton.**—The Trenton Passenger Railway Company has recently equipped 31 cars with the new iron front electric heaters manufactured by the Consolidated Car Heating Company of Albany, N. Y. These heaters are of the latest type, and are provided with a temperature regulating switch having five intensities of heat, using from two amperes up. Each car is equipped with six heaters having a very large radiating surface, there being about 400 feet of wire in the coils of each radiator. The cold air is taken from the sash space back of the seats instead of just above the floor, as in former practice. The radiators are of neat design and add to the attractive appearance of the cars.

**The Sperry Electric Railway Company** has just issued a new catalogue which describes its electric railway apparatus. In this little pamphlet is illustrated and described the new single motor equipment, in which all the driving wheels are coupled and revolve in unison. The company claims that far greater efficiency is obtained than when the separate motor is coupled to each axle. The catalogue contains several illustrations of cars in different cities where Sperry motors are used, and cuts of the motor complete and of all its parts are presented. Views in the factory are also given. A considerable part of the catalogue is devoted to a description of the Sperry electric brake, which was recently described in full in Mr. Sperry's paper before the American Institute of Electrical Engineers.

**Belt Dressing.**—No one using leather belts can afford to be indifferent to their care. There is a certain amount of elasticity in all good leather belting, but time and continued hard work seem to destroy or at least weaken its power. Then comes the question whether it is better to simply tighten the belt or use some form of dressing. Experience of many very practical observers seems to favor the use of a good dressing, as tightening the belt strains it and calls for more engine power. A dynamo engineer who is transmitting 60-65 H. P. with a 50-foot link belt 8 inches wide, running from a 72-inch pulley on driving shaft to a 13-inch pulley on dynamo, claims that freedom from jumping and flickering of the lights is due entirely to the belt dressing used, and that tightening never helped. The superintendent of a large printing establishment has an 18-inch main belt now running its eighth year which has never been taken up, and it would be extremely hard to convince him that the dressing used does not preserve the life of the leather and keep it soft and elastic. Of course one should be careful what sort of dressing is used. Soap, rosin, tar and tallow should not be used at all. Even castor oil is criticised. The dressing used in the two cases cited was Dixon's belt dressing and leather preservative, which was the only article that would start the big driving belt used at the Paris Exposition in 1878 and keep it from slipping. Circulars about the dressing will be sent to any one interested by the Dixon Crucible Company, Jersey City, N. J.

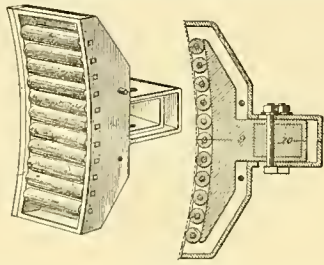
## RECORD OF STREET RAILWAY PATENTS.

### U. S. Patents Issued Nov. 6, 1894.

**528,539. Rheostat;** John C. Fyfe, Chicago, Ill., Assignor to one-half to James Hayes, same place. Filed April 27, 1894. This method of ventilating and insulating layers of electrical conductors consists in separating the layers with silicate of soda and then subjecting them to heat sufficient to crystallize the silicate.

**528,553. Brake-shoe;** John O'Brien, Gracedale, Pa. Filed May 28, 1894. The brake-shoe has a series of rollers supported in the side walls and adapted to bear upon a wheel. The brake-shoe is loosely arranged within the casing having a face adapted to bear upon the rollers, the shank extending into the projection of the casing and being adapted to receive the end of the brake-beam. (See illustration.)

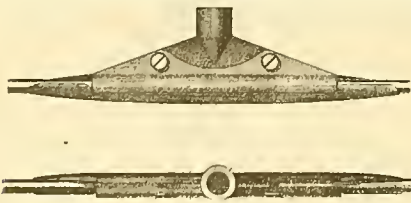
**528,561. Trolley-wire clip;** James W. Perry, Philadelphia, Pa., Assignor to the Johns-Pratt Com-



No. 528,561.

pany, Hartford, Conn. Filed May 5, 1894. The clip has means for attachment to an insulator, with a trough or pocket for the wire. The walls of latter are formed by separate parts that are held together on one side of the wire by a non-adjustable fastening and on the other side of the wire by an adjustable fastening. (See illustration.)

**528,647. Storage Battery;** Charles J. Reed, Philadelphia, Pa., Assignor to the Reed Electric Company, same place. Filed June 3, 1894. The positive electrode is surrounded by a perforated envelope not readily attacked by the battery liquid. The negative electrode consists of vertically disposed strips located on opposite



No. 528,647.

faces of the surrounding protecting casing. A spirally disposed strip of lead is wrapped around the entire mass, having its ends secured thereto.

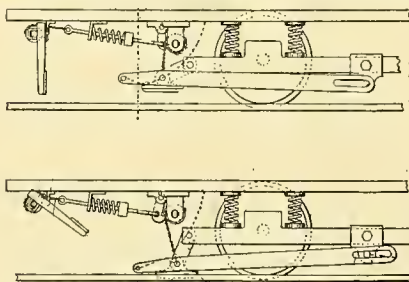
**528,685. Trolley-Catcher;** Albert S. Osborn, Rochester, N. Y. Filed May 9, 1894. The trolley-catcher combines a spring-operated shaft, a winding-head attached to the shaft, a fixed ratchet, a spring-operated detent which engages with the ratchet, a cord-holder with which the cord engages and a connection extending from the cord-holder to the detent, whereby the disengagement of the trolley from the wire draws upon the cord-holder, disengages the detent from the ratchet, and causes the cord to wind on the head.

**528,740. Secondary Battery;** Elias M. Poston, Springfield, Ohio. Filed Jan. 29, 1894. The outer casing is formed in sections, each section being provided with internal projecting lugs or shoulders. Non-conducting porous plates rest against the shoulders, and a peripheral opening extends through the outer walls of the casing between the porous plates. Positive and negative electrodes are adapted to close the ends of the re-

spective sections, active material being between said porous plates and electrodes.

**528,744. Insulating Compound;** Oscar Stiles, Omaha, Neb. Filed March 26, 1894. The compound consists of the combination of the following ingredients: Asbestos, alcohol, shellac and mica.

**528,766. Fender and Brake for Street Cars;** Jacob S. Detrick, Baltimore, Md. Filed Oct. 11, 1893.



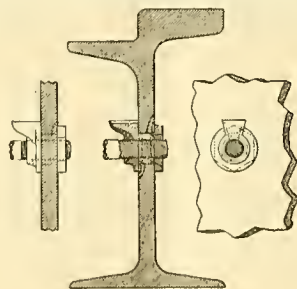
No. 528,766.

A flexible apron is secured to the under side of a car body and in front of the wheels. Mechanism supports the lower end of the apron above the track rails. There are brake-shoes on the supporting mechanism, with actuating devices available to release the lower end of the apron, so it will pass over the object which is struck. (See illustration.)

**528,767. Trolley Line Breaker;** Charles H. Dey and Johan M. Anderson, Boston, Mass. Filed Feb. 16, 1894. A double insulation separates the line terminals, and a non-conductor is interposed between the terminals which the trolley wheel engages when passing from one terminal to another. There are auxiliary removable terminals co-operating with the line terminals.

**528,788. Bond for Electric Railways;** Henry B. Nichols and Frederick H. Lincoln, Philadelphia, Pa. Filed Sept. 20, 1894. The bonding joint comprises a rail provided with an opening, a bonding wire, nuts engaging therewith and provided with flanges engaging the opening of the rail. One of the nuts is provided with a pour-hole to permit of molten metallic material being introduced so as to expand and establish an air and water tight connection of the rail with the bonding wire. (See illustration.)

**528,796. Motor for Street Cars;** Harvey S. Park, Chicago, Ill. Filed Dec. 5, 1893. This is a primary motor having a continuous and constant speed approximately, a secondary motor receiving and storing



No. 528,788.

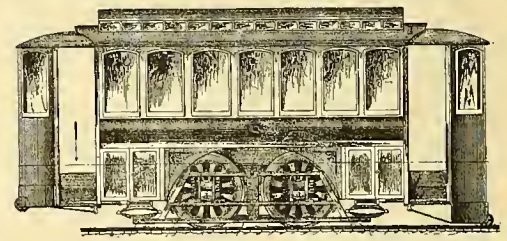
power from the primary motor. A controlling mechanism for the primary motor automatically operates to throw the motor out of use as the secondary motor reaches the limit of power.

**528,845. Railway Car;** Charles H. Barrows, Wilkes-Barre, Conn. Filed Feb. 9, 1894. The car body has a longitudinal passenger compartment and transverse,

spaced, battery compartments at or near the end of the passenger compartment and below the door thereof. A truck frame is situated between the battery compartments and has at its ends the bearings or cushions upon which rests the car body. The axles are journaled in the truck frame, and a motor is carried by the truck frame and geared with the axles. (See illustration.)

**528,860. Brake for Railway Cars;** John R. Cribbs, Verona, Pa. Filed March 10, 1894. This is an improvement in brakes and is illustrated in the accompanying cut. (See illustration.)

**528,867. Automatic Railway Switch;** Charles F. Duval, Boston, Mass. Filed Nov. 25, 1894. A push-piece is arranged for actuation by a passing car, there being provided operating connections between the push-piece and the switchpoint with provisions for turning the point in either direction. An adjustable member determines by its position the direction of movement of the switchpoint under impulse of the push-piece. Elec-

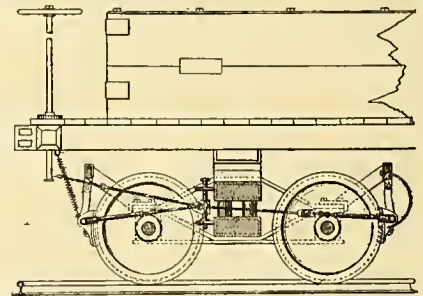


No. 528,845.

trical devices establish the two different positions of the said adjustable member.

**528,900. Electric Switch;** Frank G. Bolles, Washington, D. C., Assignor to one-third to Paul Eaton, same place. Filed March 27, 1894. The switch has a fixed contact, and a movable contact, an operating handle on the movable contact and movable relatively thereto, and a clamping device operated by an independent movement of the handle for tightening the contact between the fixed and movable contacts after the circuits are closed.

**528,904. Sandbox for Cars;** Adolph Garing, Allentown, Assignor to one-half to Clinton H. Fuller, Cata-



No. 528,860.

wanqua, Pa. Filed June 8, 1894. A circular rotary valve depends from the hopper and registers with opening in the hopper. A discharge tube rotates with the valve and is adapted to be closed at discharge end by a stop bracket when thrown up out of operative position.

**528,907. Rheostat and Heater;** Robert C. Mitchell, New York. Assignor to one-half to Henry W. Vail, Brooklyn, N. Y. Filed Jan. 17, 1894. This has a metal base, the resistance wire with the perforated sheet or sheets of non-fusible insulation interposed between the base and wire with a covering of insulating substance.



# Street Railway Gazette.

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**Rapid Transit System** Since New York voted in favor of the municipal construction of a rapid transit system there has been increased interest in the magnificent project. Suggestions in abundance are now to be expected. The view of Commissioner Starin, one of the Rapid Transit Board, is presented in this issue. He outlines a scheme of municipal rapid transit of so comprehensive a description that one inclines to question its practicability, though there is no doubt about the attractiveness of the plan.

**Electric Railway Construction in Brooklyn.** Within a comparatively short time a magnificent system of electric traction has been developed in the city of Brook-

lyn. The horse car lines, which in some sections were excellent of their kind, but none too good in other districts, have now almost entirely disappeared; and the city can boast of street railway facilities that are excelled by those of few cities in the world. There is a vast deal in Brooklyn to interest those who are studying electric railway construction and equipment. When forms of construction that were originally adopted there have proved unsuccessful they have been promptly discarded and better types substituted, until there is little left in construction or equipment that experience has not proved to be good. There is considerable variety in the arrangement and equipment of the power-houses, one of which is illustrated and described elsewhere in this issue, and it may be said that several of them embody the very latest ideas in the engineering world. Brooklyn may be slow in some respects, but not in the matter of street railway service.

**Collisions of Street Cars and Fire Engines.** It has been not infrequently remarked that in their anxiety to save life and property at the points to which they have

been summoned, firemen are too often inclined to be reckless of life and property on the way thither. This criticism is undoubtedly just, and to this tendency may be ascribed the increasing number of accidents resulting from collisions of street cars and engines and hose carts at street crossings. Some of these have resulted in serious injuries to passengers, firemen and street railway employees; in more than one instance that we can recall life has been sacrificed to the reckless determination of fire engine drivers to reach their destination in the shortest time possible. An accident of this sort is noted elsewhere in this issue, which resulted disastrously to the firemen, who in crossing a street disregarded the fact that a trolley car was rapidly approaching. As far as we have been able to learn, motormen and gripmen cannot be charged with responsibility for these casualties, and there seems to be no reason to believe that the number will be decreased, unless the fire department authorities insist upon the exercise of greater precaution where street car tracks are crossed, or until a signal system of some sort is adopted to notify the men in charge of the cars that the way is not clear. The only hope of averting accidents of this kind at the present time lies in the vigilance of policemen, but they cannot be expected when alarms are sounded to guard every crossing and

keep the streets clear for the fire department, even if the common belief that an officer is never at hand when he is most needed is untrue.

**Liberality of Transfer Systems.** The value of a transfer system traffic is just commencing to

be properly appreciated by street railway companies, as its introduction has led to such surprising results in the way of increasing travel in many cities. City councils, perhaps, still generally regard the transfer system as something that companies will grant only under compulsion, and it may be just as well that such is the case, but the latter now have reason to believe that they are likely to profit by the concession as well as the public. Companies, therefore, are becoming more and more liberal in the matter of transfers. This is particularly true in New York City and Brooklyn, and the most prominent street railway companies are constantly increasing the number of points at which transfers are obtainable. They are following this plan, not through any compulsion, but because they find the policy profitable; in fact, the expansion of the transfer system has been a very important factor in favor of the street railways in their competition with the elevated roads. The figures that appear in the annual report of the Manhattan Company in New York are generally believed to prove the correctness of this assertion.

In the year that closed 12 months ago, the Manhattan lines in New York City carried 19,000,000 passengers more than during the year that ended a few days ago. During the latter period the transfer systems of the two great cable roads were materially expanded. The number of transfer slips on the Metropolitan Traction system, for example, has almost trebled during the year ending Nov. 1. In October, 1893, the number of such tickets issued was less than 340,000 and during last month the number had increased to over a million. The officers of the Metropolitan Company admit that a considerable amount of new business has been attracted by the liberality of its transfer system, although only rough estimates of the increase can be made. It has been asserted, however, on the authority of one of the officers of the company, that about half the number of passengers transferred represent new business to the company. On this basis it is estimated that this single company is gaining over 500,000 fares per month that it would not have secured had it not developed liberally its transfer system. It seems to be the general belief that the company's new traffic is taken directly from the elevated roads, and the officers of the Manhattan company, who have seen a very material percentage of their patronage fall away during the past year, have evidently come to the same conclusion, for they have also decided to adopt a transfer system of their own. Since Tuesday last a transfer system has been established on the elevated roads, and hereafter any one who so desires may ride for a single fare on the elevated roads all around New York, down on one side and up on the other. When elevated railroad officials, who are usually so independent, consider it worth their while to introduce a change of this sort, it is pretty fair to assume that liberality to the public in the issuance of transfers is a profitable policy.



**TRAFFIC OF NEW YORK AND BROOKLYN ROADS IN 1893 AND 1894.**

The following figures show the passenger traffic of the surface and elevated roads of New York and Brooklyn for the years 1893 and 1894. The statistics are tabulated from the annual reports filed with the Railroad Commissioners. It will be noticed that, as a whole, the surface roads in New York have made large gains during the last year. Just how large cannot be told, as, on account of changes in the companies leased to the Metropolitan Company, figures for 1893 cannot be accurately given. The notable decrease in traffic during the last year is that of the Manhattan Elevated, which amounts to almost nineteen millions. The falling off in patronage, of course, is due to the competition of the Broadway and Third Avenue cable lines. In the same way the losses on several of the horse car lines may also be explained. Such roads and the cable lines compete for traffic between a great many points and the faster lines are necessarily the gainers. The lines that are still operated by animal power, however, have not been greatly affected; in fact they have suffered surprisingly little in comparison with the Manhattan. In Brooklyn it may be said that the same state of affairs exists. The surface roads have made heavy gains during the last year, just how heavy it is impossible to tell on account of changes and consolidations. The elevated roads lost almost 8,000,000 passengers during 1894. During last year they carried 56,654,409 passengers; during this year the total is 48,705,847. The loss in traffic is about 12 per cent. The trolley lines, of course, gained all that the elevated lines lost and also secured a large amount of new traffic.

NEW YORK.		
	1894.	1893.
Metropolitan.....	*107,036,254	.....
Second Avenue.....	20,269,215	19,647,764
Central Cross Town...	10,777,151	10,707,659
Dry Dock, E. B'dway & Battery .....	12,808,811	14,573,141
Forty-second St., Manhattanville & St. Nicholas Ave.....	12,732,330	13,513,050
New York & Harlem (Fourth Ave.).....	21,452,098	21,816,767
Eighth Avenue.....	15,377,164	15,749,457
Union Railway.....	9,373,175	6,492,126
Third Avenue.....	35,900,000	33,150,777
Manhattan Elevated...	202,751,532	221,407,197

\* During 1893 the Broadway road carried 83,196,302 passengers. The Sixth Avenue line's report did not give the number of its passengers, as it was leased to the Houston Street Railway Company, which reported 63,011,785 cash passengers. This company was leased to the Metropolitan in December last.

BROOKLYN.		
	1894.	1893.
Atlantic Avenue.....	18,331,745	16,464,173
*Brooklyn, Queens County & Suburban.....	4,768,108	.....
Brooklyn, Bath & West End .....	1,545,545	1,168,721
Brooklyn City & Newtown.....	14,664,083	11,994,772
†Brooklyn Heights .....	92,335,282	.....
Coney Island & Brooklyn.....	5,507,732	5,667,738
Steinway.....	3,589,360	3,352,501
Brooklyn Elevated.....	34,233,697	38,110,376
Kings County Elevated...	14,472,150	18,544,033

\* For five and a half months to June 30, 1894. The company on Jan. 15 leased the Broadway and Jamaica roads, which carried from June 30, 1893, to that date, 4,900,087 passengers.

† This company operates the Brooklyn City road and its leased lines. In 1893 the Brooklyn City system carried 83,196,302 passengers, and the Brooklyn Heights road 7,756,577 passengers.

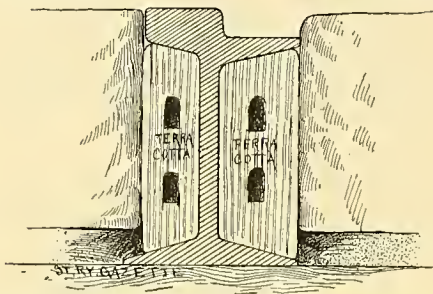
**COLLISION OF A TROLLEY CAR AND A HOOK AND LADDER TRUCK.**

A hook and ladder truck collided with a trolley car on Orange avenue in Newark on last Tuesday. The driver of the former attempted to cross the track in front of the car, but the latter was traveling at too rapid a rate, and it struck the truck damaging it badly, and causing serious injury to several of the firemen. It appears that the motor-man was ringing his gong, and that when he saw the danger of a collision he applied the brake and reversed his motor. He then sprang back against the door, and fortunately escaped injury, although

the bonnet and platform of the car were badly damaged. It is stated that quite a number of the Newark fire department drivers are quite reckless in driving across trolley tracks, and accidents of this sort have been predicted.

**GIRDER RAIL WITH TERRA COTTA FILLING.**

In the accompanying sketch is illustrated a section of girder rail with terra cotta filling, now being laid by the Brooklyn City Railway Company on Fulton street, between Fulton Ferry and Flatbush avenue. The traffic is exceedingly heavy on this section of the line—more so, in fact, it is claimed, than on any section of street railway track in the country. The joints of the rails employed since the equipment of the road with electricity have not proved strong enough to stand the heavy traffic. For this reason the company is relaying the tracks with 9-inch girder rails of the Wharton and Johnson



Girder Rail With Terra Cotta Filling.

types, weighing 90 pounds to the yard. The joints are held by 12-bolt fish-plates. The space between the head and the flange of the rail is filled with terra cotta, which presents a smooth face for the paving block, as the sketch shows. The Johnson unbroken main line crossings are employed.

**MOTIVE POWER OF THE NEW YORK RAPID TRANSIT SYSTEM.**

Few persons who have thought of the matter have doubted that electricity would be adopted for operating trains on the rapid transit system of New York, if ever the enterprise became an accomplished fact. A New York paper within the last few days has been interviewing the engineers of steam railroads regarding the best motive power for the great system which at the last election the people voted in favor of issuing bonds to construct. It is interesting to note that these gentlemen, who are assumed to be authorities regarding motive power, hold the same opinion as the public entertain; that is, that the road must be electrically operated. Summaries of the views that they express are given herewith.

Edgar Van Etten, general superintendent of the New York Central, said:

"I am a strong believer in the fact that when an invention is really needed to fill a bill it usually turns up. That may be the case with the motive power that will be used on New York's underground rapid transit. Electricity will unquestionably be the power used; unless—as I said before—something new turns up for the occasion, which is not unlikely to happen. Steam engines are out of the question as an underground motor, and no other independent engine is more than an experiment. The bulky, expensive storage battery will not do; but it must be electricity utilized through the trolley system. Each engine should have its own motor, receiving energy through a conductor leading from a central station."

C. A. Thompson, superintendent of motive power on the Central Railroad of New Jersey, said: "It will be electricity through the trolley system. There is no question about it. As our experience and knowledge and our wants now stand, it can be nothing else. Just think of it, electricity does it all; absolutely all that is required. First of all you must have the power, and the electric motor on your engine fed over a wire from the dynamo gives it to you; then you must have light both for

your tunnel and your cars, and you want a good light, too, and you get it by the same means; and then there is the question of heating—and an important one—and that you can get from the electricity. If ventilating fans are needed they can be run by the same power. Could anything, under the present state of knowledge, be more perfect—motive power, light, air and heat, all from the same central power plant?"

Walter Katte, chief engineer of the New York Central: "Steam is out of the question for underground travel in New York. The passengers would never stand the heat, smoke and gas. Then there are the great expense and annoyance of ashes and of water supply—much more serious matters than many imagine. You have no idea of the annoyance caused by these two items on the elevated railways. I had to consider these matters in the construction of the Third and Ninth avenue lines, and I know something about them. The ash-pits have to be made with double bottoms and heated to keep the ashes from freezing, becoming hard as rock and made almost impossible to move. Then all of the system of water pipes has to be followed by steam pipes to keep the water from freezing in cold weather. Then there is the necessity of coal stations and the annoyance of dust and dirt attached to them. These things are all out of place along a great line of travel in a city. Everything of this sort should be at a central station and leave the line open and clear.

"The cable system will not do, for it is both uncertain and dangerous. The terrible and varying strain is likely to part the cable and stop the entire traffic of the line. Then there is danger of loose strands of wire fouling with the grip and causing a runaway train, which may play havoc. Every engine should have its own motor, and one that is not an experiment, but a tried one that does its work. The electric motor fills the bill exactly, and nothing else approaches it. There is now little difficulty in operating these motors from a central station, and when the system is used underground the few difficulties are removed."

A. E. Mitchell, superintendent of motive power on the Erie road, said:

"Electricity seems to have come the nearest to answering the required purposes, and as the storage battery has not given entire satisfaction, the trolley is no doubt the better way to operate the electric motors."

William Buchanan, superintendent of motive power on the New York Central and Hudson River Railroad, said: "The electric trolley is the plan, particularly where the wires can be placed underground out of the way. Then we must remember that improvements are being continually made, and the system brought nearer and nearer to perfection, until it begins to approach the ideal. Likely, before the new road is running, there will be additional inventions and improvements that will adapt the trolley for its work much better than it is now. There is really no other engine that I know of that is nearly as good as the electric motor operated over a conducting wire. I have no doubt that the electric trolley will be the system used."

Mr. H. S. Hayward, superintendent of motive power of the Pennsylvania Railroad, said: "The storage battery will not do, as it is too likely to get out of order and is entirely too heavy. If anyone thinks that he wants steam in a tunnel, he has never had experience in the old London line, where the passengers are nearly choked with smoke and gas. The cable is unreliable, and the objection of the entire line depending on one wire rope, under a heavy strain, is insurmountable. I think that there is no chance for carbonic acid gas or compressed air; but the system of electricity, from which we now get 95 per cent. of its energy, comes nearest to the mark."

The office of the American Institute of Electrical Engineers, which has been at 12 West Thirty-first street since May, 1890, has been removed to rooms 1009 and 1010 Havemeyer Building, 26 Cortland street, New York City.



### THE RIDGEWOOD POWER STATION, BROOKLYN.

The Ridgewood power station, although the "baby" power plant of the Brooklyn City Railway Company, plays no small part in the operation of its immense system, and is a model plant in its arrangement and operation. The building is a substantial structure of brick and iron about 110 by 112 feet, and is located on Wykoff avenue, between Woodbine and Madison streets (Fig. 1).

The engine-room (Fig. 3), the dimensions of which

belts are two-ply, 60 inches in width, and were supplied by Charles A. Schieren & Co., the Bradford Belting Company and Fairweather & Ladew.

The switchboard is conveniently located in the eastern end of the building. The panels are of marbleized slate, and the station-controlling instruments are of the General Electric type. Ajax feeder switches, furnished by Albert & J. M. Anderson, of Boston, are used. For facilitating the moving of the machinery, a 10-ton traveling crane was installed. All the ironwork in the building,

are used throughout the station. One of the interesting features of the plant is the oiling system. An oil tank, of the capacity of 8 barrels, is located in the upper part of the room, and from this source of supply the oil flows by gravity to all the bearings with the exception of those of the engine shafts. The drip flows by gravity to filters in the basement of the engine-room, and the oil is pumped thence back to the supply tank. An indicator that is used for showing the amount of oil in the supply tank is illustrated in Fig. 5.

The device or system by which the bearings of the engine shaft are kept lubricated is illustrated in Fig. 6. In the main pillow block casting is an oil reservoir of a capacity of about 30 gallons. Attached to the side of the casting is a small pump, operated by a connecting rod, attached to a crank-pin in the end of the main shaft. The oil is pumped to the oil cups over the bearings and thence flows by gravity through a small filter to the reservoir from which it was originally pumped.

The station is provided with a separate arc lighting plant, which consists of an 8x10 Ideal engine, built by the Harrisburg Foundry & Machine Co., and a 45-light arc machine, built by the General Electric Company. From this plant light is furnished for the station, for the coal-pocket and carhouses. The engine-room is also lighted by groups of incandescent lights mounted on handsome brass columns. Surmounting each generator is a group of five incandescent lights, the center one inclosed in a ground glass case, on the four sides of which appears the number of the generator (Fig. 3). The walls of the engine-room are finished in a light cream color, the effect greatly adding to the attractive appearance of the station.

The hoiler-room is 112 feet long and about 50 feet in width. It is equipped with six 250 H. P. Babcock & Wilcox boilers, with enamel brick fronts, arranged in batteries of two each, Fig. 2. Each boiler is equipped with a device shown at the top for instantly shutting off the water and steam for water gauges, in case the gauge glass should break. As all the boilers are run at high pressure and the water ganges are some feet above the reach of the



FIG. 1. RIDGEWOOD POWER STATION.

are 72 by 112 feet, is located on the Wykoff avenue side of the station. The height of the room from the floor to the roof trusses is 30 feet. This department is lighted by windows on three sides, while both light and ventilation are afforded by skylights. The engine equipment consists of three McIntosh & Seymour tandem compound, non-condensing engines of 760 horse-power each, with cylinders measuring 20 and 36 inches by 36-inch stroke. Each engine is connected to two General

including the traveling crane, was furnished by the Boston Bridge Company.

All the wiring and all the steam piping, with the exception of the main steam lines, are arranged under the floor. This disposition not only adds to the appearance of the room, but facilitates the handling or the repairs of the machinery whenever needed. The steam mains are supported from the roof trusses, and lead through special separators designed by the company and built by Riter &

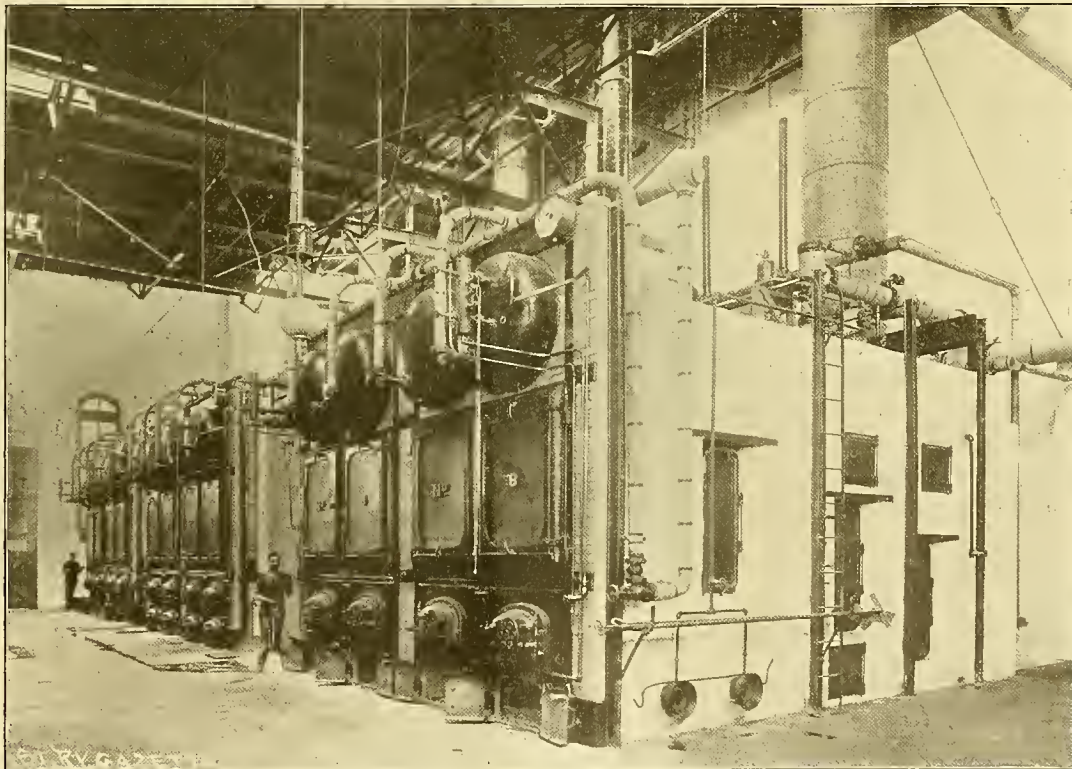


FIG. 2. RIDGEWOOD POWER STATION BOILER ROOM.

Electric multipolar generators, each of 300 kilowatts capacity (Fig. 5). Both armatures are mounted on the same shaft and are connected to the driving pulley by means of friction clutches, furnished by the Hill Clutch Works, of Cleveland. The

Conly, of Pittsburg, Pa. All drip from the separators and engine jackets is returned to the boiler by a Worthington pump, while that from the main steam lines returns by gravity. Chapman valves and throttles and Keasbey magnesia pipe covering

attendants on the floor, it is considered desirable to provide in some way for shutting off the water in case of the breakage of the gauge glass. The device connects the gauge to the boiler and is provided with shut-off cocks, the handles of which are



joined by a connecting rod. Should the gauge glass break, the valves are instantly closed by a pull on the handle.

Argand blowers for the furnaces are provided. The feedwater heaters are two in number, of 500 H. P. capacity each, and were manufactured by the National Pipe Bending Company of New Haven, Conn. The feed pumps are of the Worth-

#### NEW PUBLICATIONS.

**ELECTRIC LIGHTING PLANTS: THEIR COST AND OPERATION.** By W. J. Buckley. 275 pages, price \$2. Published by William Johnston Printing Company, Chicago.

This book contains matter of a great deal more practical value than many volumes of a far more pretentious description. Its purpose is to give in-

formation of plants. The author confines himself to one type of lighting apparatus, and for this reason the reader is not inclined to value it as highly as if it was more general.

**ELECTRIC LIGHT AND POWER.** By Arthur F. Guy, A. M., I. E. E. Published by Biggs & Co., London. 346 pages. Price, 5 shillings.

This volume gives the results of practical experience in the management of English central stations. The matter will be found of great interest and value to that great class of persons who want information of a practical character relating to the management of electrical plants. A great deal of the matter applies to central stations and electrical plants wherever they may be located, but some of it is of significance only so far as it relates to plants.

**CENTRAL STATION BOOKKEEPING AND SUGGESTED FORMS, WITH AN APPENDIX FOR STREET RAILWAYS.** By Horatio A. Foster, New York. Published by the W. J. Johnston Company, New York. 139 pages, with forms and diagrams. Price, \$2.50.

The matter of forms for keeping the accounts of central stations has been discussed at electrical and street railway conventions for several years, and the importance of proper classification now seems to be generally realized. The matter was discussed at considerable length in the paper presented at the last convention of the American Street Railway Association by H. I. Bettis and published in the last few issues of the *STREET RAILWAY GAZETTE*. Mr. Foster supplies what was not given by Mr. Bettis in the paper as it was published; that is, the forms of accounts which are best designed for central station bookkeeping. The book contains diagrams for the organization of the staff of central stations, methods of classifying accounts and reports with model forms for each department. It presents a complete scheme by which the management may be enabled to determine at any time the condition of the business and the unit cost for the generation and distribution of current. It is stated that the forms that have been suggested have been prepared after the examination of many that are now in practical use in stations. The appendix contains a classification of street railway accounts,

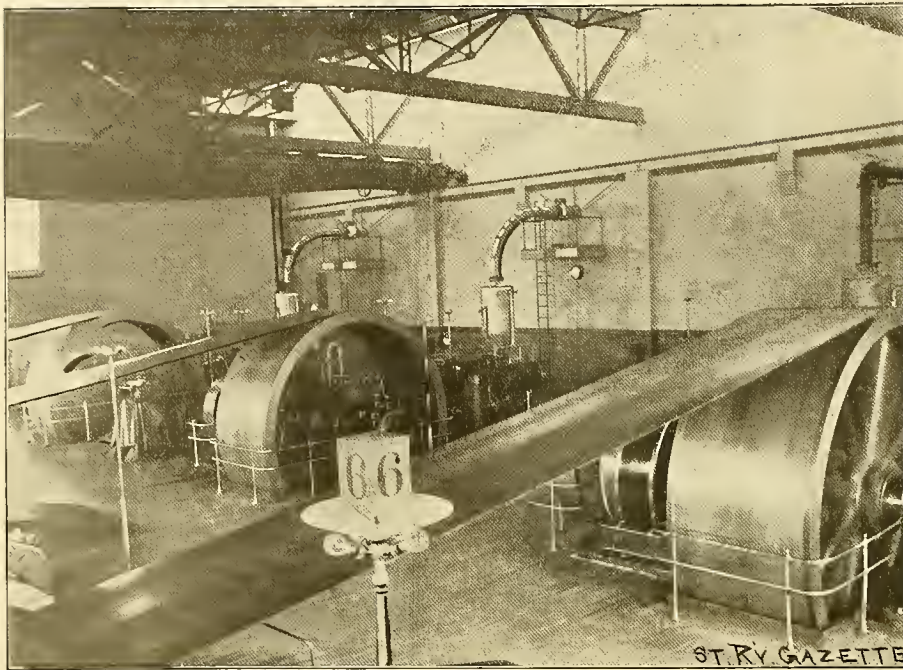


FIG. 3. McINTOSH & SEYMOUR ENGINES IN THE RIDGEWOOD POWER STATION, BROOKLYN.

ington compound duplex type, and, in addition to these, three No. 13½ Metropolitan injectors are in use.

A siding from the Long Island Railroad tracks extends to a coal pocket in the rear of the boiler-room. The pocket, which has a capacity of 1,000 tons, is provided with shutes for delivering the coal in front of each boiler. A Howe standard scale is provided for weighing the coal as it is taken from the pocket. The company will shortly introduce an automatic machine, so that the coal may also be weighed as it is taken from the cars. The space under the coal pocket is inclosed and is used for storage purposes, and under the floor is a water storage tank holding about 100,000 gallons. The feed can be drawn from this supply, if in any case the water from the city mains should be shut off.

All the cotton waste used in the station is cleaned in a steam boiling tank especially provided for this purpose, and in this way it is claimed that a saving of \$15 per month is effected.

The station is equipped with a complete fire-alarm system. A four-inch water main with hose attached at convenient points is connected with a Worthington compound duplex pump and extends through the station and adjacent car-houses. Alarms and signal boxes made by the E. S. Greeley & Company, of New York, are employed.

The plant was designed by M. G. Starrett, the chief engineer of the company, and has been in operation since August last.

**Battle Creek, Mich.**—The work of rebuilding the old Battle Creek Electric Railroad which passed into the hands of a new company, the Citizens' Street Railway Company, Sept. 30, is rapidly approaching completion. An entire new track of 45 and 60 pound T-rail has been laid, double bonded with 0 copper wire, all in the most thorough manner. The overhead line has been all rebuilt. New trucks, motors and car equipment throughout have been ordered. Each car will be equipped with two W. P. 50 General Electric Company's motors. The equipment will consist of eight closed motor cars, three large open motor cars and six trail cars. The company has about seven miles of single track and a half-mile of double track, and a loop at each end of the Lake line, which is two miles in length. The opening will take place in about 30 days.

formation to the purchasers of electric lighting apparatus and to afford them assistance in making estimates of the cost of construction and operation of power stations. While the electrical engineer has been amply provided for in the great mass of technical literature which has appeared within the last few years, the needs of the buyer have been

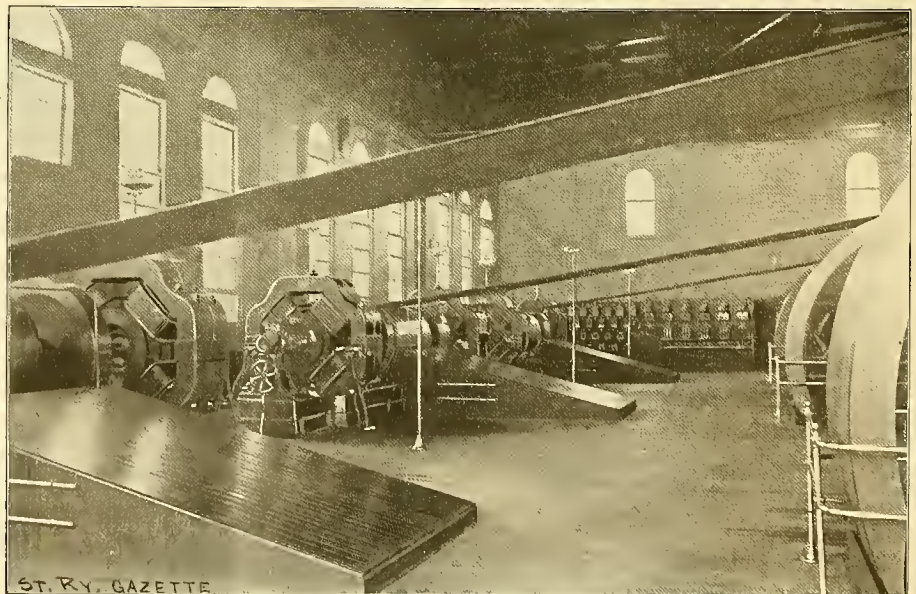


FIG. 4. GENERATORS AND SWITCHBOARD, RIDGEWOOD POWER STATION, BROOKLYN.

sadly neglected, the author states, and it is his purpose to supply this need as far as possible. The writer has been a salesman of electrical apparatus for a great many years and his experience has been of a character to enable him to realize just the information that the prospective owners of electrical stations require. The writer wisely confines himself to small electrical plants; and the information that he gives is compiled from reports of such stations. The book contains many plans of stations and diagrams that will be found of service to those intending to inform themselves regarding

with instructions, forms of books, etc., necessary to carry the suggestions into practical effect.

**PRACTICAL NOTES ON ROPE-DRIVING.** By M. E. Published by the Street Railway Publishing Company, New York. Price 50 cents.

This is a pamphlet of 48 pages and is a reprint of articles which originally appeared in the *Street Railway Journal*. The subject of rope-driving is discussed in a practical and exhaustive manner.

Volume II. of the Standard Dictionary, published by the Funk & Wagnalls Company, of New York, will be issued this month. The sales of the book



have been phenomenal already and it is commended in the highest terms by the very best authorities.

**BOSTON WEST END CO.'S ANNUAL REPORT.**

The annual report of the West End Street Railway Company, of Boston, has just been made public and it is decidedly favorable. It appears that the company has 7,010 shareholders. The dividends included 8 per cent. on the preferred stock and 7½ on the common, the latter having the 3 per cent. paid Jan. 1, 3 per cent. July 1, both semi-annual, and 1½ per cent. quarterly on Oct. 1. The road, actually earned over 8½ per cent. on the common stock. If the traffic increases the stock-

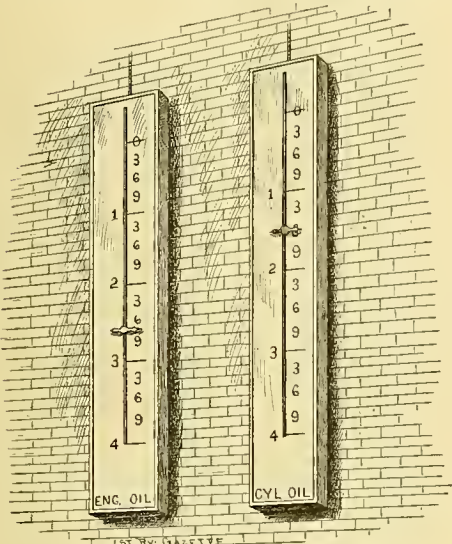


Fig. 5. Oil Tank Indicator, Ridgewood Power Station.

holders will be inclined to demand an 8 per cent. revenue on their holdings. Following is a summary of the report, the fiscal year ending Sept. 30:

Year Sept. 30:	1893-94.	1892-93.	Increase.
Earnings.....	\$6,823,879	\$6,692,578	\$131,301
Expenses.....	4,807,083	4,550,731	256,352
Net.....	\$2,016,796	\$2,141,843	*\$125,047
Int. tax and rent.....	725,964	689,778	35,286
Balance.....	\$1,291,731	\$1,452,064	*\$160,333
Dividends.....	1,193,375	1,329,650	*136,275
Surplus.....	\$98,356	\$122,414	*\$24,058

\* Decrease.

President Samuel Little says in the report: "Owing to the general business depression only a comparatively small increase in the gross earnings is shown while the operating expenses show an increase of \$256,348.42. This is more than accounted for by having included the track improvement account of last year, amounting to \$192,190.22, and similar work performed during this year amounting to \$90,617.64, or a total increase on this

have all been electrically equipped and some of them extended, and at present a new carhouse with a capacity for 36 cars is nearly completed. The lines running to both Malden and Medford are now being operated by electric power, and a new carhouse has been erected on Salem street, Medford, with a capacity for 56 cars. The new tracks on Mt. Auburn street, in Cambridge, were completed and electric lines opened from Newton and Mt. Auburn, and the new carhouse at the latter place is now being used.

"The East Boston division is being equipped electrically, the tracks having been rebuilt and the overhead lines constructed, and it is now nearly ready for operation, with the exception of the completion of the power station. It is expected that electric power will be inaugurated on this line by the middle of December. A power-house and a new carhouse with a capacity for 48 cars are being erected at Eagle square for this division. Important additions have also been made to the reservoir and Summer street carhouses. The company sold during the year \$2,000,000 4½ per cent. 20-year bonds, with the proceeds of which the entire floating debt has been retired, and at present there is cash enough on hand to cover the expense of finishing the electric equipment now under way and contemplated."

The general balance sheet shows this comparison with Sept. 30, 1893:

	ASSETS.	1891	1893.
Sept. 30			
Construction.....		\$6,135,434	\$6,076,760
Real estate.....		4,667,552	7,315,153
Power stations.....		3,203,271	1,845,843
Electric car houses and shops.....		1,569,087	166,841
Electric line equipment.....		1,481,717	1,276,417
Cars, 2,115 in 1891 and 2,172 in 1893.....		5,119,973	5,009,436
Horses, 1,223 in 1891 and 2,123 in 1893.....		163,582	284,481
General equipment.....		548,464	512,614
Malden & Melrose Railroad.....		214,520	214,520
Somerville horse.....		294,482	8,353
Furniture and fixtures.....		15,478	19,878
Stock and bonds.....		75,100	75,100
Track improvement.....		82,370	192,190
Cash.....		1,313,100	738,651
Cash, for October dividend.....		136,275	
Materials and supplies.....		365,008	472,539
Accounts receivable.....		185,915	255,842
Insurance.....		15,523	31,114
Total.....		\$25,579,850	\$24,569,871
	LIABILITIES.		
Common stock.....		\$9,085,000	\$9,085,000
Preferred stock.....		6,400,000	3,400,000
Funded debt.....		9,475,000	6,690,000
Notes payable.....			1,219,700
Current liabilities.....		492,783	770,443
Sundry items.....		397,712	224,866
Profit and loss surplus.....		29,356	179,861
Total.....		\$25,579,850	\$24,569,871

The surplus account gives a debit of \$68,861 written off for old track removed and not replaced, and \$180,000 discount on bonds, presumably the \$2,000,000 4½'s, which must have been sold at 91. An interesting feature of the report is an analysis of the stockholdings, preferred and common, on Sept. 30, 1894—

	Preferred.	Common.
No. shares.....	128,000	181,700
No. shareholders.....	3,611	3,399
Average holding.....	35	53
Trust shareholders.....	471	81
Trust stock.....	23,256	5,797
Women stockholders.....	1,677	1,164
Stock held by women.....	38,364	24,737

Of the total revenue, \$6,734,311 was from passengers. Advertising yielded \$34,158, an increase of \$2,832 from the previous year. The classified operating expenses were:

		Increase.
General expenses.....	\$418,874	\$17,681
Maintenance of track.....	536,177	255,161
Maintenance of buildings.....	41,796	24,644
Maintenance cars and vehicles.....	48,701	110,632
Maintenance horse equipment.....	130,225	79,124
Maintenance electric equipment.....	356,833	35,760
Road and snow expense.....	194,458	33,788
Transportation expenses.....	2,510,016	181,257
Injuries and damages.....	240,000	19,677

\* Decrease.

\*\* Includes the charge to track improvement account last year of \$192,190.22, and similar work performed during this year amounting to \$90,617.64, or a total of \$272,807.86.

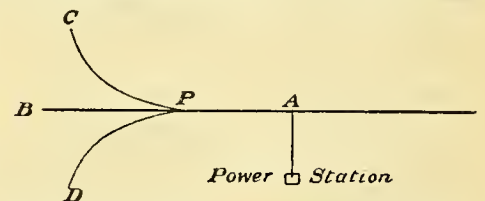
The company added 10,477 miles of track, and took up 3,482 miles, making a net addition of 6,995 miles. The mileage owned Sept. 30, 1894, was 261,334; the mileage operated, 272,894. The completed overhead mileage is 212,466. The revenue passengers carried numbered 137,028,449. Of the mileage run 87.29 per cent. was electric, and 12.71 per cent. horse cars. Of the passenger receipts 90.17 was from electric and 9.83 from horse cars. The reconstruction account for the year was \$210,352, of which \$47,415 was charged to construction, \$80,617 to operating expenses, and \$82,320 to track improvement account, to be written off against earnings. Other and new construction cost \$172,586, which was offset by a credit of \$113,861, book value of track taken up, etc., leaving the net addition \$58,724. There was a reduction of 900 horses during the year. The company had 606 horse and 1,507 electric cars on Sept. 30, also 1,223 horses and 1,842 electric motors.

**NOTES ON ELECTRIC TRAMWAYS IN THE UNITED STATES AND CANADA.\***

BY H. D. WILKINSON.

**PART II.**  
(Concluded.)

Reviewing the circumstances attending electrolytic action, as far as I have been able to gain information on the spot, I find that these troubles have chiefly been traced to insufficient conductivity at the rail joints, and to the want of proper return conductivity in the shape of feeders. When traffic on the lines increases, or extensions take place, and the increased power is drawn from the same supply station, either the bonds must be increased in sectional area (if they have not been put in at first of sufficient size for ultimate demands), or return feeders must be run to relieve the bonds; otherwise the consequence will be that the current will be crowded out of the rails into the earth. This is what has actually taken place on some systems in the States, and the current has been allowed to take its own course until the heating of rail joints and bonds has drawn attention to the want of conductivity. This crowding out occurs on the main or trunk lines into which several branch lines converge. On simple lines, or those from which no branch lines radiate, it is less liable to occur, as even with an excessive volt loss per mile the density of current is well within the capacity of ordinary single bonds. Take, for instance, a line of three miles of double track between A and B and consider it first with no branch lines. Say we have a three-minute service of cars, and the average speed, allowing for stoppages, is 7½ miles per hour. The cars will then be three-eighths of a mile apart, and there will be eight cars on each track. With two motors per car the current will be about 25 amperes at maximum speed; but some cars will be starting, and using 100 amperes, and we may take a time average right through of 50 amperes per car. The maximum current returning to the power station from A will then be 800, and the maximum at B 100 amperes. The resistance of copper bonds varies according to method of bonding, length and size of bond wire, and whether it is double or single. Per mile run of rail the bonds may be from one-sixth to twice or three times the resistance of the rail. Taking a 70-lb. rail with low-resistance bonds, say of No. 000 gauge, 12 inches long and fixed double, we shall



have the resistances per mile of rail 0.0344 ohm of bonds (176 to the mile), 0.0056 ohm; total, 0.04 ohm, or 0.01 ohm for the double track. The voltage loss will therefore be 1 volt per mile per 100 amperes. Working this out for the varying strength of current on different portions of the return, we have a loss of 10 volts on 1½ miles from A to P, and 4 volts on an equal distance from P to B—total, 14 volts.

Suppose, now, a branch line is laid from P to C, also of 1½ miles, with cars at same speed, and same rate of service. This will then absorb 4 volts, but the loss between P and A on the trunk line will be increased to 19 volts; and if another similar branch, P to D, is added, the loss on the trunk line becomes 28 volts, or a total of 32 volts on the whole. When it is considered that with a theoretical continuous rail without bonds this loss is only reduced by 5 volts, it will be seen that to prevent waste of energy, quite apart from reducing current density, we must connect return feeders to the rails on the trunk line.

Now, considering the current density, we have in the trunk line, when the two branches are in operation, a current of 1,300 amperes at P and 2,400 amperes at A. The maximum current per rail is therefore 600 amperes, and this on 7 square inches gives a density of 86 amperes per square inch of rail (equivalent to 510 amperes per square inch of copper). This could be increased four or five times before any sensible rise of temperature would take place in the rail; but, considering the bonds, whose sectional area per rail is 0.262 square inch, we find we have a density of 2,290 amperes per square inch. It would probably take very little increase of current beyond this to cause heating of the bonds and crowding out of current into the earth; and yet the bonds on many lines in the States have less sectional area than the one cited, and the currents are from twice to four or five times as great, producing far higher densities in the bonds than they can carry. I am convinced that this is

\* Abstract of a paper read before the Institution of Electrical Engineers, London, England.

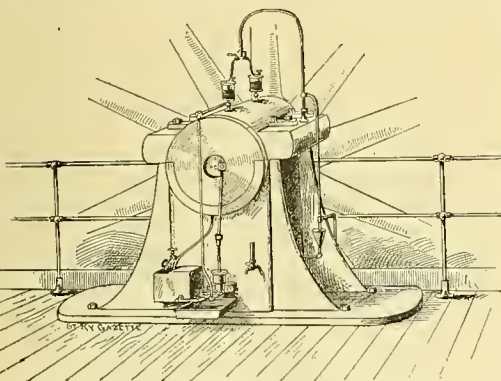


Fig. 6. Device for Oiling Engine Bearings, Ridgewood Power Station.

account alone of \$272,807.86. It has been thought best by the directors to change the dates of paying the common stock dividend from Jan. 1 and July 1 to April 1 and Oct. 1, in order that the dividend year may agree with the fiscal year of the company; and three months' dividend was declared payable Oct. 1.

"At the close of the year 93 per cent. of the mileage, namely, about 1,770,000 miles per month, was run by the electric system, and the equipment of the larger part of the balance is rapidly progressing. During the year the Brookline lines



the cause of most of the electrolytic troubles in the States. Trunk lines, into which a number of branch suburban lines feed, are frequently of considerable length, and cars necessarily move slower in consequence of their accumulation on one line. Not only on account of the number of cars, but also because of their slower speed and frequent restarting, the current put on to the rails is very much increased, and the density in the bonds becomes far more than they can carry. We have seen that it is not a question of resistance or conductivity of the bond, as the voltage loss beyond that on a perfectly continuous rail is only increased by about one-sixth of that lost on the rail, and therefore the increasing of the conductivity confers no appreciable benefit so far as reducing voltage is concerned. The question is one of sectional area of bond with reference to the ultimate maximum current it is expected to carry, and this, I think, should not exceed 2,000 amperes per square inch. The sectional area of the bond refers as much to those portions in contact with the rail at the joint or joints as to that of the single or double bond wire itself.

I cannot leave this portion of my paper without a tribute to the pioneer work and enterprise of our transatlantic cousins. They meet every difficulty squarely in the face, and, in spite of all obstacles, "get there all the same." Our designs must necessarily comply with more conditions than are exacted in America; but when our difficulties have been the same, our friends have generously been ever ready to impart their experience.

I found that the insulation of the double-trolley lines was good so far as the overhead construction was concerned, but that it frequently broke down at the motors, thus putting one or other trolley line to earth. To show what kind of insulation existed my friends and I boarded a single-trolley car, stopped it and pulled the trolley arm off the single wire on to one of the double-trolley wires; the lamps lit up inside the car showing an earth on one main of about 200 volts. The leak was not sufficient, however, to run the car, but it appeared that in wet weather this was frequently done. Again, in the Hunt-street station, an earth indicator was permanently fixed, consisting of two rows of five lamps, in series. Each row was connected between one of the trolley wires and earth, and I observed during my visit to this station that one of these rows was lighted up to nearly full candle-power. The light was fluctuating slightly, which appeared to indicate that the earth was on a moving car; at all events I was informed that such earths were of frequent occurrence, and went off as suddenly as they came on, but did not affect good working. Earths on a line were "spotted" after all cars were home for the night by switching off one section after another while full power was kept on. The leakage current on two lengths of 12 and 9 miles of double track joined in multiple with all cars off, was 12 amperes, under the full pressure of 500 volts. The cost of street work in America for double trolley car construction is about £650 per mile. This is about one-third more than the cost of single-trolley construction; but against this must be put the dispensing with bonds.

While this system is out of place in cities and confined thoroughfares, and, indeed, wherever span wires must be used, I believe it offers some advantages for heavy passenger traffic or goods traffic in suburban districts. It offers immunity from leakage currents to earth, for such can only take place when more than one earth is on the line. There is, therefore, no anxiety as to electrolytic action on pipes, even with the heaviest currents, no interference with telephones, and it is not necessary to bond the rails. With neat iron poles and ornamental cross brackets the line is not at all unsightly in the center of the road. On some lines the appearance is improved by clusters of incandescent lamps, with reflectors, on every second or third post, and all feeder cables kept underground. The only objection to the system is the amount of overhead work at curves, turn-outs, and crossings; but it certainly holds its own in Cincinnati for smooth and rapid transit, and has proved itself a commercial success.

#### IMPORTANT RAILWAY TRANSACTION IN ALABAMA.

The Columbian Equipment Company, of New York, has purchased the Highland Avenue and Belt Railway and the Gate City line, both in the city of Birmingham, Ala., embracing about 40 miles of road. By securing the Highland Avenue Belt Line the company obtains a most valuable terminal system, practically controlling the terminals to many of the industrial as well as steam railway lines in the city. It is the intention of the Columbian Equipment Company to rapidly develop these properties and make them second to none in the south. A large amount of electrical construction will undoubtedly soon be begun. The officers of the company are as follows: Wayland Trask, president; Charles A. Avery, vice-president, and Clarence E. Stump, secretary and treasurer.

#### CONDUIT ELECTRIC RAILWAYS: IS THERE A SOLUTION OF THE PROBLEM?\*

BY JOSEPH SACHS.

##### PART II.

Another class or system combines the magnetic arrangement of surface contact with the electro-magnetic. One of these is the Siemens system. Contact plates are used, and the switching mechanism therein consists of a pivoted lever which is first attracted by the magnet on the car, and after the plate has been connected the current passes around a coil of wire on the lever, and magnetizes it as long as the car is in contact with the plate.

There is another system devised by Lieut. Patten in which practically the same method is adopted. The switching device is so arranged as to improve the magnetic circuit. A separate contact rail is used.

Next we have what is perhaps the latest attempt in the surface contact system, by Messrs. Johnson and Lundell. It is very similar to the system shown previously, in which the magnetic switches are all grouped together, but a sectional rail is used instead of contact plates.

This system possesses various points of interest. Its chief peculiarity is that the car is also equipped with a storage battery, so that in case the brush under the car loses contact with any section of the contact rail the car is simply operated by the storage battery. The battery is also used to actuate the magnetic switch if it should be de-energized. The inventors claim various advantages in combining the storage battery with a system of surface contact.

Other surface contact systems have been devised by Gordon, Pollak and Binswanger, Shuckert and others. In the last named system iron filings are used as the switching medium in the same way as the levers are used in one of the systems described.

I will not dwell on the various points of advantage or disadvantage of the various surface contact systems. The claim put forth by their promoters is that they dispense with the open slot and can be installed cheaper than any such system. However, on the other side we have the difficulty of keeping down the leakage of the section that may be alive, the complicated mechanism, the many parts, and the uncertainty of action which always attends the operation of a number of small mechanisms under the conditions. This would seem to seriously defer the ultimate success of such systems.

Now we come to another class or system—there are many of them—in which the open conduit is used, but instead of having a continuous wire there is a sectional conductor; that is, only a section of the contact conductor is connected with the supply wire, and magnetic, electro-magnetic or mechanical switches may be used. We could, for instance, take any of the sectional conductor systems which I have shown you and place the contact rail or plate within a slotted conduit.

Various systems of this kind have been devised in which the sections of contact wire were operated by electromagnetic switches. Systems of this nature have been devised by Mr. Wheless and others. The switching of the various sections, plates or contact points can, however, also be accomplished by mechanical devices operated by the moving car. Many of these have been devised and tried.

In the Lawrence system a mechanical switch box is located at intervals, and the contact rail is composed of small T-rails supported on a pivoted lever, one end of which is connected with the switch piston. The trolley comes down upon the conductor and, by depressing one end of the lever supporting the rail, shoves up the lever and pushes in the switch rod, making connection with the main wire. After the collector has passed, the bar springs up again and connection is broken in the switch box for that section.

The Muncie-Coles system was experimentally tried some time ago at New Haven. In this, instead of using a continuously depressed rail a number of switch boxes are used and the contact points are depressed by a long plow on the car. The conduit is very small and simply covers up the boxes.

A system which was recently exploited and tried at Coney Island presents a combination of ideas, but, as far as I can understand, it is also fundamentally due to the very fertile brain of Mr. G. T. Woods; it is practically the same as the Muncie-Coles, but the very great advantage of this is that the switching mechanism, instead of moving up and down, moves on a pivot. The conduit used was very roughly constructed, simply made of boards. As the shoe on the car comes along it pushes the arm aside and throws it into connection with the main line conductor inside of the box. The shoe is flexible and so arranged that it will conform to all the irregu-

larities in the slot in the conduit. An experimental road was built at Coney Island, and from results published in a paper read before the American Institute of Electrical Engineers I consider it to possess a number of good points.

A system devised by Mr. Frank H. Ashley is much the same as the Lawrence or any other of the sectional conductor systems operated mechanically. It consists of a conduit, a sectional flexible rail, the supply conductor inside of a jacket, and as the connector comes along it presses up each section of the conductor and throws it in connection with the supply wire.

Now, these various forms of sectional conductor open-slot conduit systems possess, in my mind, very little advantage over the continuous wire conduit. You have in the open conduit the chance for getting mud, slush and dirt therein, and you must have a fairly large conduit.

Next we come to a very peculiar system. In this the inventor has attempted to bring the conductor not in the conduit, not on the surface, but he has gone to the other extreme and says, Let me bring it above the surface and I will have it clear and sure. So he constructs a slot parallel to the rail, along the roadbed, and places adjacent to that slot a number of switch boxes, having long arms, the contact point at the end of which runs across the slot. On the car is a plow, which projects down into the slot, and also a similar plow at the other end, and a connection or contact bar between the two plows. The plow goes down into the slot, catches one of these arms and raises it up. While the lever is raised in connection with the bar, current is supplied from that particular switch, and then after the car has passed by the raised contact, the contact simply drops back again, but another lever is always raised before the last is dropped. This would be very good if we always had clean and clear streets and no mud, slush, dirt or snow; but inasmuch as the system has not yet been tried, I cannot say whether it will be able to operate against these or not.

In another form of raised sectional contact system, devised by Mr. Henry, the contact device is located in a box in the roadbed, and instead of having a mechanical device we have an electro-magnetic device. A long magnet under the car attracts a plug in the box to it, and makes contact therewith. After the car has passed, the plug drops back and out of connection. The raising and lowering of the plug cause it to be connected and disconnected with the supply wire. The same points hold good with this system.

There is another form of raised contact system which is an exceedingly odd thing. This invention has a slotted conduit, and puts therein a flexible cable, which is supported on cross bars. As the car goes along it raises up the flexible cable out of the slot and over rollers under the car, and after the car has passed it drops back.

Now we come to the last class. This is what is called the induction system, in which a number of primary coils are located at the regular points along the line, and upon the car is located a secondary coil, brought into such relation to the primary that a current is induced in the secondary from the primary. Although we may have the alternating current motor, the system would be very inefficient and costly. [The system shown was by Mr. Dewey.] The primaries are wound upon U-shaped cores, imbedded in the roadbed with the two ends up. The long core on the car is also U-shaped; each end is a long brush which comes into intimate contact with the ends of the U in the street. The brush makes contact with a primary core before it leaves the last, and in that way a continuous alternating current is induced and the car is supposed to move; it has not as yet, though.

Now, as you see from the vast variety of possibilities and probabilities that I have shown, the solution of the conduit electric railway problem is not at all limited, and all you have to do is to pay your money and take your choice; but the peculiar part of it all is that there is not much choice to make, because apparently nothing has ever been evolved—nothing commercially practical—from any of the vast variety of material I have shown you except the plain, every-day open conduit and the continuous wire. That simply means that it has many points of superiority, is actually in operation, and nothing else has ever operated. There is such a system in operation at Budapest and at Blackpool, England, but it is doubtful whether either of these systems can be made operative in this country. The climatic conditions are different, and it is doubtful whether our American streets are quite up to those streets in Budapest in which one of the systems is in operation.

Various advantages are claimed for the different systems that have been suggested as a substitute for the open-slot conduit. They may obviate some of the disadvantages of the open-slot conduit with the continuous wire; they may claim to possess certain advantages in the way of costs, and other considerations which are even less apparent than that of cost, but they have other objections, and

\* Abstract of a lecture delivered before the New York Electrical Society, Nov. 1, 1894.



very strong objections, which, I think, put them far behind any open-slot conduit system, although I do not mean to say that such systems—that is, those other than the open-slot conduit—cannot be made operative.

**BROWN BICYCLE ELECTRIC CAR.\***

The accompanying illustrations represent a new plan for electric cars, designed by Charles Brown, of Basle, Switzerland. The car, as will be seen, has eight wheels. These are attached to four independent truck frames, the two wheels in tandem, on each side of each group of four, being mounted on separate frames, having jointed connections with the car body, whereby each pair of such wheels are permitted to adapt themselves in position to curves and vertical irregularities in the track, independently of the other wheels. Each tandem frame is provided with an independent motor. This is located between the two tandem wheels, with which it is connected by suitable gearing. The motor and gearing connecting it with the wheels are inclosed in a casing which forms a portion of the tandem frame.

bar, R, which is attached to the frames at each end by a universal joint, so that it and the frames can adjust themselves to any position.

Of this car Mr. Brown says: "If accumulator traction is to come up, this will, I hope, help materially, as it must reduce the power consumed to a minimum, and this is all-important in accumulator traction, as the power in store is a fixed quantity. This car is furnished, moreover, with a very convenient place for the batteries under the car body, between the fore and aft bicyclettes—the place under the seats is very inconvenient and damages the construction of the car very seriously. The bicyclette permits the construction of cars of any size or capacity, and the tendency just now is in the direction of larger cars. The use of Hyatt's bearings would also reduce the amount of power consumed by at least, I should say, 25 per cent.

"From a constructive point of view the four bicyclettes are absolutely identical, and can be manufactured in numbers at a low figure, and they are entirely irrespective of the car they are to serve under. If any one becomes defective it can be replaced in a few minutes without disturbing the three others. Further, the platform is only

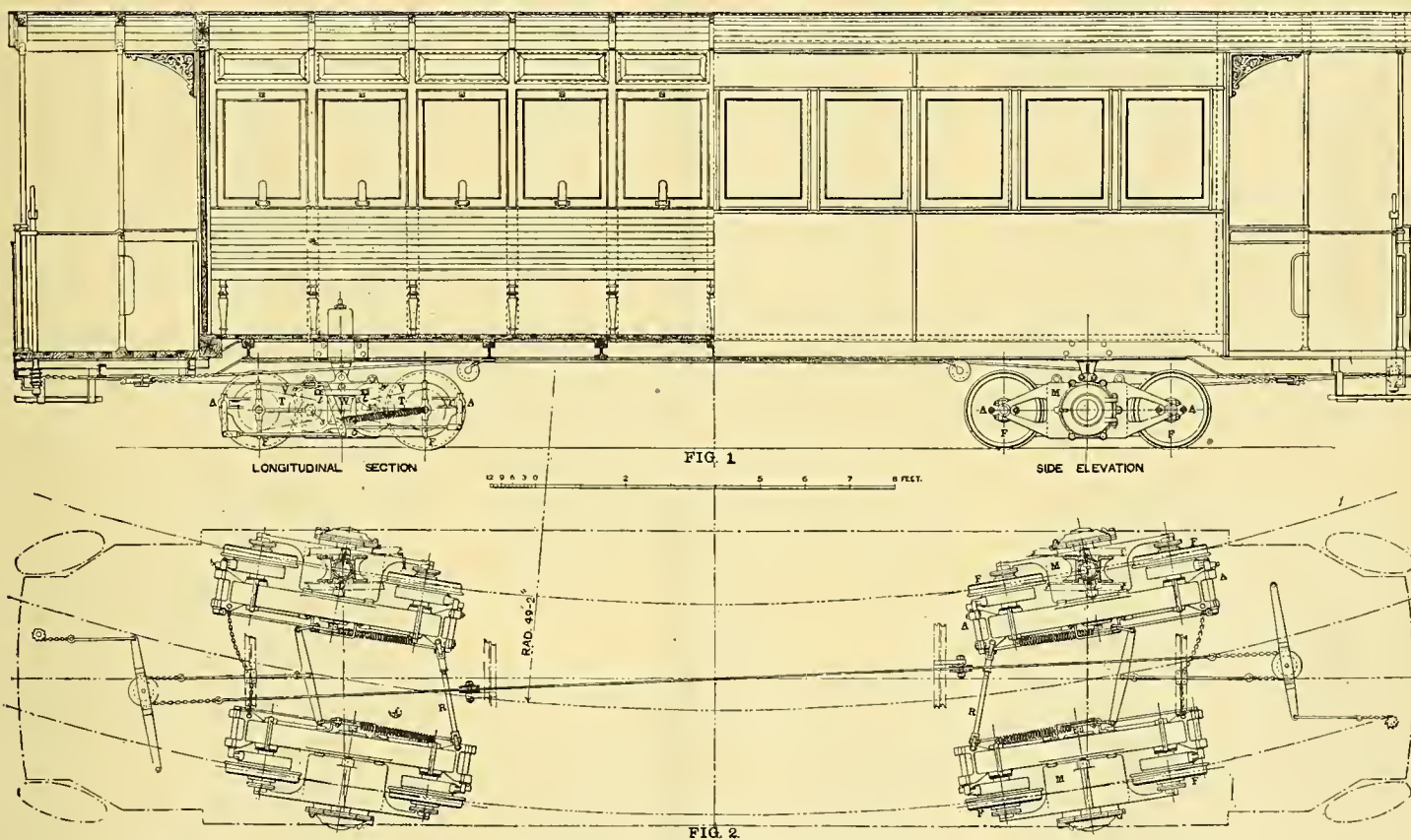
**NEW YORK RAPID TRANSIT.**

At the meeting of the Rapid Transit Commission in New York last Tuesday a letter from Commissioner John H. Starin was read outlining at considerable length his project for a Metropolitan rapid transit system. An abstract of the letter is given herewith:

Mr. Starin favored, in general, the lines adopted by the last commission—namely, a four-track road up Broadway and on the west side to the city limits, with a four-track line on the east side extending beyond the Harlem River. The Elm street route, he continued, would seem to meet the demands for a continuation of the east side line below Fourteenth street, if for new and far better reasons than any yet advanced it was decided that Broadway could not be used for a four-track road below Fourteenth street. Then his choice would be the Elm street route for the east side, and a line through Church street and similar streets parallel and close to Broadway for the west side.

The possibility of an underground road in New York had, in his opinion, never been fully realized by the public. "The underground road which New York should have—and ultimately would have—must be built," he remarked, "on a magnificent scale. It should not be a mere passenger road—it ought to be a great railroad, a railroad calculated to carry all the vast internal commerce

In the drawing F, F, are the wheels and A, A, their



FIGS. 1 AND 2. BROWN BICYCLE CAR.

frames, with casings M, M, for the electric motors. Upon the inner end of each armature shaft is mounted a pinion, which gears into wheels on the shafts. On the inner ends of these shafts and the axles of the wheels sprocket wheels are mounted, which are connected by chain belts, shown by dotted lines in the left-hand truck of Fig. 1. The manner in which the motion of the motor is thereby communicated to the wheels F, F, is obvious.

The outer portion of the tandem frames at the middle of its upper side carries what may be called a cylindrical plunger, which is pivotally connected to the frame by a pin, so that the frame can vibrate vertically about this pin. The plunger fits into a corresponding case attached to the body frame, and can turn in it about its vertical axis. The tandem frames have, therefore, a universal movement vertically about the pin and horizontally about the axis of the plunger. Suitable spiral springs are contained in the plunger, which support the weight of the car body. Each pair of tandem frames is connected together by a tie-

2 ft. from rail-level, a great facility for entering and leaving the car, saving time and preventing accidents.

"The wheels are much smaller in diameter than is the case with the American motor cars, being only 20 in. instead of 32 in. or 34 in., hence much less tendency to jump the track.

"The rail joint (the damage to the rail-joints is very serious with the heavy motor cars) would suffer less than with the two-axled cars, there being only one-half the load on each wheel in the case of the bicyclette, and thus there is the softening action of the bogie, as the car body is only lifted one-half so high in going over an obstacle on the rails, thus reducing the force of the blow to one-fourth of that in the case of the two-axled cars.

"The power required will not exceed one-half that now used. This is a very important point in the case of accumulator cars. I hope to be able to run a whole day with one charge."

of the city. It should be built to do a part of the work now done by river steamboats, barges, tows, trucks, express and delivery wagons, which should be more than a mere sub-service artery traversing the city north and south. It must become in time a vast railroad system, competent to do most of the traffic in passenger and freight now carried on upon the surface of such size and nature that in the future a passenger may enter his car in Chicago or St. Louis, or other distant point, and not be required to change cars until he reaches the station upon the underground in New York City that is most convenient to his destination.

"It should be planned," continued Mr. Starin, "so that freight could be billed, locked and sealed at the underground receiving station and carried to any point reached by the railroads of the country without breaking bulk."

The construction, he insisted, ought not to be less than four tracks contained in one broad, well-ventilated, thoroughly lighted tunnel, to avoid the noise and other discomforts of a narrow, separated tunnel for each set of tracks.

All the tracks should be devoted during the day to passenger traffic, while at night one-half the number would answer, and the other half could then be used entirely for freight. Hundreds of thousands of dollars, he remarked, were annually expended in New York for transporting the mails within the city limits by the primitive railway and

\* Abstract of an article in the *American Engineer and Railroad Journal* for November.

Norwich, Conn.—The directors of the street railway company have decided to extend the Laurel Hill branch as far as Crouch avenue.



unsafe method of wagon delivery. An immense sum of money was also annually expended by the express companies for transferring their express matter from one portion of the city to another by wagons. A proper underground railway system, he pointed out, would provide for the transfer of the mails and express matter far more economically and advantageously.

The rapid transit system, Mr. Starin insisted, should be planned to embrace the whole subject of passenger and freight traffic for the city of New York. Provision should be made to carry the United States mails. The express companies could build tunnels connecting with their storage vaults, and after loading their cars could run them to the main line for transportation to the desired points.

Beyond doubt, Mr. Starin further insisted, electricity had reached such a stage of development that the proposed system of underground railroads could be operated by it at a greater speed and more cheaply than by steam. The same power could ventilate and light the tunnels and provide safeguards against accident upon the lines, so that every imaginary objection to an underground road would, upon actual operation, immediately disappear.

Mr. Starin thought that the double deck road was out of the question. A broad road upon one level standard gauge and ample height was essential.

#### OPEN FRONT PLATFORMS.

The gates on the front platforms of the cars on the Seventeenth and Nineteenth streets line of the Philadelphia Traction Company have recently been removed as an experiment. It is noticeable that passengers are never inclined to move toward the front of a car, and the officers of the company think that their objection is due to the fact that it takes them so far from the exit. They argue that, if the front platforms are left open so that passengers may enter and leave by them, they will be far more easily induced to stand in the front part of the cars, and thus the crowding on the rear platforms and around the rear doors may be avoided. There is, however, an obvious objection to leaving the gates off the front platforms, and that is that it increases the chances of accidents.

#### NEW ENGLAND NOTES.

(From Our Special Boston Correspondent.)

At the next meeting of the Society of Arts, I. H. Farnham will read a paper on "Electrolysis of Pipes: The Cause and Prevention." Mr. Farnham has already read papers on this subject; in fact, he may be regarded perhaps as the leading authority on electrolytic troubles.

The selectmen of Braintree, Mass., in granting locations for laying out the tracks of the Weymouth & Braintree Electric Railway, have imposed extremely onerous conditions. It is provided that on each side of a grade crossing, derailing switches shall be placed in the track. In the case of overhead crossings or tunnels at railroad tracks, the street company must bear the entire cost. Whenever the people residing in Weymouth and Braintree subscribe 25 per cent. of the cost, the company must extend its tracks to other parts of the town. A provision is also made for the use of the company's tracks by a new company.

An effort is being made to secure a franchise for the construction of an electric railway connecting Great Head, overlooking Boston Harbor, with Braclmont, the next promontory to the north.

#### CANADIAN NOTES.

(From our Special Ottawa Correspondent.)

**Vancouver, B. C.**—The electric street railway and lighting system of Vancouver, B. C., has been sold to an English company for \$350,000.

**Toronto, Ont.**—A public meeting has been called in North Toronto to discuss the question of improved electric railway communication with the city of Toronto.

**Aylmer, Que.**—The Town Council has passed a by-law granting a 20-year charter to the Hull Electric Railway Company for the operation of an electric railway between Hull and Aylmer and through the streets of the latter town. It is expected the road will be in operation by July next.

An action has been begun in Toronto by John Inglis, an engine-builder, against Alderman Hewitt and J. T. Johnston to recover \$10,000 alleged to have been paid them for securing a contract from the Toronto Street Railway Company. Inglis did not get the contract; hence the suit.

**Brockville.**—A. B. Wilgus, of Boston, representing a company of American capitalists, has made a proposition to the City Council offering to build an electric street railway in Brockville. They ask for a 20-year franchise, an acre of ground for buildings, exemption from taxation, and permission to run the cars on Sunday.

The annual meeting of shareholders of the Montreal Electric Street Railway was held this week. The election of directors resulted as follows: L. J. Forget, James Ross, H. A. Everett, K. W. Blackwall, G. C. Cunningham. At the directors' meeting Mr. Forget was made president; Mr. Ross, vice-president and managing director; Mr. Cunningham, manager. Mr. Ross takes Mr. Everett's place on the Board, as vice-president, and Mr. Cunningham's as managing director.

**St. John, N. B.**—The Electric Railway Company made application to the Mayor of the city requesting him to rescind the order which he issued on Tuesday forbidding the company to run its cars. The Mayor refused to grant the request, contending that it would not be safe for the company to turn on the electric current until all the wires which had been knocked down by the storm had been repaired. The company, on the other hand, contends that the road can now be operated with perfect safety and threaten to sue the city for damages for every day that the cars are stopped.

**Montreal, Que.**—The Recorder has imposed a nominal fine on the Electric Street Railway Company for overcrowding its cars. One car, licensed to carry 36 passengers, was found with 50 passengers on board. The judge, in rendering judgment, said: "I understand it is difficult to prevent overcrowding on the cars, owing to the persistency of the public in boarding them; but, so long as the city bylaws restrict the carrying capacity of the cars to a certain number, the company must obey the rules or suffer the consequences. If the company objects to the bylaws and finds it impossible to obey them, it must either get them repealed or pay for breaking them."

**Ottawa.**—The Electric Street Railway Company has decided to issue \$187,000 new stock. The present paid-up capital of the company is \$625,000. The new stock will make the paid-up capital \$813,300. The additional money is needed partly to clean off floating liabilities, partly to defray the cost of probable extensions of the system. The present stock has been changing hands at from \$165 to \$180 per share of \$100. From June, 1891, to June, 1892, the first year of operation, the company carried 1,220,000 passengers, and paid 7 per cent. dividend. For 1892-93 the company carried 2,394,000 passengers, and paid 8 per cent. For 1893-94 the company carried 2,700,000 passengers, and paid 8 per cent. For the present year so far the number of fares has greatly increased.

#### COMMENTS AND VIEWS OF CONTEMPORARIES.

**NEW YORK GRIPMEN.**—The great majority of the cable gripmen have now so perfected themselves in their work that usually they start and stop the cars smoothly. Many of them are artists, who handle a car beautifully, calculating with the utmost nicety, not only the power at command, the weight carried, and the operation of the brake and grip of the particular car, but also the movements of neighboring teams and their effects upon the truck immediately in front, and the characteristics of the driver of the truck ahead. With all these elements they compute the measure of speed needed. There is in the town, perhaps, no set of men more alert, physically and mentally, than the high-grade gripmen. They pilot their cars fearlessly, dashing and safely, often with but a hair's breadth to spare. It would be hard to say which are the better gripmen, those of Third avenue or Broadway.—*New York Sun.*

**COMPETITION WITH STEAM ROADS.**—The idea that trolley lines would ever become active competitors with the steam railroads in the transportation of not only passengers, but freight and mails, has ceased to be the subject of the ridicule with which it was received long ago, and is now commanding serious thought and attention from railroad managers. This is due, not so much to the fact that the trolley lines have already done material damage to the traffic of the steam roads, but because they have captured enough local business to show that they are destined to become important factors in the question of transportation, and that great projects have been begun which will, if carried out, make long journeys by the trolley service possible. The declared intention of the projectors to compete for freight traffic, added to the experience had so far, justifies the conclusion that a condition is being rapidly reached where the interests of the steam roads will be so affected that managers will be forced by circumstances to devise ways and means with which to save their roads from serious loss.—*Buffalo Courier.*

#### NEWS OF THE WEEK.

**Pottstown, Pa.**—The Ringing Rocks Electric Railway has been shut down for the winter, as the traffic was insufficient to pay for the operating expenses.

**Nashua, N. H.**—The Nashua Street Railway Company has presented a petition to the Board of Aldermen, asking for the right to introduce an electric system.

**Waukegan, Ill.**—Surveyors have been in this vicinity of late laying out the proposed electric line to be built along the lake shore between Chicago and Milwaukee.

**Philadelphia, Pa.**—Adam C. Tietz has obtained a judgment against the Philadelphia Traction Company for \$26,960, for injuries received in a collision between two cars.

**Woodbury, N. J.**—Mayor Henderson has vetoed the ordinance which permitted the Camden, Gloucester and Woodbury Electric Railway to extend its tracks through Woodbury.

**Brooklyn, N. Y.**—The city authorities have withdrawn their opposition to the construction of a trolley line instead of a horse car line on Franklin avenue along Prospect Park.

**Kansas City, Mo.**—The Metropolitan Street Railway Company has decided to equip its Broadway road as an electric line, if the consents of the property owners can be secured.

**Salina, Kan.**—L. M. Erb, of Leavenworth, Kan., has been given a bonus for the construction of an electric railway, and it is announced that work will be commenced at once.

**Youngstown, O.**—The Youngstown Street Railway Company has applied to the County Commissioners for a franchise to construct an electric railway from Youngstown to Niles, via Girard.

**Brooklyn, N. Y.**—The Railroad Commissioners have granted to the Nassau Electric Railway Company the right to use the trolley system in New York avenue from Fulton street to Atlantic avenue.

**Brooklyn, N. Y.**—The Newtown Railway Company has obtained a franchise to operate an electric system in the town of Newtown, from the point bordering on Long Island City to the Flushing line.

**St. Louis, Mo.**—The Citizens' Electric Railway Company will be in operation by electricity by December. The track has been laid with 78 pound girder rails. The American Car Company, of St. Louis, is to build 60 cars for the road.

**Denver, Colo.**—In celebrating the recent Republican victory in Colorado, the East Capital Hill Woman's Republican League rented a number of electric cars decorated with lights, lanterns and flags and took an excursion about the city.

**Grand Rapids, Mich.**—John H. Roberts, of Grand Rapids, has been granted a franchise by the Council of Mackinac Village to construct an electric road to follow the shore line around Mackinac Island. The road is to be ready for operation next spring.

**Westboro, Mass.**—An electric railway between Woodville, Hopkinton and Westboro is projected, \$50,000 of the stock having been subscribed therefor. B. G. Underwood, of Malden, and Arthur M. Bridgman, of Brockton, are interested in the enterprise.

**Philadelphia, Pa.**—The steam dummies of the Fifth and Sixth street line, which for 30 years have connected Kensington and Frankford, have been displaced by the trolley cars. The first electric car over the line caused the greatest enthusiasm on the part of the residents.

**Syracuse, N. Y.**—The Common Council last week granted the Syracuse Street Railroad Company a franchise which will enable that company to complete its railway system to the city, and introduce a system of transfer by which residents can reach any portion of the city for five cents.

**New York, N. Y.**—The Manhattan Elevated Railway has established a transfer station at South Ferry. Transfers are issued to persons wishing to go from the west side system to the east side lines, or vice versa. The company is introducing express trams running from Franklin street to Fourteenth street without stopping, for the accommodation of those wishing to visit the shopping district.

**Baltimore, Md.**—The contract for the equipping of the power station of the Pikesville, Restertown & Emory Grove Railroad has been given to Stern & Silverman, of Philadelphia, Pa. It calls for three 250 H. P. Ball & Wood engines, four boilers, and three 150 k. w. Westinghouse generators. The plant is to be in operation Jan. 1, 1895. The road when completed will connect Gettysburg, Pa., with Baltimore, Md.



**PERSONALS.**

**Charles E. Newlon**, of the Jewell Belting Company, of Hartford, Conn., was in New York this week.

**R. A. Crawford**, of the R. A. Crawford Manufacturing Company, of Pittsburgh, was in New York this week.

**W. C. Groetzing**, general manager of the Charles Munson Belting Company, of Chicago, was in New York this week.

**Mr. Edwin Beers** died Sunday at his home in Brooklyn, aged 73. He was president of the Broadway Railroad Company of Brooklyn for 20 years.

**E. B. Ives**, chief engineer of the Electric Traction Company of Philadelphia, who has been connected with the Signal Corps of the First Brigade of the New York National Guard, has just been appointed Chief Signal Officer of the State, and has successfully passed a special examination. He is a graduate of West Point.

**George D. Widener**, vice-president of the Philadelphia Traction Co., has been presented by the members of the Electrical Engineering Corps a handsomely framed collection of photographs, which includes pictures of themselves, views of the exterior and interior of the company's four power stations, of the engineers' car, and of the tower and emergency wagons.

**TRADE NOTES.**

**The Louis K. Comstock Company**, electrical engineers and contractors, Monadnock Block, Chicago, have recently opened an office in Detroit, Mich., in the Hodges Building.

**Westinghouse Company.**—The Westinghouse Electric & Manufacturing Company is said to have \$1,000,000 orders on hand. The company is nearly ready to start its new works at Brinton.

**Flexible Trolley Brackets.**—Since the Burnham & Duggan Company, of Boston, reduced the price of its flexible trolley brackets and completed arrangements with Morris, Tasker & Co., of Philadelphia, for the manufacture and sale of them,

enormous orders have been received and the company has found it hard work to keep its customers supplied.

**The Imperial Rubber Company**, of New York, Geo. E. Austin, manager, Agents for the Charles Munson Belting Company, of Chicago, report that trade is very brisk. The company recently shipped eight rolls of belts to Prussia, a fact that goes to indicate that there is a demand for Munson belts on the other side of the Atlantic as well as in the United States.

**Scranton Contract.**—The Scranton & Pittston Traction Co. has given the contract for the building of 4½ miles of track between Pittston and Avoca, Pa., to Stern & Silverman, of Philadelphia, Pa. The rails are to be 56 pounds, with ties 2 feet centers. The same firm also secured the contract for the furnishing of the car bodies and trucks, as well as motors. Motors are to be two 30 h. p. Westinghouse series motors to each car. The contract also includes the furnishing and erection of all overhead material, and the construction of the road complete.

**Munson Belt Sales.**—We learn from the Charles Munson Belting Company, of Chicago, that trade has greatly improved of late, especially in the Pittsburgh territory. Among the orders that have recently been taken there are: two 52-inch and two 24-inch belts for the Second Avenue Electric Street Railway Company; one 28-inch belt for the Central Traction Company, and the entire equipment of leather belting for the new Brinton shops of the Westinghouse Electric & Manufacturing Company. The general trade of the company seems also to be greatly improved of late.

**The Clayton Air Compressor Works**, Havemeyer Building, New York, have sent us a copy of their newest publication on the "Uses of Compressed Air." This list cites about seventy different applications of air under pressure. It is of especial interest to engineers, railroad men, machine and construction shops, marble and granite works, chemical works, sugar refiners, to those interested in rubber and silk mills, tinware, pipe and hose manufacturers, and in all industries using artesian wells, automatic sprinklers for fire protection, oil for fuel, and to physicians and in hospitals or baths that use sprays for curative purposes. The list is mailed free on application.

**The Berlin Iron Bridge Company**, of East Berlin, Conn., has just completed for the Baldwin Locomotive Works, of Philadelphia, Pa., steel roof trusses for the addition to the latter's wheel shop. The same company will furnish the new power station for the United Electric Light and Power Company, on East Twenty-eighth street, New York city. The power-house is 100 feet wide and 200 feet long; the engine-room is 100 feet wide and 80 feet long, and the boiler-room is 56 feet wide and 100 feet long, the whole covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron roofing. The coal pockets in the boiler-room have a capacity of 3,000 tons.

**Edward F. Austin**, who was sales agent in the Pittsburgh district for the Altoona Manufacturing Company before that company made an assignment, has taken charge of the Pittsburgh office of the Phoenix Iron Works Company, of Meadville, Pa., manufacturers of the well known Dick & Church engines, boilers, feedwater heaters, etc. Mr. Austin reports the sale of a 15 x 18 engine to Jones & Laughlin; three 100 h. p. boilers for the Schenley Park Casino. These boilers are particularly designed for safety, etc., and are of special make all through. He also reports several smaller sales and states that inquiry is increasing from all localities and that he looks forward to an increase of trade in the boiler and engine business.

**Electric Heaters for Philadelphia.**—The Consolidated Car-Heating Company, Albany, N. Y., received last week an order from the People's Traction Company of Philadelphia for the equipment of 300 cars with its system of electric heating. This is the largest order ever given for electric heaters. Other large orders recently received by the Consolidated company are: 149 car equipments for the West End Railway, Boston; 187 for the Union Railroad, Providence; 60 for the Nassau road, Brooklyn; and many other smaller orders, aggregating in all about 500 car equipments. The electric heater of the Consolidated Car-Heating Company was the only electric heater that received an award at the World's Fair, and a medal and diploma were given to it for efficiency and economy of operation combined with admirable regulation of temperature. The heater is now in use in 100 cities and towns of the United States and Canada and on over 1,300 cars.

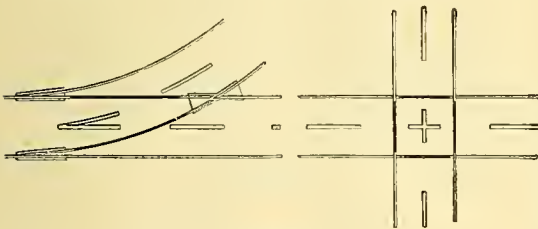
**RECORD OF STREET RAILWAY PATENTS.**

U. S. Patents Issued Nov. 13, 1894.

**528,949. Trolley;** Benjamin F. Lare and Charles M. Greer, Philadelphia, Pa., Assignors to the Ajax Metal Company, same place. Filed May 1, 1894. The trolley wheel fork has two upwardly projecting arms or prongs, the latter having suitable noes drilled therein for the insertion of the trolley wheel shaft and, on opposite sides of the said holes, slits or depressions.

**528,959. Intersecting Electric Railway Tracks;** Mark Lowd, Salem, Mass. Filed Feb. 19, 1894. A rail at an angle to the main line rails is provided with a tread of insulating material in the path of the current collector carried by the car on the main line. (See illustration.)

**528,963. Underground Conduit for Electric Roads;** Ezra A. Mathers, Romeoville, Ill. Filed June 12, 1894. This is a slotted conduit having double sides forming air spaces opening into the slot on each side. A flexible plug that fits the slot in the conduit is adapted to be lifted for a portion of its length from the slot by the passage through it of a trolley bar, and to close behind this bar as it passes, pipes adapted to convey compressed air and communicating with air spaces. Mechanism operated by the lifting of the plug permits the compressed air to flow from the pipes into the air spaces as the plug is lifted. (See illustration.)



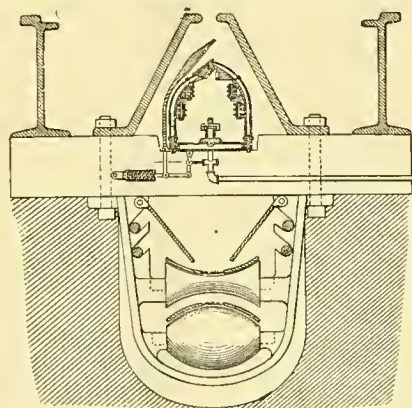
No. 528,959.

**529,011. Electric Railway Switch;** Rollin A. Baldwin, South Norwalk, Conn., Assignor to the Fitch Excelsior Switch Company, of New Jersey. Filed Jan. 4, 1894. Two electromagnets are adapted to move the switch in opposite directions, a circuit changer acting automatically to change the path of the current from one magnet to the other. A controller for the circuit changing device is arranged to hold the circuit changer in a given position until the circuit is broken and then permit it to operate. (See illustration.)

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**529,041. Fender for Cars;** John McCarthy, Newark, N. J. Filed June 2, 1894. The fender or guard is secured to slide in a supporting frame and the trolley pole is connected with the fender, whereby the backward movement of said fender will disconnect the trolley wheel from the trolley wire.

**529,052. Fender for Cars;** Frederick D. Weber, Brooklyn, N. Y., Assignor of one-half to Henry C. Christian, same place. Filed Feb. 23, 1894. A stationary fender projects in front of the car platform, and a lower fender is suspended at its rear end by spring-

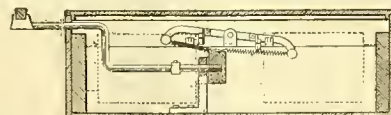


No. 528,963.

cushioned rods and suitable cables or chains, the lower fender frame extending beyond the upper frame.

**529,058. Trolley-Wire Hanger;** Johan M. Anderson, Boston, Mass., Assignor of one-half to Albert Anderson, same place. Filed July 19, 1894. The hanger comprises the following instrumentalities, viz.: An insulator to which the trolley wire is secured, a socket for the reception of said insulator and in which the said insulator is capable of being turned or rotated, a protective sleeve on the said insulator, and a locking device engaging the said sleeve to retain the insulator in its adjusted position within the socket.

**529,095. Safety-Guard for Cars;** Frederick Zorn, New York, N. Y. Filed June 21, 1894. This comprises a rock bar, means being provided for supporting it. A



No. 529,011.

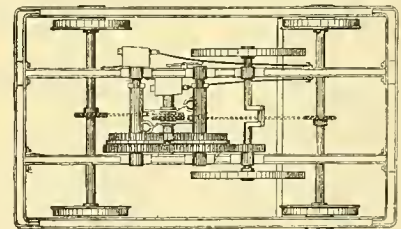
series of guard pieces secured to the rock bar extend outward away from each other, the rock bar being constructed to draw the free ends of the guard pieces toward each other as it is rocked rearwardly.

**529,158. Street Car Heater;** Menard K. Bowen, Chicago, Ill. Filed July 11, 1894. This is an improved device for street car heating.

**529,226. Vehicle Door;** Charles A. Wright, Philadelphia, Pa. Filed Oct. 26, 1893. A movable door is adapted to open or close the passage or doorway, and a weighted device independent of the door proper operating by its inertia opposes all movement of the door relatively to the vehicle frame occasioned by movements of the vehicle.

**529,260. Car Fender;** Elie B. Graff, Baltimore, Md. Filed June 25, 1894. This is composed of a framework having two side bars each made in one piece, one portion of each side bar being bent to a vertical position, and the other portion to a horizontal position, the vertical portion having its lower end connected to and continuous with the rear end of the horizontal portion and coiled at this point into one or more elastic convolutions to form springs.

**529,268. Reversible Driving Gear for Cars;** James Hopkirk, San Francisco, Cal. Filed Feb. 12, 1894. The tension device for flexible driving bands consists of the lever through which the driving-pulley shaft turns loosely, rollers journaled in the levers at one end to press upon opposite parts of the driving band, a casing containing a spiral spring standing between the ends of the levers opposite to the rollers, and



No. 529,268.

an adjusting screw by which the pressure of the spring upon the lever is regulated. (See illustration.)

**529,275. Street-Car Fender;** Henry C. Kennedy and George W. Roletter, Philadelphia, Pa. Filed July 10, 1891. The fender is V-shaped and has its lower ends concave, with an elastic strip secured thereto. An elastic member held to the apex of the fender is curved to conform to the shape of the post, the bars of the fender being designed to be fastened at their ends to the ends of the bars of the side fenders.

**529,284. Car Truck;** Benjamin F. Manier, Jr., Providence, R. I. Filed April 11, 1894. This has a hollow pedestal rigidly secured to the car frame or base with oppositely arranged inclined braces fastened to the lower portion of the pedestal and to the car frame. A tie brace unites the pedestals and a bottom tie or cap unites the two sides of the pedestal. All are adapted to move vertically in unison with the car. The axle-carrying box is loosely mounted in the pedestal, a light spring or cushion interposed between and in contact with said box and tie and a full elliptic spring arranged longitudinally of the car. The spring is interposed between and in contact with the upper side of the box and the under side of the pedestal base.



## NEW INCORPORATIONS.

**Carthage, Mo.**—Jasper County Electric Railroad Company, capital stock \$150,000, has been incorporated. The promoters are: J. W. Halliburton, F. W. Fitch, Isaac Perkins, Carthage, Mo.

**Philadelphia, Pa.**—The Philadelphia & Lansdale Railway Company has been incorporated; capital stock, \$100,000; promoters, Robert A. Welsh, H. A. Mullen, John B. Moffitt, Philadelphia, Pa.

**Harrisburg, Pa.**—Mechanicsburg and Boiling Springs Electric Railway Company has been incorporated with a capital stock of \$100,000. The promoters are: Jno. B. Skyles, Martinsburg, Pa.; S. Ritter Ickes, W. K. Meyers, Harrisburg, Pa.

**St. Louis, Mo.**—The Carthage, Webb City, Joplin & Galena Electric Railway Company has been incorporated with a capital stock of \$175,000. The promoters are John J. Taussig, David R. Powell, St. Louis, Mo.; Chas. C. Carroll, Springfield, Ill.

**New York, N. Y.**—Boynnton Transit Company of Spain (incorporated in West Virginia), capital stock \$10,000, has been incorporated. The company proposes to acquire patents for appliances relating to steam and electrical railways, etc. The promoters are I. E. De Navarro, New York City, N. Y.; Eben Moody Boynton, Newbury, Mass.; Wm. H. Boynton, New York City, N. Y.

**New York, N. Y.**—Boynnton Transit Company of France (incorporated in West Virginia), capital stock \$10,000, has been incorporated. The company will acquire patents and patent rights for appliances, etc., relating to steam and electric railways, etc., in France. The promoters are J. F. De Navarro, New York City, N. Y.; Eben Moody Boynton, Newbury, Mass.; Wm. H. Boynton, New York City, N. Y.

## FINANCIAL NOTES.

**Chicago, Ill.**—The North Side Electric Street Railway Company has filed a certificate increasing its capital stock from \$500,000 to \$1,500,000.

**New Orleans, La.**—The Orleans Street Railway is to be electrically equipped. At a recent meeting of stockholders it was voted to make this improvement at a cost not to exceed \$210,000.

**Chicago, Ill.**—The directors of the Chicago City Railway Company have decided to issue a million dollars of new stock, for which stockholders will be allowed to make pro rata subscriptions.

**Indianapolis, Ind.**—Grafton Johnson and John A. Polk have applied to the commissioners of Johnson County for an electric railway between Indianapolis and Franklin. Pleasant Township of Johnson County will vote on a proposition to appropriate \$34,000 toward building an electric line between Greenwood and Franklin.

**Sioux City Receivership.**—The Manhattan Trust Company, of New York, on Nov. 13, applied for a receiver for the Sioux City Cable Railway Company. The Manhattan company is trustee for \$300,000 of bonds of the cable company. The road has not been paying expenses, and has not paid interest on the bonds for four years. The court appointed Howard S. Baker, of Sioux City, receiver.

**Consolidation in New Jersey.**—Representatives of the Union Traction Company, of New Jersey, and the Newark, Rutherford & Hackensack Electric Railway Company have agreed that the latter company should be absorbed by the former, Delos E. Culver and Henry H. Copeland becoming members of the directorate. Consents of property owners to the right of way through Lyndhurst, Kingsland and Rutherford are thus transferred to the Union Traction Company.

**Manhattan Statement.**—The New York Herald claims that the statement of the Manhattan that has just been published is to all intents and purposes incorrect. It asserts that the earnings were \$400,000 more than they appeared to be, as it is alleged that the cost of twenty new engines, new rails, ties, etc., was charged to operating expenses. The statement, it is said, gives evidence of an intention on the part of the managers to allow the investing public to deceive itself and to consider the competition of surface lines more serious than it is.

**Consolidation of Chicago L Properties Suggested.**—The bringing of the elevated properties under a harmonious management is a scheme that offers

so many desirable results and would permit in its manipulations such enormous profits that it can be set down as a foregone conclusion it will be done sooner or later. It has been said by shrewd judges of the situation that the combined elevated properties have \$5,000,000 added to their value the moment the combination is made, because that combination permits an immediate down-town outlet.—*Chicago Tribune.*

**Montreal Company's Earnings.**—The earnings of the Montreal Street Railway Company for October, the first month of the company's fiscal year, amounted to \$88,023.28, the average per day being \$2,839.46. The increase for the month as compared with last October was \$15,580.78; the average increase per day, \$502.60. To Nov. 13 the increase is about on the same ratio as during October. The annual earnings of the company during the last 10 years were as follows: 1885, \$222,063; 1886, \$252,186; 1887, \$346,022; 1888, \$386,486; 1889, \$412,216; 1890, \$431,389; 1891, \$491,862; 1892, \$569,810; 1893, \$750,751; 1894, \$896,090.

**Brooklyn Elevated.**—Adolf Ladenberg, president of the Brooklyn Elevated Railroad Company, denies the rumor that a petition for a receiver for the company is to be filed. "If an attempt to secure a receiver is made," he said, "I might fight it. Because of bad times and the competition of the trolley system the company will have a deficit of about \$200,000 at the end of the year. But what is that for a company with nearly \$12,000,000 of bonds, upon which it has never defaulted in interest and has always heretofore earned a surplus? We have some unissued bonds which will be put out as soon as times are good, and every obligation of the company will be then taken up."

**Chicago Elevated Roads.**—Rumors that the Metropolitan Elevated Railroad, of Chicago, is seeking to get control of the Alley "L" have led to the belief that a combination is being contemplated which would be of material advantage to both roads. There is some probability that the wealthy stockholders of the Metropolitan are buying up large blocks of the Alley "L" stock. But it is emphatically denied by officials of both roads that any overt acts looking to a consolidation of interests have taken place on either side. Whether there have been any actual transfers of the stock of the Alley "L" to Metropolitan stockholders is not known to a certainty. There are some strong reasons for the belief that as individuals several of the Metropolitan financiers have been quietly negotiating for the purchase of Alley "L" shares with a view to ultimately getting a controlling interest.

**Terre Haute, Ind.**—An election in Harrison township, which includes Terre Haute, has been ordered for Dec. 17 on the proposition to vote a donation of \$20,000 for an electric railway between Terre Haute and Brazil. The company has been incorporated with \$100,000 capital stock, and it is estimated that it will cost \$125,000 to build the line and locate a power-house at Seeleyville, which is about half way between the two cities. Of the \$100,000 stock \$20,000 has been subscribed in Terre Haute, and the promoters of the road say they have assurances of twice that amount if the \$20,000 donation is secured. The right of way has been secured along the north side of the old government national road. It is proposed to run cars every 30 minutes. There will also be express cars, and it is expected that considerable business may be done in the shipment of the lighter articles of what is usually handled as freight. The passenger fare is to be 15 cents. The fare on the Vandalia road is 50 cents.

**Permission to Build Gloversville Road Denied.**—The New York Railroad Commissioners have denied the application of the Amsterdam, Johnstown & Gloversville Railroad Company for authority to build its proposed road. In its memorandum filed with the decision the Board says that the new road makes a saving of only two miles in the distance from Akin to Gloversville over the existing route of about 16 miles by the New York Central road to Fonda, and from thence to Gloversville by the Cayadutta electric road. The commissioners continue: "In different reports from the time of its organization this Board has set forth certain evils that had been inflicted upon existing enterprises and upon the general community by the construction of unnecessary railroads. Such unnecessary railroads, after a brief period of unwholesome competition, had speedily gone into bankruptcy and had finally become a burden upon the older projects and upon the general community.

The evidence is undisputed that the existing roads are abundantly able to transact all business now offered or that is likely to be offered for many years to come. If the charges made for transacting such business are exorbitant there is a better method of curing this evil than by inviting superfluous competition. Furthermore, if the existing roads between Fonda and Gloversville are making exorbitant charges, this fact may indicate that there is hardly business enough to support them upon reasonable charges, in which case there is obviously no occasion to build another road in a neighborhood already oversupplied."

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**Street Railway Franchises.** An article on "Franchises" by R. D. Fisher is printed in this issue. The author's purpose is to correct the vague notions that have been entertained on this important subject, and many points that are presented will be noted with a great deal of interest.

**British Ideas of Electric Railways.** Here speaks the true Britisher: "We feel certain that when electric traction moves in this country, British engineers will not copy the details of American practice, but will work out the problems in their own way." Of course the only surface trolley line in England worth speaking of is American, but that doesn't signify with the London *Electrical Review*. The complacent Englishman talks in his self-satisfied strain of what he knows about electric traction and what he could accomplish in that field of activity if he tried, but he does not do anything. British engineers may be able to work out the details of an electric railway installation in a way far more satisfactorily than Americans have done, but they haven't even tried to do it as yet. The journal from which we have already quoted thinks very little of American construction, because "it would seem that, in spite of the great application of electric traction in America, they are still improving in important points, so that what is the best practice to-day is bettered by some improvements next day, and so on." If it is the English idea to postpone the construction of electric railways until all the problems have been satisfactorily solved, the British public will continue to ride in antiquated trams for generations to come.

**Showing the Trolley System's Merits.** A report of an exceptionally interesting meeting at which the trolley system was discussed is sent to us from Chicago, and is printed on the next page. The residents of a certain avenue now traversed by horse cars strenuously oppose the introduction of electric cars, which the street railway company is anxious to operate on the street. They argue, it is almost needless to remark, that overhead wires will disfigure the street and that the trolley cars will prove so dangerous that they will cause the depreciation of their property. The company decided that the only way to change the views of the "nobility," as the residents of the avenue in question are known in the Chicago City Railway offices, was to give them correct information on the electric railway as it is operated to day. A meeting was called at which about 1,000 persons were present. A paper was read describing the merits of the trolley system, and stereopticon views of streets in several cities where the trolley car is in successful operation were thrown on a screen, giving an ocular demonstration that aerial wires do not disfigure a street as badly as is commonly believed. Several pictures were projected on the canvas illustrating the avenue as it is to-day and also as it would appear were overhead wires introduced. It would be going too far to say that the property owners were convinced that they had been heretofore laboring under a delusion, but it may be asserted with safety that many of those present obtained new light on the trolley question. The example of the Chicago company may be worth

following in many cases where street railway companies find they must deal with an exceptionally prejudiced public.

**Electric Railway Conduit Construction.** The concluding installment of Joseph Sachs' paper on electric railway conduits, recently read before the New York Electrical Society, appears elsewhere in this issue. The author has described a considerable variety of plans suggested for the solution of the conduit problem, most of which may be regarded as purely experimental inasmuch as they have never been subjected to any practical test. The systems that were enumerated by Mr. Sachs, of necessity, were only the most prominent, for collection of all the varied schemes devised for the operation of railways by wires below the surface of the ground would fill a stout volume. The problem is one that seems to exercise the strongest kind of a fascination over the minds of inventors, for they have believed, in view of the existing prejudice against overhead wires, that the time is soon coming, if, indeed, it is not at hand, when the possessor of a patent broadly covering a successful conduit electric railway could name almost his own price for the invention. The statement that Mr. Sachs makes, that of all the electric railway patents granted since the first days of the practical application of electricity one-half have been issued for conduit railways, illustrates the extraordinary interest that has been taken in the problem, and those who have followed the weekly patent record of the STREET RAILWAY GAZETTE realize that this interest is by no means dying out. Several of the plans described by Mr. Sachs are so complicated that one is at once inclined to condemn them on this account and doubt their practicability, but they are simplicity itself compared with some of the projects revealed in the patent records. The conduit problem Mr. Sachs regards as soluble, and this belief is beyond a doubt entertained by the Metropolitan Traction Company of New York City, whose electric conduit construction in Lenox avenue is illustrated and described elsewhere in this issue. The construction in this case is of the simplest kind, in fact, in general design it is not materially different from that of the earliest efforts in this direction. The company evidently pins its faith in its ability to overcome difficulties heretofore encountered to thoroughness of construction and to perfection in detail along well-tried paths, rather than to any ingenious and novel method about which nothing definite is known. It may safely be asserted that electric railway conduit work has never before been done in so admirable and expensive a way—the construction is equal to that to be found in the best cable roads. It should not, however, be inferred from what has been said that there are no new features about the work now in progress on Lenox avenue. Those who attempt to investigate the construction will soon realize that there are many new wrinkles to be added to the old design and that there are several mysteries that the engineers are not yet ready to reveal. Still the statement that the general plan is of the simplest form is true, and the tests of the Lenox avenue electric line will doubtless demonstrate once for all whether this type of conduit railway can be made successful in actual service.



### TROLLEY QUESTION IN CHICAGO.

An unusual meeting of persons interested in the transit facilities of Indiana avenue, Chicago, was held in that city a few nights ago. The street is now traversed with horse cars, but the Chicago City Railway desires to substitute electric cars, as it proposes to do on most of its lines that are tributary to the main cable roads. The residents of the thoroughfare are proverbially conservative and object to an improvement in the street railway facilities, and the company called the meeting in order that arguments in favor of changing the motive power might be presented.

Louis E. Myers, of the Electrical Installation Company, of Chicago, read a paper showing the desirability of installing an overhead trolley system on Indiana avenue. He referred somewhat at length to conduit systems and storage battery systems, and thought that it would be a very doubtful experiment to introduce either of them in Chicago. He thought that neither system was at the present time so perfect that it could be installed with advantage in a Chicago street. He asserted that much of the prejudice against the overhead trolley system was entirely unreasonable, and he endeavored to prove this to the satisfaction of his audience by the use of pictures thrown onto a screen by a stereopticon. He showed street scenes in Cincinnati, Minneapolis and Indianapolis, where the trolley system is in use, and said that it could easily be seen that the overhead wires did not by any means destroy the handsome appearance of a thoroughfare. Mr. Myers then attempted to show that the appearance of Indiana avenue would not be marred to any extent by the addition of overhead wires. He threw on the screen photographic representations of the street as it is today, and pictures showing the thoroughfare as it would appear if the overhead system were installed. These pictures were especially interesting to the audience as the subject has been so much discussed that the unæsthetic character of the overhead material has been exaggerated. The hearers, however, were not all convinced, and some of them expressed their disapproval by hissing when the views showing the overhead system were presented. Mr. Myers corrected the general impression that accidents on electric roads are due to the escape of electric currents, and referred to other erroneous opinions that exist.

Quite a number of property owners spoke, some of whom condemned the trolley very bitterly, and stated that they were well satisfied with transportation by means of horse power.

### TROLLEY SPEEDS IN BROOKLYN.

The railroad committee of the Board of Aldermen of Brooklyn last week considered the matter of limiting the speed of trolley cars. Several persons complained of the rapid speeds, and thought that the rate should be considerably reduced. D. F. Lewis, president of the Brooklyn Heights Railroad Company, argued that it was entirely safe to run the cars at 10 miles an hour outside of the crowded business streets, and as this speed was not considered too great above Sixty-fifth street in New York City, he could see no reason why it could not be allowed in Brooklyn. He said that the people demanded rapid transit, and a speed of six miles an hour would not satisfy this demand. He thought that the greatest objection to the speed of the trolley cars came from the elevated railroad companies, as their business had materially decreased since electric cars had been introduced.

The matter of open cars was also considered, and Mr. Lewis said that he thought the question of open and closed cars should be left to the discretion of the companies. It was true, he admitted, that open cars were run on cold and wet days, but it was done because the people who patronized the roads demanded them. He made this statement, he said, from experience, because the company had made a test by running a closed car with

an open trailer on cold and wet days; while the former was almost deserted, the latter was well patronized.

### ANNUAL REPORT OF THE PHILADELPHIA TRACTION COMPANY.

The stockholders of the Philadelphia Traction Company held their annual meeting last Tuesday. The report for the fiscal year ending June 30, 1894, was read by the secretary, D. W. Dickson. It showed that the receipts for the year were \$5,194,990.52, and the expenditures \$4,702,416.70, leaving a net profit of \$492,573.82. During the year 136,327,329 passengers were carried, including transfers and free riders. This is an increase over the year ending June 30, 1893, of 10,692,794 passengers.

President P. A. B. Widener made a statement, in the course of which he said:

"It is perhaps well to state that the bulk of our trolley roads have been started since the period of this report, which ended the 30th of last June. With two roads running during the last six months of the last fiscal year, the report shows an increase in earnings of \$100,000 over the previous year. We feel very much flattered by that showing. We are gradually getting rid of our horse stock. We count the maintenance of a horse at the rate of 50 cents a day, and when we have disposed of the 2,000 horses still on hand we will save just \$1,000 a day. Since the introduction of the trolleys our increase in revenue has averaged about \$50,000 a month, and the figures for the present month of November will show an increase of not less than \$75,000 over the corresponding month of a year ago. Next month we look for even a much larger increase in business.

"I think that the earnings of the road for the existing year will show all, if not more, than we really anticipated when we began the construction of the electric lines. By the next annual meeting of the stockholders we will have all our trolley roads running, and then we will have begun to get the full benefit of the new system, and will be able to show just what we can do. In the light of the past, I don't think that there is any property in the country that has a brighter prospect than this property. We feel that it will certainly give to the stockholders all that has been promised by this management."

After the report had been read a motion was presented by Gen. James F. Rusling and adopted, extending to the president and directors the thanks of the stockholders for the efficient manner in which they had discharged their duties.

President Widener expressed his appreciation of the stockholders' action, and referred to the care and anxiety that attended the introduction of the trolley system.

It had involved, he said, a very large expenditure of money on what most people had believed to be an experiment, but which the management of the company had never regarded as experimental from the first. Turning to the later efforts of the management to develop the full paying capacity of the trolley system, Mr. Widener spoke of the poor business of the railway companies in Philadelphia on Sundays as compared with other cities of the United States. Particular attention had been paid to the growth of the Sunday travel, and now, with the addition of the Dauphin and York streets line, the operation of the Walnut street bridge route and the future occupation of Girard avenue bridge, which he felt sure the company would get, the company has all its roads centering at the Park. With the proposed new road within the Park limits in operation, people could be carried to any part of Fairmount Park. By next summer he thought the receipts on Sunday would be as great as on any other day of the year.

William L. Elkins, continuing the line of thought as brought out by Mr. Widener, stated that the increase in the Sunday business would amount to not less than \$350,000, and that without any additional expenditure. General Rusling followed Mr. Elkins

and said he had offered the resolution of thanks spontaneously and without a word of consultation with his brother-stockholders. He and others outside of the city had watched the company's development, first to cable cars and then to the trolleys, and they were all of the opinion that the affairs of the corporation had been handled with great skill and discretion. For that reason he believed that it was only just that the stockholders should record their appreciation of the wisdom and labor exerted by the management in bringing the Philadelphia Traction Company up to its present flattering condition.

### NEW YORK RAPID TRANSIT.

The New York Rapid Transit Commission held a meeting last Tuesday. Several plans and suggestions were received from Jesse W. Reno, the proposer of the double-deck, four-track road; Herman Rausch, Ogden P. Bell, the secretary of the Central Tunnel Company; J. W. Pinchor and Joseph G. Hillam. All such letters will hereafter be referred directly to Engineer Parsons.

Mr. Parsons submitted the following report:

"According to the instructions contained in your resolution of two weeks ago, I have made a study of the extension of the east side route north of Forty-third street, where the plans provisionally adopted terminate, and herewith beg leave to submit my suggestions.

"I recommend to commence at a point at Fourth avenue, between Fortieth and Forty-first streets, where the present line diverges to the left, and continue in a straight line beneath the Grand Central Depot and the yard to a point about Forty-eighth street, there dividing the four-track system into two and carrying two tracks on each side of Fourth avenue, to the left and right respectively of the present Harlem River tunnel. Just north of Ninety-seventh street the tracks would emerge into an open cut and, by an ascending gradient reach an elevation so as to give at least 20 feet in the clear above the Harlem tracks, thence by a steel elevated structure spanning the new steel structure now being erected by the Harlem River Railroad, thence continuing to the Harlem River, crossing the same to the north of the Harlem River Railroad bridge to Walton avenue, and continuing thence along the line surveyed and located by the previous Rapid Transit Commission, which line lies substantially parallel with and a short distance east of Jerome avenue.

"The officials of the New York Central Railroad have very kindly given me access to the plans of their present and proposed structures on Fourth avenue, sections of which accompany this report, from which you will see that the carrying out of an additional railroad on Fourth avenue conflicts slightly with their stations at Fifty-ninth street, Seventy-second street and Eighty-sixth street, and also with their wide tunnel between Eighty-sixth and Ninety-sixth streets. Before detailed plans for your structure can be drawn an arrangement will have to be made with the New York Central Railroad Company looking to a modification of its structure at these points."

### DEATH OF COL. S. A. DYER.

Colonel S. A. Dyer, president of the Chester Traction Company, died at his home in Chester, Pa., last Sunday. He had been ill about ten days. Colonel Dyer was the leading business man and financier in Chester. He was the founder of the Chester National Bank and its first president, which position he held until 1893, when he resigned to take entire charge of his railroad interests. He was a director of the Chester Railway Company—capital, \$100,000—and then organized the Union Railway Company, in 1888, paying \$200,000 for the stock of the Chester Railway Company. The Union was chartered with a capital of \$300,000. In December, 1892, horses were abandoned, and the trolley substituted, and in 1894 the Chester Traction Company was organized, embracing the other lines whose tracks had been extended to Marcus Hook and Media. The Darby line was then built and incorporated in the Chester Traction Company, which has a capital of \$500,000, and covers 33 miles of track. The plant is considered one of the best and most complete and prosperous in the State, and drains into Chester from every side except the river side.



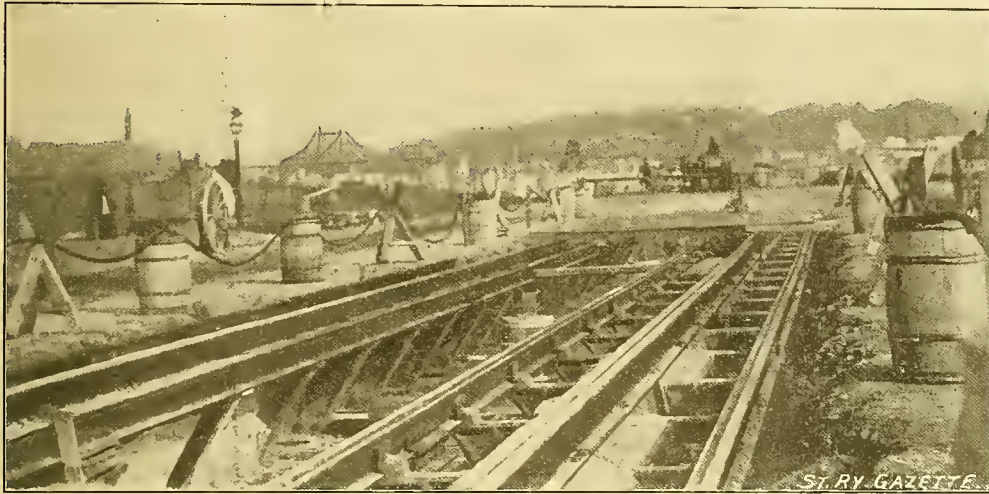
**LENOX AVENUE CONDUIT CONSTRUCTION, NEW YORK.**

The Metropolitan Traction Company of New York City has been anxious to introduce mechanical power on certain of its lines now operated by horses, but it has realized that permission to install a trolley system cannot be secured, as the popular feeling against aerial wires is too strong. As the company wished, however, to discard animal power if a satisfactory substitute cheaper than the cable could be found, it determined to introduce an elec-

The contact shoe comes down through the slot, and has two arms pressing outwardly from the center supporting bar against the conductors, making a continuous rubbing contact. The voltage on the line will be from 250 to 300 volts.

The power station is located on 146th street between Seventh and Lenox avenues. The work on the structure has been commenced and is progressing rapidly, the side foundation of the walls now being built. The foundations were started from a point about 25 feet below the grade of 146th

of the Alley "Alley "L" road advanced over three points when the news of the loop projects was received. Two companies have been formed to build a downtown loop and both were incorporated upon the same day. The first of these is the Central Elevated Railroad Company, which is the outgrowth of the union of interests of the Metropolitan Elevated and the Alley Elevated companies. The corporation has a capital stock of \$3,000,000 and among the incorporators are John Worthy, president of the Metropolitan Company, and Marcus Hopkins, of the Alley "L" Company. The second company is the Union Elevated Railway Company, which proposes to build a downtown loop for the Lake street and new Northwestern Company. The capital stock is \$5,000,000 and the incorporators are John A. Roche of the Lake street road; Egbert Jamieson, counsel of the Yerkes roads; John B. Parsons, general manager of the West Side road; D. H. Louderback, general manager of the Lake street road, and others. It seems to be an open question whether these two new companies will engage in a bitter fight for the right to build a loop, or whether they will get together and agree on a single belt line to be used jointly by all the companies.



ELECTRIC RAILWAY CONDUIT CONSTRUCTION IN LENOX AVENUE, NEW YORK

tric conduit system on one of its new lines. After some investigation and negotiation, the design of the conduit was intrusted to the engineers of the General Electric Company, and it was decided to install the new system upon the Lenox Avenue line. The work has now been in progress for a considerable time, and the accompanying illustrations show the general character of the construction. The photograph from which Fig. 1 was reproduced was taken at 146th street looking north on Lenox Avenue.

The company has been prosecuting the work with great vigor and 600 men are now employed. Most of the construction on the Lenox Avenue line is now practically finished and for a considerable part of this distance the paving has been completed. It will be seen that the construction which has been done with the greatest thoroughness resembles very closely the cable work on the several lines of the Metropolitan company. It seems to be a fact that the company regards electrical operation in the nature of an experiment, and therefore the conduit has been so constructed that the line can be operated by cable if the electrical working is not altogether satisfactory.

The conduit is a sheet iron one and the yokes are of cast-iron. The rails are 7-inch girders and are laid on the ends of the yokes. The space between the flange and the head of the rail is filled in with cement. The manholes are located every 30 feet, and to the yokes at this point insulators are attached on suitable supports. The insulators are of rectangular form and are supported in cups and are imbedded in sulphur, as will be seen in Fig. 2. The insulators are made of soapstone, and fastened to the top is an arm of iron to which is fastened the channel iron contact conductor. As the insulators are located at the manholes, they are easily accessible. As two conductors are employed, no structural return circuit is required. The feeders will be carried in pipes laid between the tracks.

In his lecture on conduits, an installment of which appears elsewhere in this issue, Joseph Sachs calls attention to the fact that the power conductors are very nearly under the slot, and he mentions this fact as an objection which was found to some of the first conduit systems. The work, however, has been so carefully planned by the engineers of the General Electric Company, and has met the approval of so many of its experts, that it is not likely that any trouble will be experienced on this score.

street. The entire surface of the interior of the power station is laid with a bed of concrete about 4 feet in thickness. A steam concrete mixer is used, and eight men are employed solely in shoveling in the broken stone.

**DOWNTOWN LOOP IN CHICAGO.**

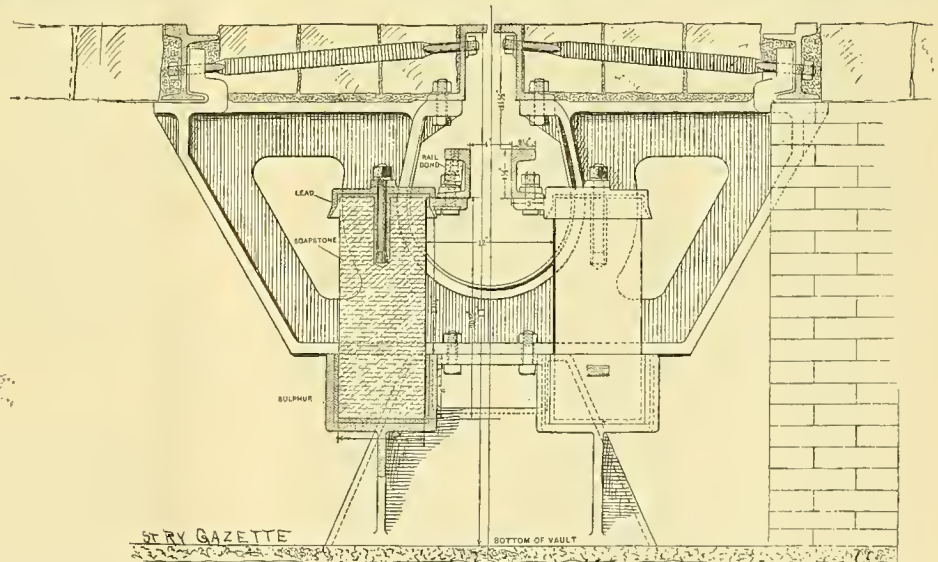
The great need of the existing and prospective elevated railroads of Chicago is a downtown loop. Both the roads that are now in operation have their termini at points several blocks distant from the center of the business district, and as a result they have not secured the patronage that was ex-

**ALLEGHENY TRACTION COMPANY'S CAR BARN BURNED.**

The barns of the Allegheny Traction Company, on Spring Garden Avenue, Allegheny City, Pa., were burned on Nov. 23. Before the engines arrived the entire roof was one mass of flames. The flames spread to the other parts and burned 150 feet on Spring Garden Avenue and 200 feet back. There were 50 horses in the barns, 49 of which were burned. Seven old horse cars and seven new electric motors were also burned. The loss of the street car company is estimated at \$75,000; insurance not known.

**AUTOMATIC TICKET SELLERS.**

The Consolidated Street Railway Company, of Cincinnati, has decided to introduce automatic ticket sellers for the convenience of patrons on its lines on which tickets are good. A manufacturer of nickel-in-the-slot machines conceived the idea



SECTION AT THE VAULT OF THE LENOX AVENUE ELECTRIC RAILWAY CONDUIT, NEW YORK.

pected. There has been a great popular demand in Chicago for the construction of a downtown loop that would be used jointly by all the companies, but none of the efforts to satisfy this demand has, as yet, come to anything. Real estate owners have opposed every scheme for an elevated structure in the business district, as they have argued that it would greatly injure their property. Last week two projects for the construction of a loop were made public. It would appear that there is a belief that something definite will be developed, for the reason that on the Stock Exchange the shares

that machines built on this plan would be favorably regarded by the public, and he laid the proposition before the company. According to the machine that he has devised, tickets will be arranged in packages of six and will be dropped out when 25 cents is slipped into the slot. It is stated that each box will contain different divisions for the several lines. Six machines will first be located at the stations around Fountain Square. If these are found to operate satisfactorily both to the public and to the company, it is likely that the number will be increased and that they will be distributed in various places about the city.



## FRANCHISES.

BY R. D. FISHER.

*Import--Purposes and Consideration--Evidence of a Grant--Limitation.*—Properly defined, franchises are special privileges conferred by government upon individuals, and which do not belong to the citizens of the country or community generally, of common right. It is essential to the character of a franchise that it should be a grant from the sovereign authority, and in this country no franchise can be held which is not derived from a law of the State. (Chief Justice Taney, 13 Pet. U. S. 595.)

Many vague ideas are prevalent concerning the meaning and import of the term "franchise." This fact seems to be due less to any intrinsic difficulty causing confusion than to a failure to keep pace with the development of the law of corporations by reason of marvelous improvements of a rapid age.

It is a conceded power or duty of government to provide in a variety of ways suitable provisions for the comfort and convenience of the public. When these duties are not directly assumed by the government they may be delegated. In all civilized countries the duty of providing and preserving safe and convenient highways to facilitate communication between communities is considered a governmental duty. This is usually done through the agency of corporations created for special purposes. The inducement for individual incorporators to undertake these obligations to serve a public is usually that the consideration be a grant of more or less exclusive privileges. Such privileges are a common form of modern franchise. They are usually conferred upon corporations for obvious reasons of good business policy. If it be by a municipality, the power and duty of the local government do not end here. The objects for which a corporation is created are universally such as the government, local or otherwise, wishes to promote. They are deemed beneficial to the community, and this benefit constitutes the consideration, and in most cases the sole consideration, of the grant.

No franchise can be granted for other than a public use or upon public considerations to a street railway company. The power granted to municipal corporations to regulate the use of their streets extends to public uses only, and does not authorize an ordinance permitting a private corporation to build a railroad track in and across the streets of a city for the transaction of private business; neither can corporations of natural persons lawfully operate cars for the transportation of freight, in respect to private business, over street railway tracks, notwithstanding the managers continue to use the tracks as a street railway for the transportation of passengers for hire. The authorities are numerous and decisive on this point. (See 100 Mo., 508; 102 N. Y., 411; 34 Kan., 509; 61 Ia., 11; 75 Ga., 761; 36 N. J. L., 79; and 129 N. Y., 408.)

The character of the business of a corporation may be limited notwithstanding its lines be constructed and operated wholly within the boundaries of a municipal corporation. Such a company is not affected by legislation applicable alone to street railways. But if a company lays its rails in the streets of a city, having the right to construct a track for passenger cars only, it cannot subsequently use the track for the operation of freight cars upon it without first obtaining an additional franchise for that purpose. Indeed in a case brought before the Illinois Supreme Court (112 Ill. 611) it was held that a petition of the property owners was necessary to enable the company to use its tracks for freight purposes, and that an ordinance not so supported was void, and the unauthorized prosecution of such business a public nuisance rather than a public utility.

A substantial compliance with the statute under which a street railway company is organized is all that is required as a condition of the right of a private corporation to exercise the franchise which it accepts. Mere irregularities in the organization of a street railway company will

not necessarily prove fatal. The direction, however, is important, for a failure to follow it is likely to work a forfeiture and enable the authorities to retake the franchise. The non-compliance with the statute in the organization of such company will not, as many believe, give an abutting property owner a right of action against the laying of tracks, unless his property rights are seriously affected, simply because of differences between such company and State concerning the usurpation of a corporate franchise. Street railway companies have suffered from the annoyance of numerous frivolous suits, in which complainants are often driven to attack the legality of the organization, hence courts usually hold in such cases, as well as contentions of unwarrantable interference with the rights, privileges and property of opposing companies, where charges and countercharges are made by each, that an investigation of the steps taken in the organization of either for the purpose of determining whether the corporation complained of has a legal existence is unnecessary. (See *Street Ry. Co. v. St. Ry. Co.*, 2 Colo., 673.)

The evidence of a public grant is usually in the form of an instrument denominated a "charter." But a "franchise" is the thing granted. A franchise for a given purpose obtained from a legislature has the legal characteristics of an estate. It is well, however, to distinguish the meaning of charter, franchise and license. A franchise, as previously defined, confers a privilege by sovereignty upon natural or artificial persons to exercise powers which they could not otherwise lawfully assume. But when a street railway company, by ordinance of a municipality, is granted the privilege of constructing and operating the same upon certain streets, such grant by a municipality is held to be a license merely, and not a franchise. A right of way is the only interest a street railway company has in a street upon which its tracks are laid, and its franchise consists in its rights to use the right of way exclusively for the running of public cars thereon.

It has been held by the Alabama Supreme Court (79 Ala., 465) that a franchise once granted by a municipal corporation, upon valuable consideration, by an ordinance in the nature of a grant, if legal, is within the protection of constitutional provisions against laws impairing the obligation of contracts, and can neither be taken away by repeal of the ordinance nor impaired by a subsequent grant of such franchise to another. On the other hand, the authorities are numerous declaring that a franchise for a railway company is not in its nature exclusive, and, therefore, does not preclude the State from creating another similar franchise which may materially impair the value of the first. (See 48 Mich., 433; 41 La. Ann., 561; 67 Barb., 315.)

The vested interest a street railway company may have in particular streets, derived by contract with a city which prohibits their use by any other company, is no part of such company's franchise, but may be considered in the nature of property, and is, according to the Supreme Court of Illinois (87 Ill., 317), an incorporeal right, as a franchise can emanate from the sovereign power of a State only.

A license is simply a permission to do certain things. Hence, a license or permission to occupy a street is not "a special privilege or immunity," within the meaning of constitutional inhibitions. (See 31 Kan., 660, and *Booth on Street Railways* 11.)

A franchise is without any possibility of physical identification or delivery. It is not tangible, and therefore an action at law to recover the possession of a franchise cannot be maintained; so held by the Supreme Court of Oregon. (See 15 Ore., 404.)

What streets and property are subject to or exempt from street railway franchises is one of manifest interest to the public. The consent by the State or municipal authorities to occupy public highways for the construction, maintenance and use of ordinary street railways is all that is

necessary, and this too without compensation to abutting property owners. The recent decisions firmly uphold this doctrine of non-additional servitude. There is some conflict of opinion whether or not one company may appropriate the use of the right of way and tracks previously acquired and constructed by another; the weight of authority, however, is to the effect that such property may be taken. (See *Booth, St. Ry's, Chaps. IV, V.*)

A state or city may reserve public parks, squares, streets or boulevards and exempt them from the purposes of street railway traffic. Either may bind itself by limitations contained in a statute, by a condition that a public street, avenue or boulevard shall never be subject to a street railway franchise, even by virtue of a subsequent act, without compensation to abutting owners. This limitation on the extent and character of the public use of such a street should be so made and construed at the time of the dedication or subsequent improvement of the street. (See *Boulevard Co.*, 12 N. Y. Supp., 466.)

*Limitation of Franchises.*—This question has been fruitful of litigation in recent years. The primitive condition of cities in the earlier periods of street railway service were such as to induce very great liberality as to the life of a grant for local transportation. So crude and indefinite are many instruments drawn that they admit of liberal construction concerning the life of the franchise which they evidence. Of the many cases carried to our higher courts for a review and construction of the powers to grant, it is safe to assume that in the absence of constitutional limitations a State legislature may grant privileges exclusive in character and perpetual in duration; but a city has no such power without explicit legislative authority. (See 78 Ala., 465, and *Booth, Chap. V.*) The constitutions of nearly, if not quite, all the States provide "against the passage of laws making an irrevocable grant of special privileges or immunities." Cooley on Constitutional Limitation upholds the same doctrine. Indeed it has been held that a franchise granted by ordinance or a special legislative act, which was silent as to the length of time for which it was conferred, should be construed as perpetual and therefore void, unless some limitation is imposed by some law or ordinance whereby the term may be rendered definite. (See 49 Ga., 151.) In a number of the States, under general statutes, we have observed that the franchise is limited to terms varying from 20 to 50 years, and in only a few is the right reserved to revoke at pleasure. From a fairly reliable source of information we have gleaned the following list of street railway companies operating under perpetual franchises or a very long term in point of limitation:

Alton Horse Railway Company, Alton, Ill.; Citizens' Railway Company, Baltimore, Md.; Washington, etc.; State Asylum Railroad (100 years), Binghamton, N. Y.; Middlesex Railway Company, Boston, Mass.; Bridgeport Horse Railway Company, Bridgeport, Conn.; Atlantic Avenue Railway Company, Brooklyn City Railway Company (120 years), New Williamsburg, etc.; Railway Company, Brooklyn, N. Y.; Camden Horse Railway Company, Camden, N. J.; Chicago City Railway Company (99 years), North Chicago Railway Company (99 years), Chicago W. D. Railway Company (99 years), Chicago, Ill.; Concord Horse Railway Company, Concord, N. H.; Des Moines Street Railway Company, Des Moines, Ia.; Globe Street Railway Company, Fall River, Mass.; Harrisburg City Passenger Railway Company, Harrisburg, Pa.; Knoxville Street Railway Company, Knoxville, Tenn.; Manchester Horse Railway Company, Manchester, N. H.; Minneapolis Street Railway Company, Minneapolis, Minn.; Mobile, etc., Railway Company, Mobile, Ala.; Nashville Street Railway Company, Nashville, Tenn.; Orange, etc., Horse Car Company, Newark, N. J.; New Bedford, etc., Street Railway Company, New Bedford, Mass.; New Haven, etc., Street Railway Company,



New Haven, Conn.; Broadway & Seventh Avenue Railway Company, Central Park, etc., Railway Company, Central Crosstown Railway Company, Harlem Bridge Railway Company, New York; Lombard, etc., Street Railway Company, People's Passenger Railway Company, West Philadelphia Passenger Railway Company, Ridge Avenue Passenger Railway Company, Second & Third Street Passenger Railway Company, Philadelphia, Pa.; Pittsburgh, etc., Passenger Railway Company, P. O. & E. L. Passenger Railway Company, South Side Passenger Railway Company, Pittsburgh, Pa.; Citizens' Street Railway Company, Indianapolis, Ind., now in litigation, claims a grant in perpetuity.

NOTE.—Since the above concerning the Citizens' Street Railway Company was written, the court has granted an injunction against the City Railroad Company, restraining the latter from interference with the Citizens' Street Railway Company in attempting to occupy the streets by virtue of a grant of right of way and franchise to the Indianapolis City Railroad Company by the Common Council. This ruling strengthens the claim of a perpetual grant. The cause will be appealed to the Supreme Court of the United States.

**THE ELECTRO-MAGNETIC TRACTION COMPANY'S UNDERGROUND RAILWAY SYSTEM.\***

That an underground conduit railway system, sufficiently simple to operate successfully in all kinds of weather and under great changes of temperature, is a great desideratum for large cities seems to be pretty generally acknowledged, and the greatest interest in the subject is being taken by electricians and capitalists alike. The recent paper by Mr. Joseph Sachs, before the New York Electrical Society, showed forcibly how many systems have been tried and how few are without some drawback which has proved fatal to their practical commercial usefulness.

It is interesting to note that an entirely new system is now operating in daily service upon a branch of the Eckington and Soldiers' Home Railroad, about one mile in length, situated on North Capitol street, Washington, D. C., which is said to fully comply with the three main requirements of an electric railroad, viz.: minimum first cost of construction; maximum economy in working, both of power and maintenance; and absolute safety to both passengers and general public.

The car, as shown in Fig. 1, has suspended from

at a pressure of about eight volts, and connected to the energizing bar.

In the center of the track are placed, at intervals of about 15 feet, hermetically sealed cast-iron boxes, upon the lids of which are two raised surfaces, as shown in Fig. 2, known as the energizing and collecting plates, respectively, corresponding with the bars suspended from the car, which slide lightly upon them.

Securely attached to the under side of the lid of each cast-iron box is a simple electromagnet,

along the energizing bar through the corresponding plate upon the box lid to the electromagnet, which, upon becoming energized, instantly attracts the armature and bridge piece, thus bringing all four carbon faces into close contact and completing the circuit, which allows the current to flow from the main cable up through the collecting plate to its corresponding bar upon the car and thence to the motors.

This applies only to single track. Where there is a double track the arrangement is somewhat

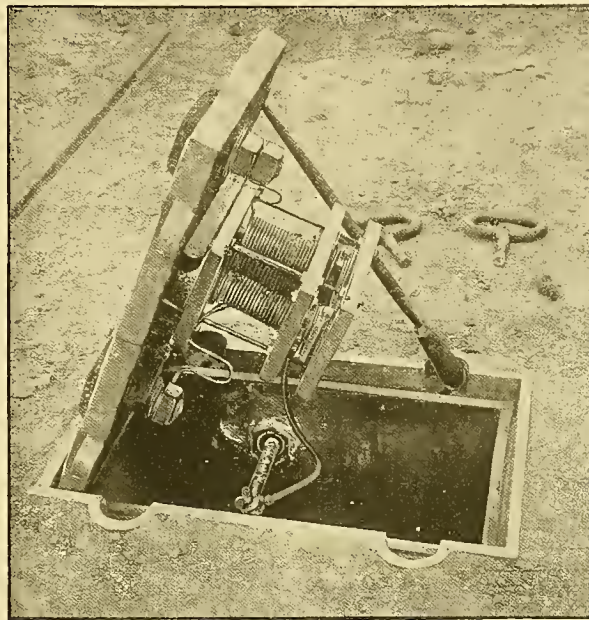


FIG. 3. WHELESS TRACTION SYSTEM—MAGNET.

as shown in Fig. 3, wound with fine copper wire, one end of which is connected to the energizing plate. The free poles of the magnet hang down vertically and work in connection with an armature attached to a bridge piece. Upon this are two carbon faces, directly above each of which is a corresponding carbon face fixed to the slate bed of the magnet. One of the fixed carbon faces

modified, and in the new roads now under construction upon this system another novel feature has been introduced in the shape of a metallic return, which is effected by simply adding a third, or return, circuit bar to the car and connecting a third contact plate with a return cable, laid in the same trench with the main cable. For double track the construction is as follows: The cast-iron boxes, at



FIG. 1. WHELESS CAR.

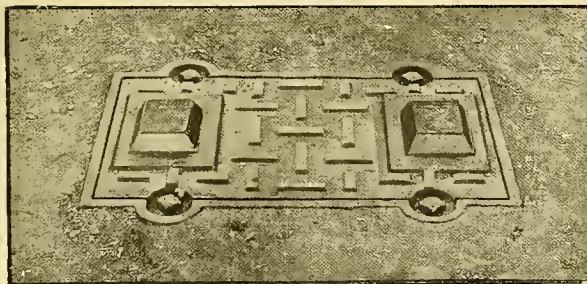


FIG. 2. WHELESS TRACTION SYSTEM.—ENERGIZING AND COLLECTING PLATES.

the under side of its truck two iron bars, the same length as the car, hung upon light springs and adjustable by means of screws, known respectively as the energizing and collecting bars. Beneath one of the seats of the car is a small storage battery consisting of six cells, arranged to give a current

is directly connected to the main cable which conveys the 500 volts current from the generators at the power house. This runs in an iron pipe through all the boxes, as shown in Fig. 4, and the other carbon face to the collecting plate upon the box lid.

The operation of the car then becomes as follows: The battery discharges its low-pressure current

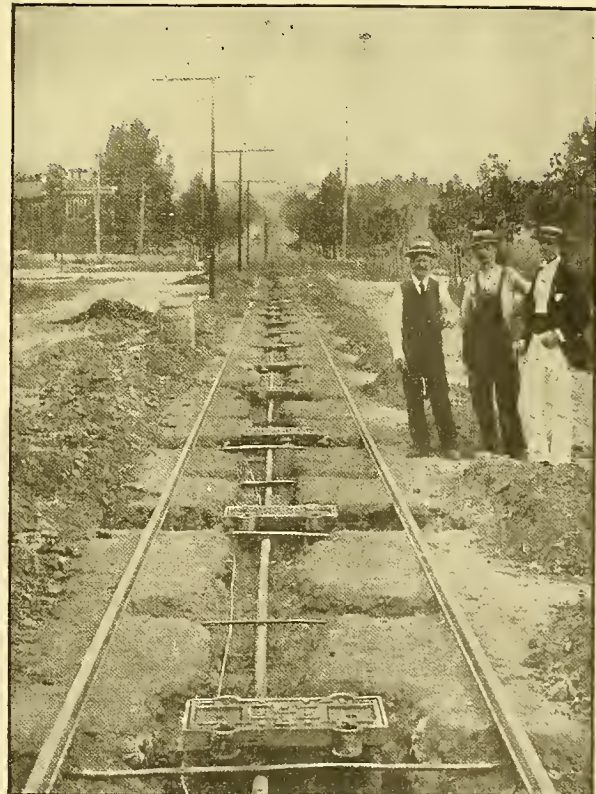


FIG. 4. WHELESS TRACK CONSTRUCTION.

the same distance apart as in the case of the single track, are placed between the tracks, and the electromagnets for both tracks are placed in the same box. The collecting, energizing and return contact plates are then set in the center of the track in the same manner as illustrated for single track, with the exception that they are set upon blocks of either terra-cotta or granite, instead of upon

\* From the *Electrical Engineer*, New York.



the lid of the cast-iron box as shown. All the connections are made in a cast-iron water-tight dish underneath the blocks and taken to the cast-iron box between the tracks in an iron pipe. The advantages of the arrangement are manifold, not only reducing the cost of construction, but enabling the whole system to be installed without interruption to the traffic on the road.

The difference between the length of the collecting bars and the center of the boxes insures good contact with the forward plate before the rear one is left. As proof of this, even when traveling at a considerably greater rate of speed than the city authorities allow, a steady and unflinching light is maintained in the lamps of the car. Should any part of the electro-magnetic switch fail, it simply leaves the pins dead and the car has to drift by its own momentum to the next box. During the three months that the current has been on the existing road, no trouble has been experienced. From tests applied by the Wheatstone bridge after flooding some of the boxes with water while the car kept the switches closed, the leakage was found to be less than one-half of one per cent. of the power required per car. During snow storms the tracks will be kept clear of snow in the usual manner, and when frost after rain is expected, a car will be kept in operation to keep the contact plates clear of ice. The contact plates stand only about seven-eighths of an inch above the pavement, and offer, it is said, little or no obstruction to vehicles. The car has made 2,000 miles without an interruption or mishap and the steel collecting bars show no appreciable wear.

The cost of installing this system is about \$35,000 per mile of double track, including the metallic return and all the cables, feeders and conduit.

The line now in operation was equipped by the Electro-Magnetic Traction Company, Corcoran Building, Washington, D. C., and the system is the invention of Mr. Malone Wheless.

#### CONDUIT ELECTRIC RAILWAYS: IS THERE A SOLUTION OF THE PROBLEM?\*

BY JOSEPH SACHS.

##### PART III.

(Concluded.)

But let us return to the open-slot conduit systems that have been tried and installed. What do we find? We find, in the first place, a very small conduit, poorly constructed; the wires are located in very poor positions and badly protected; the drainage is exceedingly poor and the voltage is exceedingly high. The last is the case in the attempts that have been made and have failed, although in the attempts that have been made and succeeded the voltage is low—being about 300 volts. The aim has always been to produce a cheap system, a system which will compete with the trolley. That is a very desirable aim, but not one that is absolutely necessary; and from the fact that cable traction companies will put in cable systems where the track construction alone costs very nearly \$100,000 per mile, single track, as in New York, I think we can afford to spend quite a little on a conduit system which will operate quite as well as the cable system, and certainly has advantages which the cable has not. The problem is, primarily, one of the mechanical construction of the conduit. We must get a large conduit, a dry conduit; we must place the wires in such positions as to make them high and dry, and various other conditions must be studied. It seems to me that it is rather a rebuke to electrical engineers that they have not been able to devise, or have not devised, such, or that some philanthropic men or corporation have not come along and advanced the interest of the conduit system; but they have not. Let us take the cable conduit, for instance (and those that have recently been built are certainly excellent conduits), and what do we want to do? If we look at the problem thoroughly, we want, in the first place, as previously stated, to put the wire high and dry and protect it; the insulators must be far apart and located in manholes or pits; the contact should be an underbearing one; the voltage should be as low as the first cost of the plant will permit—in fact, below 300 volts if possible, for reasons which I will bring out hereafter, and if possible we should use at a low voltage the structure as a return. I believe that those points can be met and that a system containing them can very readily be devised; in fact, Mr. C. H. Warner, an electrical engineer of New York, and myself some time ago attempted to attack that problem. We were striving for the \$50,000 and we have not as yet gotten it.

Now the main electrical point in the system is the voltage. If we can get the voltage low enough, why we may put the conductor on the surface of the street, as Mr. Edison proposed some time ago. There are various methods for utilizing low voltage, and one of them is that which has been adopted

by the General Electric Company recently to supply the ordinary overhead trolley system; it consists in applying the three-wire system to the electric railroad, and it can be very readily applied to conduit construction in this way. We can take an ordinary conduit, such as the Broadway conduit, and let the structure itself be the neutral wire. Suppose we use about 300 volts: now we put, as you know, in many conduit systems two wires, an outgoing and a return wire. In the three-wire system we use two wires also, no more. One forms a negative, the other a positive, and the structure neutral, and by alternately connecting between the neutral and one side and the neutral and the other side we can balance up our three-wire system fairly well without very much additional trouble, because although one car may be stopping, another may be going at full speed and another up grade; still for all that we can get a fairly even distribution and fairly even balance. But other devices could be found for balancing the system. We can also have a double track system with one set of three wires. For instance, the plus wire in one conduit of one track and the minus wire in the other, the structure being the neutral. In that way we could really have the voltage about 250 for actual work, while we would have 500 volts for distribution. If the Edison Illuminating Company can afford to spend millions in installing underground three-wire feeders at 220 volts for furnishing hundreds of horse-power in lights, it certainly seems possible that electric railway companies, whose dividends are just as high, if not higher, could afford to put in a system at the same or perhaps somewhat higher voltage; and perhaps in that way something successful may be done.

The point is simply this: I do not think it is so much a question of building a system, but it is one which sounds very like this: What will it cost? The cost appears to me to be necessarily so great as to preclude the adoption of the conduit in any but our largest cities; but if we can build a system even at high cost, I feel quite confident that it is wanted. I am sustained in this opinion by many eminent electrical engineers, and by the fact that a number of companies are willing to risk their good dollars in putting down such a system. The cost, I think, will not be less than \$30,000 to \$40,000 per mile, single track—that is including perhaps some cheap paving. This estimate, however, is low and not for the best construction, and assumes that there will be but very little obstruction in the way of pipes, sewers, etc. But we must not compare this with the trolley. The trolley will reign supreme in its own field, and it certainly has been of enormous value in the ten short years of its life; and to say that at the coming of the conduit system the trolley will go out is to make a false prophecy. We will never get a conduit system which will be put in for \$20,000 a mile, track and all, but I believe we have large cities, in which we cannot have an overhead wire, where we can put in an open-slot conduit and operate it approximately at a cost such as I have given. I do not mean to say that some of the other systems won't work, because some of them do work experimentally; but I think absolute simplicity can only be gained by getting down our mechanism to the simplest forms and fewest parts, and arranging it so that it can always be gotten at and be readily and easily repaired.

In conclusion I would say that I believe, as I have repeatedly said, that we can solve this problem. I have shown you some of the ways in which it has been attempted to solve it and some of the ways in which it may be solved. Some of you undoubtedly have other ways, and I should very much like to have you discuss the matter, and would, in fact, invite discussion on the question; it is all-important—it is one that we are coming to. We have got to have an underground or conduit system for our large cities where they will not let us use a trolley, and from the fact that at least three companies—three large corporations—that I know of are trying the ordinary open-slot conduit, I think we will shortly see something in actual operation.

But before closing I want to afford you more or less of a treat in explaining a system a stretch of which will be installed upon the Lenox avenue cable road of the Metropolitan Traction Company. It has been devised by the engineers of the General Electric Company, has been approved by their most eminent men, and contains various features, some of which I have already described. The ordinary conduit yoke is taken, and at the manholes, 30 feet apart, placed upon suitable supports, insulators which are of rectangular form are located. They are supported in cups and embedded in sulphur; these insulators are of soapstone, and fastened to the top is an arm of iron. There being two conductors used there is no structural return. To this arm is fastened the contact conductor, which is of channel iron. The contact shoe comes down through the slot and has two arms which press outwardly from the center, supporting the bar against the contact rails, making a continuous rubbing contact. The insulators

are located in the manholes and are easily accessible; they are quite a distance apart, and the voltage, last of all, is low, it being intended to use about 250 or 300 volts. I want to point out the fact, without criticism, that the conductors are very nearly directly below the slot, which was apparently the objection in some of the first systems, but the peculiar construction and location of the insulators in this system may prevent any trouble from this source.

#### ELECTRIC TRACTION, WITH SPECIAL REFERENCE TO THE INSTALLATION OF ELEVATED CONDUCTORS.\*

BY ROBERT W. BLACKWELL AND PHILIP DAWSON.

Probably no practical point in electric traction was less understood a few years ago than "rail-bonding," and a few words may be added to what has been said on that subject. It has but recently been appreciated; and it is of the first importance. It may be taken that the bonds connecting rails should be, as nearly as possible, of the same current capacity as the metals themselves. If a 70-pound rail be used, the sectional area of copper bonds should be as nearly as possible  $\frac{3}{4}$ ths of a square inch, the ordinary steel rail having approximately  $\frac{3}{4}$ th as much conductivity as commercially pure copper. This would exceed nine No. 0 copper wires.

When electric roads were first constructed, a No. 4 galvanized iron wire was considered sufficient!

Professor Jackson, of the University of Wisconsin, has found by experiment that the chemical composition of the soil has a great influence on corrosion. The most favorable to it, and having the smallest resistance, is that in which there is the greatest proportion of chlorides. Nitrates come next and sulphates last.

As has been before said, the contact between rail and bond should be as near as possible seven times the sectional area of a bond wire sufficient to carry the given current. The sections shown exhibit the construction very fully. While the solid copper bond possesses all the flexibility found to be necessary, it is made, when desired, with flexible stranded copper cable between the terminals.

Whether electric welding will eventually take the place of all bonding is still an undecided question. It has not yet stood the test of practical use on a large scale for a sufficiently long period to pronounce an opinion.

When first introduced in Boston it was not successful, many rails breaking near the joint after some months' use. The process has since been improved, and a trial section of line was in course of being welded when the West End Street Railway was visited last June. Seven miles of welded track have given satisfaction for some months in St. Louis. Over 100 miles are now being welded in Brooklyn, and the result of this trial will demonstrate, after a year or two, the value of welding. At present it takes from 10 to 15 minutes to make a welded joint, and, on an average, a current of about 250 amperes at 550 volts is necessary, which is transformed into an alternating current at 2 to 3 volts pressure. Approximately, each joint costs 12s. to 15s.

It is worth mentioning that modern American practice is to butt the rails, allowing nothing for expansion, wherever the streets are paved. The result is a nearly perfect joint.

With heavy cars, having at least four or five tons load on each axle, this is of the highest importance.

Mr. Wilkinson refers to the possible adoption of the three-wire system for electric tramways. That system has been in satisfactory use in Portland, Ore., for the past four years. Compound-wound generators, working at 500 volts without load and 550 volts with full load, are used. The success of this system depends upon the load of the various sections being nearly balanced. At Milwaukee, where local conditions did not allow of proper balancing, the system was tried and given up as a failure. The three-wire system was introduced at Portland because the generating station was three miles away from the nearest point of the line and the cost of feeders would have been necessarily heavy. By the three-wire system 1,100 volts could be used, — 550 and + 550, between each two sections of trolley wire. The rails were connected to the neutral terminal at the switchboard. The average load on this station is 1,500 H. P. It is located near a huge lumber mill, and the fuel is carried by automatic conveyors directly from the waste lumber yard into the furnace. Several tramways derive their power from this station, at a cost of about 25s. per H. P.-month, 18 hours daily work. Thomson wattmeters register the current used. The station pays about 40s. a day for its supply of fuel.

\*Abstract of a paper read before the London Institution of Electrical Engineers.

\*Abstract of a lecture delivered before the New York Electrical Society, Nov. 1, 1894.



The enormous carrying power of an electric tramway, at a pinch, is an interesting feature. The following figures, given by Mr. Bowen, of the Chicago City Street Railway Company, show the work done by his electric line on "Chicago Day" at the World's Fair:

Fifty-one double-motor cars, 10 single-motor cars and 73 trail cars were in operation over 26 miles of track. During the day 208,575 passengers were carried, and 11,271 car-miles run. The maximum output at the power-house was 17,000 amperes, and the average for 20 hours about 1,050. The minimum current registered was 750 amperes, and the average station pressure 540 volts. The ratio of expenses to receipts on this line is 40 per cent.

A word may be said in support of what Mr. Wilkinson has said as regards the appearance of overhead conductors. Undoubtedly some aerial lines have been put up with an utter disregard of appearances, and inexperienced or careless constructors have erected webs of trolley strain and feeder wires which were most obnoxious. This is especially true of many hastily built American lines, pushed through at high pressure and at the smallest possible expenditure. Now that the first rush is over, and the tramway operator, the manufacturer and the contractor have had time to take breath, the weight of public and press criticism has had its effect, and no pains is spared to perfect the entire plant and apparatus.

A carefully designed and erected line, with sub-surface feeders, handsome poles, etc., has but few objectionable features; and in the great majority of cases public convenience is so greatly enhanced by the overwhelming advantages that closely follow upon the introduction of improved and more rapid transit facilities, that opposition to the extension of a trolley line is almost unknown.

The Siemens line at Guernsey, the line that crosses the great piazza on which Milan cathedral stands, the Brussels, Hamburg, Bremen and a dozen other Continental installations, are European examples of line construction to which no reasonable objection can be urged. The electric tramway has a future as great in Great Britain as elsewhere, and in no other country in the world has it failed to already secure universal acceptance.

The English tramway operators, and the able executive officers of the Tramways Institute of Great Britain and Ireland, are keenly alive to the possibilities that lie in electric traction, and, under most adverse conditions, are doing their best to smooth the path of progress. It remains with you, gentlemen, to supplement their endeavors, and to do your best to stimulate and encourage the growth of public opinion in its favor.

#### ITHACA STREET RAILWAY PLANT.\*

The Ithaca (N. Y.) street railway plant, now in full operation, is arousing considerable attention and interest, as an example of good practice in power generation. Here may be seen a result which for its accomplishment required much labor and the calling out of skilled and experienced engineering talent. Sparing neither money nor time, the builders have succeeded in erecting a power plant which utilizes a large part of the available energy stored in the waters of Fall Creek.

A short distance below the Sibley turbines and above the Ithaca Falls the creek makes a sudden turn which is especially noticeable in the sharp angle of the north wall of the gorge, and then falls some 30 feet. This angle seemed peculiarly adapted for the location of turbines, and was finally chosen as the site of the plant, work being commenced soon after. The angle was considerably widened by blasting, and was thus formed into a large niche for the insertion of the structure. The opposite and almost parallel walls of the niche were connected by a series of I-beams set into the rock or on heavy masonry built up against the slightly inclined walls. These I-beams, carried by a number of heavy struts of built-up steel plate, give support directly to the main floor of the plant, located on a level with the water of the creek above the fall. The main walls of the building rest partly on the I-beam structure and, where possible, on foundations hewn directly out of the rock. An adjoining structure of wood furnishes space for two vertical boilers.

The difficulties overcome will be more apparent when it is considered that the walls of the gorge at this place rise almost perpendicularly to a height of perhaps 150 feet, and that every inch of material used was hauled to the top of the walls by a circuitous route and then lowered into the gorge; yet so advantageous were the contracts made by the company that the installation of the entire plant did not cost over 5 per cent. more than would have been the expense of constructing it on level ground.

To obtain the water at the most favorable point the creek was dammed immediately below the Sibley plant and its waters forced into a race, from which a flume five feet in diameter, constructed of

five-sixteenths inch steel boiler plates and supported throughout its length on solid masonry, leads to the plant 600 feet distant, with a drop of 60 feet. Immediately on entering the building the flume makes a sharp turn toward the north, and at almost the center of the main floor occurs the downward turn, which allows the water to fall vertically. A short distance below, the penstock divides and the water falls in a slightly oblique direction to the four turbines. Two turbines are mounted on the same shaft, and each pair is rated at 400 H. P. The water enters between the two wheels and passes outward through both, thus eliminating all axial thrust.

The water on leaving the turbines is discharged through vertical pipes, and over the end of each pipe is accurately fitted a long sleeve, which, when lowered, sets closely on a seat placed a short distance below the mouth of the pipe. The amount of water discharged is governed by raising or lowering the sleeve, this action being effected by an automatic mechanism, which may be described as follows: To one end of each projecting turbine shaft is connected by belt a controlling machine acting directly on the sleeve. When the jack-shaft on the main floor revolves too rapidly an electrical contact is made by the ordinary engine governor, ball and string arrangement. The circuit thus established magnetizes one or two oppositely located electromagnets and attracts a lever vibrating freely between the two.

This attraction of the lever causes, during its continuance, the release of a pawl, which, vibrating to and fro concentrically with a tooled wheel, causes the latter to rotate in one direction. This motion is communicated by several gear wheels to a rack directly connected to the sleeve spoken of above, and lowers it, allowing a smaller quantity of water to discharge, and thus decreasing speed of turbines. Vice versa, if speed of jack-shaft is too slow the other magnet is put in operation, causing an opposite pawl to act and turn the toothed wheel in the opposite direction, with a resulting increase in discharge opening. This method of regulation has proved very successful on the lighting machine shaft, where the load is nearly constant. On the street car generator shaft, where the load varies greatly, the controlling machine, although the best of its kind in the market, seems of little value. The engineers of the plant are at present working on a new method of regulation, which, it is hoped, will prove more efficacious.

To one end of each projecting turbine shaft is firmly keyed a grooved sheave, from which the power is transmitted to the main shaft by hemp rope gearing. The general arrangement is that of the Dodge system; the rope, being continuous, is returned to the first groove after running off the last by a single wheel mounted on a cross-head sliding in vertical guides, the pulley performing thus the further function of keeping the rope taut at all times.

Two 100-kilowatt General Electric machines furnish power for the street car service. At present the current used in the dynamo laboratory is also taken from these machines, but on account of unsteadiness of current it has been decided to extend the jack-shaft, and connect at that point a Mather machine, to be used for laboratory purposes exclusively.

Brush and the General Electric alternators respectively furnish current for 1,200 and 2,000 incandescent lamps, while the three Brush and a Thomson-Houston machine, of a capacity of 65, 30, 30 and 50 respectively, supply the arc lamps scattered through the various parts of the town. The 200-H. P. simple non-condensing Ball engine and the 400-H. P. compound condensing McEwen engine, in combination with a 200-H. P. Root and a 200-H. P. Manning upright boiler, form a complete steam plant to be used in emergencies or during low-water seasons. Usually the plant burns coal only about three months annually, having at other times sufficient head of water. This time may be further reduced by the electric heating apparatus, which it is the intention to install in the near future.

From the method of connecting and arranging pulleys on jack-shafts, it is seen that any of the four prime movers may drive any one or any number of the dynamos as occasion may require, the belts of the Brush and small Thomson-Houston dynamos being easily thrown off. The McEwen engine cannot be operated without driving the sheave and its turbines, but steps are being taken to remedy this fault. The plant is further fitted out with five large fireproof enamel switchboards, lightning arrester, telephone connections, etc.

Professor Carpenter has acted as mechanical engineer for the company, and has assisted the manager, H. Bergholtz, in arranging many of the details of the station. The electrical part of the station was designed by Mr. Bergholtz. H. K. Spencer, a graduate of the class of '90 (Cornell), is chief engineer.

In the construction of the plant simplicity and utility have been made the foremost considerations, and both have been admirably attained, although the attendant difficulties were often great.

#### COMMENTS AND VIEWS OF CONTEMPORARIES.

**TROLLEY LINES AND HOMES.**—The effect of this cheap transportation upon the growing suburbs must be very stimulating. Its effect upon the condition of those who are thus enabled to secure a residence with rural surroundings must be equally beneficial. The uncertain problem will be its effect upon the value of property in the solidly built up portions of the city, and that cannot be determined for several years.—*Philadelphia Times*.

**TROLLEY LINES AND FARMING COMMUNITIES.**—The popular fallacy that a farming community is slow to grasp an opportunity of making a radical and progressive change in the mode of transportation through rural districts, a change that is so radical that it almost takes the breath away from the oldest inhabitants, has been dispelled by the vigorous manner in which the grangers of Nippenose Valley have grasped and nursed the scheme to construct a trolley road through their fertile lands.—*Williamsport (Pa.) Bulletin*.

**RESULTS OF TROLLEY OPERATION.**—Nothing is more certain than that the introduction of the trolley motor has more than doubled the possible residence area of the city, and it now remains for our business interests to combine to secure to the city every possible increase of trade and business of every kind. The people who live in Philadelphia must have their possibilities of securing a livelihood increased. Facilities for quick and comfortable transportation between their residences and places of business are already assured.—*Philadelphia Times*.

**CARELESS MOTORMEN.**—There are daily evidences that motormen are not running their cars with regard either to the safety of human life or to the interests of the railway companies. As these employes become proficient in their work there seems to be a disposition on the part of some of them to grow careless and even reckless in the discharge of their duties. A proneness to pay attention to passing scenes rather than to the track ahead, and an apparent fondness for running their cars at great speed to within a few feet of the near side of the street crossing as possible before checking them, or even not stopping at all at night, are samples of the two growing evils.—*Philadelphia Public Ledger*.

**ELEVATED AND SURFACE TRAVEL.**—Everybody who is compelled to ride long distances up and down town and who has even the smallest regard for personal comfort, will be very glad to hear that the cable cars have already made great inroads into the business of the elevated lines. For years the Manhattan lines have had a phenomenal prosperity and have accorded to the public the minimum of accommodation. They have had the opportunity and the means which, rightly employed, would have given them permanent possession of the most profitable railroad traffic in the world; but they have simply made a ride on their lines an application of torture, and have inclined their customers to seize with avidity upon any opportunity to get uptown in another way.—*New York Journal*.

**STREET RAILWAY LEGISLATION.**—The place of the trolley is likely to cause a great deal of discussion during the coming sessions of legislatures in the various States. What to do with this new factor in motive power, what rights to grant it, what future to mark out for it, are subjects that will throw legislators into the greatest straits. Now that it is no longer questionable that electricity is as powerful as steam, and that it is available for motive power, those who are interested in electric roads will attempt to have the right of eminent domain given them, and then will come the struggle. Eminent domain for the electric roads would put them on a par with railroads, so far as acquiring the right of way is concerned, and would give them an advantage over steam roads that cannot be overestimated.—*Moorstown (N. J.) Chronicle*.

**SAFEGUARD SUGGESTED.**—On the heavy grades encountered by most of the city lines, the regular equipment of powerful brakes has so far prevented any calamity. But yesterday's accident shows that it is possible for both motive power and brakes to fail at the same time. If that occurs on one of the heavy grades the peril of a severe accident is very great. With a proper appreciation of this especial hazard the traction companies should provide especial precautions against it. It can hardly be difficult to provide a special drag, which, in case of such an exigency as that of yesterday, would arrest the car. If no more finished device presents itself, a beam studded with spikes that could be thrown by a lever in front of the wheels, and by the action of the wheels jammed down so that the spikes would be driven between the paving stones, would be an effective anchor for use in such emergencies.—*Pittsburg Dispatch*.

**PROTECTING MOTORMEN.**—There was a time when locomotive engineers were exposed to the

\*From the *Sibley Journal of Engineering* for November.



elements, and when a proposition to shelter them in cabs from the roughest weather would have been declared dangerous to the trust reposed in them, inconvenient and unnecessary. But experience has proved that the men are just as alert and careful within their shelter as when they occupied their exposed posts. As it was with the locomotive engineers in the early days, so it is to-day with the motormen of our street cars. They have absolutely no protection whatever from the elements, and even in the severest storms they are inhumanly compelled to face the blasts—or give way to some one else. This should not be. The men deserve consideration at the hands of their employers. They should not be compelled to imperil their lives to secure an existence, and it is the duty of the city to demand that they shall be treated differently. The front platforms of our street cars should be inclosed.—*Philadelphia Call*.

**STREET RAILWAY SECURITIES.**—In our rapidly growing American cities the securities of street railways, which, be it remembered, are comparatively free from the inroads of sudden competition (a well situated line being generally in a position to hold its own against any lines that may be built on less frequented streets, elevated roads being the exception), should prove, if the companies are properly financed, a desirable form of investment. The street car line, moreover, is seldom if ever subject to the same degree of fluctuation in traffic that the steam roads must encounter, owing to the variations in the crops and general trade. Just at this point, however, a word of caution should be given to those engaged, or hereafter to engage, in the labor of capitalizing traction companies. They should beware of over-capitalization and the building of roads too extensively in country districts where traffic is light and must long remain unremunerative. There have been some noteworthy instances already of mistakes like those mentioned, and unless care is exercised a serious cloud may be cast on a class of investments for which the future looks so promising.—*Financial Chronicle*.

#### CANADIAN NOTES.

(From our Special Ottawa Correspondent.)

**Hamilton, Ont.**—The Hamilton Radial Railway Company asks the city for a bonus of \$400,000, in return for which paid-up stock to an equal amount is offered.

**Ontario.**—Two electric railway schemes are now under consideration in Northern Ontario, one for running a line from Owen Sound to Kincardine, and the other from Parry Sound to Abmic Harbor; and both lines to obtain their power from neighboring waterfalls.

**Oshawa, Ont.**—The agreement for the construction of an electric street railway has been again submitted to the City Council and on a vote of eight to seven was revived. W. E. Rathbun, of Deseronto, deposited bonds for the completion of the road by the time specified.

**Hull, Que.**—Mr. G. Vian, chief promoter of the new electric railway scheme in Hull, stated on Thursday that his company had not been dickering with the Aylmer road company. He thought that at the next meeting of the shareholders a proposition might be laid before them to either sell out to the new electric company or grant right of way.

#### NEWS OF THE WEEK.

**Albany, Pa.**—It is reported that an electric railway from Albany to Castleton is projected.

**Newark, N. J.**—The Consolidated Traction Company has almost completed the work of changing its tracks to standard gauge.

**Green Bay, Wis.**—Capitalists are considering the advisability of constructing an electric railway from Green Bay to De Pere.

**Augusta, Ga.**—The bill compelling street railway companies to vestibule their cars during the winter months has been withdrawn and will be reported adversely.

**Sioux City, Ia.**—Howard S. Baker, receiver of the cable line, states that he intends to vestibule the cars, introduce heaters and improve the service generally.

**Ballston Spa, N. Y.**—It is stated that the Barnes Electric Construction Company has secured the consents of all the property owners along the line of its proposed road.

**New York, N. Y.**—The Midland Railway Company of Staten Island is seeking permission from the trustees of New Brighton to extend its tracks and introduce electricity.

**Bridgeton, N. J.**—The new power-house of the South Jersey Traction Company is finished and in operation, so that the company will no longer be obliged to rent power.

**Schuylkill Haven, Pa.**—The right of way through Schuylkill Haven has been granted by the council

of that borough to the Pottsville & Reading Electric Railway Company.

**Mt. Carbon, Pa.**—At a meeting of the borough council, a franchise was granted to the Pottsville & Reading Traction road. This will be a branch of the Schuylkill Electric Railway.

**Anderson, Ind.**—A contract for the purchase of thirty-three acres of land in North Anderson has been made by the Anderson Electric Railway Company. It will be laid out as a park.

**Omaha, Neb.**—A trolley car jumped the track on November 23d and the motorman and several of the passengers were seriously injured. The car could not be controlled on account of a defective brake.

**Lock Haven, Pa.**—A great deal of interest is taken in the proposed road from Lock Haven to Milton. A committee has been appointed to solicit subscriptions. Levi Gann is at the head of the enterprise.

**Philadelphia, Pa.**—The first engine and generator in the power-station of the Hestonville road are nearly ready for operation. Within a short time the Arch street line will be traversed by electric cars.

**Mt. Holly, Pa.**—The Mt. Holly, Lumberton & Medford Railroad and the Vincenttown Branch Railroad have been leased by the Pennsylvania Railroad to a company which will operate them under the trolley system.

**Woodbury, N. J.**—Mayor Hendrickson has vetoed the ordinance granting permission to the Camden, Gloucester & Woodbury electric railroad company to construct its tracks on the outskirts of the city, where it intended to build the road to Mantua.

**Brooklyn, N. Y.**—Trains on the Kings County Elevated Railroad will in future be run on a three-minute headway in the morning and a two-minute headway in the busy hours of the evening. On Sundays and holidays the headway will be five minutes.

**Cleveland, O.**—The Cleveland Electric Railway Company has bought 12 acres of land between the Columbus Pike and the State road. This is a step toward the extension of the Pearl street line across the Brooklyn Bridge and into the village of South Brooklyn.

**Philadelphia, Pa.**—Several explosions have recently occurred in the manholes of the Electric Traction Company. It is supposed that the gas from the leaky mains of the gas companies collects in the manholes and is finally fired by a spark from one of the cables.

**Chicago, Ill.**—A Madison street cable car a few days ago struck the cover of a manhole that projected above the track and was suddenly brought to a standstill. The trailer crushed into the grip car, and the shock caused injury to the gripman and three passengers.

**Boston, Mass.**—The pardon committee of the Executive Council has reported adversely on the petition for the pardon of the Old Colony employees who were found guilty of riot at Abington, while preventing an electric railway company from laying tracks. The court sentenced the men to fine and imprisonment.

**Jersey City, N. J.**—A supply car on the North Hudson County Railway, while descending the Hoboken avenue hill, became unmanageable and started down the grade at a very rapid rate. At a point where the line makes a sharp turn the car jumped the track and was overtuned. The motorman was badly injured.

**Grahamsville, N. Y.**—Capitalists have under consideration a plan to build an electric railroad through the Never-ink Valley, in Sullivan county, to Grahamsville, and from Fallsburgh to Monticello. The right of way is being secured and a site has been obtained along the Neversink River to erect a dam for water power.

**Cleveland, O.**—The trustees of Newburgh township have passed an ordinance giving a franchise to the Cuyahoga Suburban Railway Company, from the terminus of the Broadway and Newburgh branch of the Cleveland Electric Railway to the town of Randall. The contract for the construction of the road has been awarded to A. W. Buell.

**Pottsville, Pa.**—Judge Weidman has handed down two opinions in reference to the rights of way of the Inter County and the Tamaqua & Lansford electric railways, rival companies which secured rights of way to run lines from Tamaqua to Lansford, through alleged frauds. The companies are enjoined from commencing work on the routes laid out.

**Clarksburg, W. Va.**—The Clarksburg & Suburban Street Railway Company, whose incorporators are R. S. Gardner, Lee H. Vance, Marcy McD. Price, C. M. Hart, J. H. Horner and Frank Mattox, has been granted a franchise for twenty-five years by the Council of Clarksburg for the construction and operation of an electric railway. It will traverse

the two principal streets of the city, and be extended to a place on the Milford turnpike opposite to the Chautauqua Assembly grounds, two miles from the city.

**Brooklyn, N. Y.**—It is proposed to make several extensions to the line of the Flushing and College Point Electric Railway. The company is in the hands of a receiver who is making every effort to reorganize the company and to place the road upon a sound basis. Several New York capitalists have recently become interested in the road and they propose to spend \$50,000 in making improvements. The road was built about five years ago and \$125,000 was expended, but it has never been a paying enterprise.

**Boston, Mass.**—At a recent meeting of the Board of Aldermen several sections of water pipe were exhibited which were badly corroded by the action of escaping electric railway current. The localities affected are streets in West Newton and Homer. The extent to which the pipes have been damaged is not yet known, but it is thought to be considerable. The city will probably undertake an investigation. Mr. H. W. Parker, president of several of the Newton street railway lines, says that the soil throughout the greater part of Newton is of such a character that there is little danger of any considerable leakage from the rails.

**Newport, R. I.**—Noah Redford, a property owner on Bath Road, who claims that the street railroad on that thoroughfare has caused a depreciation of the value of his property, which consists of a cottage and a hotel, has brought suit against the City of Newport. Mr. Redford is leading several owners of real estate on Bath Road, and the city will soon be involved in a half-dozen other lawsuits. The road received a franchise from the city, which is therefore charged as responsible. Redford was associated a few years ago with Cornelius Vanderbilt and several other millionaire cottagers, who asked the city to order the Bath Road rails taken up, on the ground that the city was being greatly damaged by the cars.

#### PERSONALS.

**Lieut. F. B. Badt**, of the Siemens & Halske Electric Company, was in New York last week.

**Joel Hurt**, of Atlanta, President of the American Street Railway Association, visited New York last week.

**J. H. Graham**, of the Graham Equipment Company, of Providence, R. I., was in New York this week.

#### NEW INCORPORATIONS.

**Pittsburgh, Pa.**—The Baum Street Railway Company has been incorporated; capital stock, \$10,000; promoters, Wm. C. Lynne, Jas. A. Fortune, Wm. McAdams, Pittsburg, Pa.

**Tacoma, Wash.**—The Tacoma Traction Company has been incorporated with a capital stock of \$500,000. The promoters are Stuart Rice, Geo. B. Blanchard and Chas. S. Fogg.

**Pittsburgh, Pa.**—The Liberty Traction Street Railway Company has been incorporated; capital stock, \$70,000; promoters, John F. Scott, W. F. Bickel, Augustus Hartje, Pittsburgh, Pa.

**Pittsburgh, Pa.**—Highland Park Street Railway Company has been incorporated. The capital stock is \$25,000, and the promoters are Wm. C. Lynne, Jas. A. Fortune, Wm. McAdams, Pittsburgh, Pa.

**Sedalia, Mo.**—The Sedalia & Brown Springs Electric Railway Company, capital stock \$80,000, has been incorporated. The promoters are D. C. Metsker, Chas. Carroll, of Sedalia, Mo.; W. E. Sterne, Topeka, Kan.

**Haddonfield, N. J.**—The Jamaica Construction Company has been incorporated with a capital stock of \$100,000 to construct and equip electric street railways. The promoters are Edw. Isley, Walter C. Smith, Philadelphia, Pa.; Jno. McNeill, Haddonfield, N. J.

**Denver, Colo.**—The Toltec Coal Company has been incorporated, capital stock \$50,000, to buy, sell and work coal lands, construct and operate electric railways in connection with same, etc. The promoters are Pliny F. Sharp, John McNeil, Paul Lanus, of Denver, Colo.

**Portland, Me.**—The Portland & Yarmouth Electric Railway Company, capital stock \$200,000, has been incorporated to operate an electric railway between Portland and Yarmouth, Me. The promoters are Edward S. Perry, John S. Bradley, of New Haven, Conn.; Jas. O. May, Naugatuck, Conn.

**Gloucester, Mass.**—The Gloucester & Rockport Street Railway Company has been incorporated with a capital stock of \$40,000 to construct a street railway to run from Gloucester to Rockport. The promoters are Willard B. Ferguson, Malden, Mass.;



Albert D. Bosson, Chelsea; David S. Presson, Gloucester, Mass.

**Seneca Falls, N. Y.**—The Waterloo, Seneca Falls & Cayuga Lake Railway has been incorporated with a capital stock of \$150,000 to operate a street surface road from Seneca Falls to Cayuga Lake. The promoters are: Thos. Craig, Trenton, N. J.; C. E. W. Smith, New York City, N. Y.; M. T. Atchley, Geneva, N. Y.

**Baltimore, Md.**—The Mount Washington Electric Railway Company has been incorporated by George R. Webb, William G. Webb, Charles W. Hatter, Oscar C. Martenet and John W. Midden-dorf. The capital stock is \$150,000, and the road is to run from or near the intersection of the Falls road with Smith avenue, in Mount Washington, to connect with the Pikesville line, near Belvidere avenue.

**TRADE NOTES.**

**Large Wire Contract.**—Francis E. Donohoe, West-ern agent of the American Electrical Works, has secured a contract from the West and North Chicago Street Railroad Company amounting to \$118,000.

**J. H. Bunnell & Co.,** of New York, have just issued a new catalogue devoted to telegraph, tele- phone, electric light supplies, phonographs, grapho- phones and other devices in which electricity plays more or less a part. The catalogue is very compre- hensive and comprises over 200 pages, on which 750 cuts appear. Those who are interested in sup-

plies of this description will do well to send for copies of the catalogue and keep it for purposes of reference, even if they are not tempted to send in orders at once.

**The Arbel Etablissements** of Arbel, France, which is represented in New York City by William Hazle- ton 3d, intended to distribute among the attend- ants at the Atlanta Street Railway Convention souvenirs in the shape of handsome paper-weights, representing the company's street railway wheels with wrought iron centers. Unfortunately, how- ever, the souvenirs were delayed and have only come to hand within the last day or two. Those who wish to secure a unique paper weight can do so by sending a request to Mr. Hazleton, whose office is in the Havemeyer Building, New York City.

**The Ohio Brass Company,** Mansfield, O., reports a large number of initial orders for the reversible and adjustable track brush holders and steel wire track brooms, which have been followed in almost every case by larger ones. In many instances the entire equipment of motor cars has been provided with these. Among the larger roads which are using them are the Syracuse Street Railway, Syracuse, N. Y.; Middletown-Goshen Traction Company, Middletown, N. Y.; the Cumberland Electric Rail- way Company, Cumberland, Md.; the Burlington Electric Railway, Burlington, Ia.; the Steinyway Railway Company, Long Island City, N. Y.; the Central Electric Railway, Peoria, Ill. The ease with which these holders can be manipulated, and

the saving in consequence in the wear on the track brooms, are strong recommendations in their favor.

**Southern Railways—New Passenger Service.**— On account of the large increase of passenger traffic south via the Southern Railway Piedmont Air Line, an additional limited train has been put on, to leave New York in the afternoon. The first limited departs from New York at 3:20 P. M., and is known as the "New York and Florida Short Line Limited." This train reaches Jacksonville the following evening for dinner, making immediate connections through to St. Augustine, reaching there 9:20 P. M. The second limited, leaving New York at 4:30 P. M., is the Great Washington and Southwestern Vestibuled Limited, reaching Atlanta following afternoon at 3:55 and New Orleans second morning 7:25 A. M. and Memphis 7:25 A. M., connecting at Salisbury for Asheville, Chattanooga, Knoxville and Nash- ville. This train is composed of Pullman drawing- room sleeping cars, New York to Atlanta, New Orleans, Memphis, Asheville and Hot Springs, connecting at latter point with sleeping car ser- vice to Knoxville, Chattanooga and Nashville. Dining-car service between New York and New Orleans. The Fast Mail leaves as usual 12:15 A. M., with through sleeping cars to Montgomery and Jacksonville. To those going south a more de- sirable route cannot be selected. The Southern operates over 5,000 miles of rail south of the Poto- mac, and reaches all Southern cities and winter resorts, giving its patrons the best service that can be had.

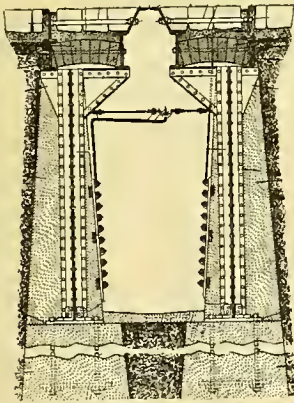
**RECORD OF STREET RAILWAY PATENTS.**

U. S. Patents Issued Nov. 20, 1894.

**529,357. Street Car Fender;** Alphonso F. Board- man, Brooklyn, N. Y. Filed Feb. 17, 1894. A turning shaft is extended across the car provided with arms and yielding material as a net extended between the arms and the car. A spring is arranged to aid in lifting the arms. A flexible band connecting a lever is adapted to turn laterally to the opposite arm arranged, so that the act of striking a person or object tends to turn the lever, and allow the flexible material to partially collapse laterally, and also to turn the shaft and allow the material to also collapse longitudinally of the car.

**529,370. Car Fender;** William F. Duncker, Steelton, Pa., Assignor to Jacob Shaar, same place. Filed March 6, 1894. The fender is hingedly connected with and suspended from the car and located in advance of the brake beam. A bar extends from the fender to the brake beam, and has its front end movably connected with the former and loosely connected at its rear end to the brake beam.

**529,372. Brake-Shoe;** Arthur W. Field, Boston, Mass. Filed March 7, 1894. The brake-shoe is provided with a series of cavities larger at the base than at the mouth, the mouths of said cavities being arranged at an



No. 529,406.

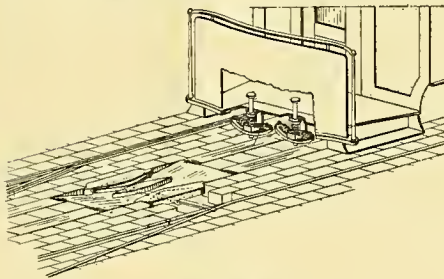
angle across the face of the shoe. A filling channel connects these cavities near the bottom, and a mass of glass fills the cavities flush with the face of said shoe, constituting a series of friction surfaces adapted to come in contact with the surface of the car wheel.

**529,383. Fare-Box;** George B. M. Harvey, New York, N. Y. Filed Sept. 17, 1894. The fare-box has a detachable top section, an interposed trap section, means securing the trap and top sections, a handle rigidly secured on the body, and a sliding connection between the top and upper end of the handle.

**529,406. Underground Electric Railway;** Henry B. Nichols and Frederick H. Lincoln, Philadel- phia, Pa. Filed June 13, 1894. The underground struc- ture comprises columns having brackets and struts with cross-beams mounted thereon, I-beams mounted on the cross beams and supporting track-rails to position and inclined Z bars or frames bound together by tie rods, the construction being such that two chambers of dif- ferent diameters are formed, whereof one is provided with a slot and the other with a conductor arranged out of alignment with the slot, supported by hangers sus- pended from insulated cross-guys attached to struc- ture. (See illustration.)

**529,433. Electrical Measuring Instrument for Switchboards;** John Van Vleck, New York, N. Y. Filed April 14, 1894. The instrument has an elongated scale-plate, a pointer or index extending through a slot in the plate and moving over the scale. The instrument is constructed and arranged so that no part thereof protrudes laterally beyond parallel planes, including the longitudinal edges of the scale-plate.

**529,434. Electrical Measuring Instrument;** Edward Weston, Newark, N. J. Filed Oct. 3, 1892. The instrument has a fixed coil, a movable coil in in- ductive proximity to the fixed coil and a spring oppos- ing the movement of the movable coil. These parts are



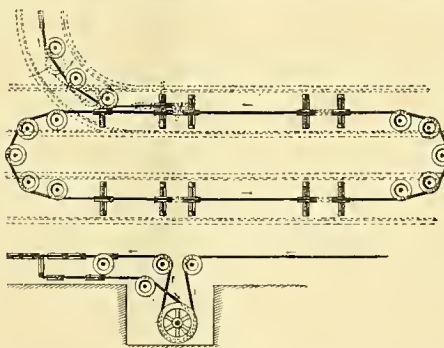
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so constructed and arranged that the moving coil, through the mutual reaction of its field with that of the fixed coil, will be caused to travel over substan- tially equal distances for equal applied force increm- ents throughout its range of motion.

**529,435. Electrical Measuring Instrument,** Edward Weston, Newark, N. J. Filed June 21, 1891. This is a case for electrical measuring instruments formed of two separable parts, each part consisting of a side plate and a flange. The parts are so con- structed that, placed together, the flanges shall form a portion of the periphery of the case, and so that between the flanges shall be left a slot or opening.

**529,444. Sand Box for Cars;** Emil Heiz, Paterson, N. J. Filed June 8, 1894. A cylinder is supported above the outlet from the case. Within the casing is an agi- tating and discharging rod, traversing the cylinder. A spring surrounds the rod and controls it. Means for depressing the rod, a valve controlling the outlet and means for opening the valve while the agitating rod is being depressed to discharge the sand from the outlet are provided.

**529,460. Car Fender;** George W. Oakley, Manches- ter, N. J. Filed May 4, 1894. The dashboard has ver- tically disposed hooks on its front side, the fender being provided on its rear side with horizontally disposed eyes adapted to engage over the hooks on the dash-



No. 529,530.

board, and means being arranged for raising and lower- ing the fender.

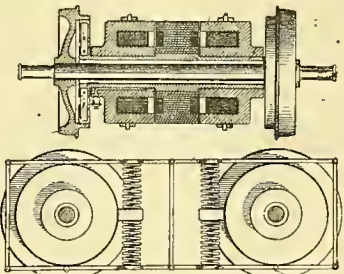
**529,488. Electrician's Combination Tool;** Jacob M. Gile, Denver, Colo. Filed March 20, 1894. The tool is composed of two arms pivoted together, the pivoted parts being recessed to form wire cutters and a wrench, plier jaws formed at one extremity and recessed

for wire connecting purposes. The outer face of the jaws have oppositely disposed cutting edges, the arms below the pivot being adapted to overlap, and provided with wire gauge recesses formed on their inner edges, with a graduated scale adjacent to their outer edges. One arm is provided with a wrench socket near its lower extremity, while the other is longer and is formed into a screwdriver, above which exterior cut- ting edges are formed on opposite sides of the arm.

**529,515. Switch Mechanism;** Sumter B. Battey, New York, N. Y., Assignor to himself and Joseph W. Hartley, same place. Filed Jan. 9, 1893; renewed Jan. 27, 1894. The mechanism is provided with a track plate having its ends bent upwardly and formed with exten- sions, and housings formed on the track plate near the sides thereof. (See illustration.)

**529,530. Cable Switch;** George C. Ormerod, Asbury Park, N. J. Filed Feb. 9, 1894. In a cable railway sys- tem with main and branch line cables, an interposed switch cable, a portion of the switch cable and a con- tiguous portion of the main line cable are capable of lateral deflection to cause the alignment of either with the main portion of the main line cable. (See illus- tration.)

**529,552. Trolley Stand;** Frank N. Kelsey, New Haven, Conn., Assignor of one-half to Charles L. Wright, same place. Filed Aug. 29, 1894. There is a pivotally supported socket piece for receiving the trolley arm, and a spring actuated controlling device which engages a



No. 529,671.

portion of the socket piece and is eccentric to the path of movement of the part which it engages.

**529,616. Section Insulator;** Albert Hennefeld, Christ. Dehner and Charles H. Van Ness, Colorado Springs, Col. Filed April 19, 1894. Claim 2 reads: "In a trolley wire break, the combination of a curved bar of insulating material provided with metallic tips, a perforated insulating bar secured to the main bar and adapted to receive loops formed on the ends of the trolley wire, clamping plates for holding the trolley wire in its place in the bar, clamps for fastening the loops at the ends of the trolley wire, and a double hook adapted to receive the span wire and support the break."

**529,646. Street Railway Switch;** Cornelius Coughlin, Cincinnati, O. Filed Feb. 15, 1894. The switch-throwing mechanism is located in boxes be- neath the surface of the street and is composed sub- stantially of tripping levers, a cord, switching lever, the slide and tongue switch connected with the slide and pivoted to the switching lever.

**529,657. Lite Guard for Street Cars;** Martin W. Lydon, North Andover, Mass. Filed Dec. 4, 1893. Re- newed Oct. 24, 1894. The life guard for street cars com- prises in its construction side-supporting arms sep- arately pivoted to the car so as to swing horizontally, and a cradle pivotally connected with the arms.

**529,671. Gearless Electric Locomotive;** Charles J. Van Depoele, Lynn, Mass.; C. A. Coffin and Albert Wahl, administrators of said Van Depoele, deceased, Assignors to the Thomson-Houston Electric Company, Boston, Mass. Filed June 3, 1891; renewed Sept. 17, 1894. The electric motor for cars is mounted upon a sleeve surrounding the axle, and is sustained by springs secured to the wheels. (See illustration.)



## FINANCIAL NOTES.

**Allentown, Pa.**—It is the intention of the Traction Company, which owns a controlling interest in the several electric roads, to consolidate all the interests into one.

**Carthage, Mo.**—It is announced that the \$15,000 required for a bonus to secure the construction of the electric railway in Carthage has been raised and that now the road is assured.

**Brooklyn, N. Y.**—Michael G. Cannon has been awarded a verdict of \$10,000 in a suit against the Brooklyn City Railroad Company for the loss of the services of his wife, who met with an accident in an electric car.

**Utica Belt Line Report.**—The following figures are taken from the report of the Utica Belt Line Company of Utica, N. Y., for the quarter ending Sept. 30: Gross earnings, \$42,284; operating expenses, \$21,408; net earnings, \$20,876.

**Syracuse Company's Report.**—The Syracuse Street Railroad Company has filed its quarterly report, ending Sept. 30, 1894, at Albany. The gross earnings are given as \$46,416; operating expenses, \$27,821; other income, \$224; gross income, \$18,819; surplus, \$23,368.

**Increase in Capital Stock.**—Officers of the Syracuse & East Side Railway Company have filed with the Secretary of State in Albany a certificate of an increase of its capital from \$200,000 to \$250,000. The debts and liabilities of the company amount to \$135,000.

**Reported Deal in Pittsburgh.**—It is said on good authority that the Second Avenue Traction Company of Pittsburgh has secured control of the Homestead electric line, and that in the near future there will be a direct line to Homestead. The deal has been consummated within the past few days.

**Consolidation of Columbus (Ga.) Roads.**—The North Highlands Electric Railway Company and the Columbus Street Railway Company have been consolidated. The latter company has recently effected arrangements with a Northern syndicate for a thorough equipment of the horse car line and the dummy line to Wildwood with electricity.

**Montreal, Que.**—A. J. Corriveau has brought suit against W. S. Williams, of New York, to recover \$118,750 stock in the Montreal Park & Island Railway Company, withheld illegally as alleged by the latter. The suit grows out of a deal between the two parties to the suit in reference to securing the franchise for the construction of the railway.

**Newburgh (N. Y.) Railway Earnings.**—The earnings of the Newburgh Electric Railway Company from July 1 to November 20 were \$34,894. The operating expenses amounted to \$16,919 and the taxes to \$300, leaving a net income of \$17,974. The interest on bonds and all securities paid and accrued was \$9,250, leaving a surplus of \$8,724, or more than 6 per cent. upon its capital stock of \$150,000.

**P. A. B. Widener on Elevated Roads.**—P. A. B. Widener, of the Philadelphia Traction Company, is quoted as saying of elevated roads: "In my opinion elevated roads have reached the height of their popularity, and, since electricity has come into such general use on surface roads, elevated roads are being crowded to the rear. We have ample evidence that this is so in Brooklyn and New York."

**Huhn & Glendinning, bankers, of Philadelphia.** have just issued two excellent street railway maps of Philadelphia and New York city. In the former railways owned and controlled by the Philadelphia Traction Company are indicated, as well as those that are proposed and under construction. In the map of New York city the railways now in operation and lines under construction and proposed are represented.

**Hoosick Falls Road Report.**—The Hoosick Railway Company, of Hoosick Falls, N. Y., reports to the Railroad Commissioners for the quarter ending September 30 as follows: Gross earnings, \$3,953; operating expenses, \$3,159; net earnings, \$795; other income, \$20; gross income, \$815; fixed charges, \$225; net income, \$590. The general balance sheet shows assets of \$120,900, including \$73,000 cost of road and equipment, and \$47,378 franchise, etc. The capital stock is \$60,000 and funded debt \$60,000.

**Cayadutta (N. Y.) Railway Report.**—The report of the Cayadutta Electric Railroad for the 10 months ended April 30, recently filed with the Railroad Commissioners, gives the following figures: Gross earnings from operation, \$51,019; operating expenses, \$39,012; net earnings, \$12,006; fixed charges, \$24,092; deficit, \$12,086; deficit up to June 30, 1893, \$417; total deficit April 30, \$12,504; cash on hand, \$389; betterments, \$61,596. The road is under lease to the Fonda, Johnstown & Gloversville Railroad.

**Brooklyn, N. Y.**—Jacob Friedman and other bondholders have begun a suit against the Brooklyn Cable Company and the Central Trust Company as trustee, and the Atlantic Avenue Railway Company. The plaintiffs ask to foreclose the mortgage on the franchise of the cable company. It is alleged that this company defaulted interest on its bonds last March and that the Central Trust Company refused to institute proceedings to foreclose the mortgage because it was also a trustee under another mortgage held by the Atlantic Avenue Railway Company to secure an issue of bonds.

**Judgment Against Kansas City Company.**—Judge Henry, of the Circuit Court in Kansas City, Mo., last week ordered that judgment for \$292,702.60, with interest and costs, be entered in the old suit of the bondholders against the Northeast Electric Railway Company, of Kansas City, Mo. The suit was brought by the Jarvis-Conklin Mortgage Trust Company against Witten McDonald, president; Gardiner Lathrop, trustee; M. B. Abell, trustee; Augusta Taylor and others. The bonds in controversy were given to the amount of \$260,000 on November 1, 1889. They were 20-year 6 per cent. bonds. The suit was brought on the grounds of lapse in payment of interest.

**Examination of Brooklyn Roads.**—The examination of the Brooklyn City and Brooklyn Heights Railroad companies for the Railroad Commissioners, as a result of the charges brought by H. M. Thompson, is now practically completed. The books have been gone over by Secretary Charles R. De Forest of the State Board of Railroad Commissioners, assisted by A. L. Judson, the official accountant. During the same time Frank A. Baxter, the engineer of the board, has been making an examination of the physical condition of the system. The facts will be reported to the board, which will then decide whether or not to order corrections made to the quarterly and annual reports of the two companies. A public hearing may be ordered, at which both sides may be represented by counsel to present arguments for and against action.

**Reading & Womelsdorf Railway.**—The books have been opened at the office of the Reading Traction Company to receive subscriptions of stock for the building of the Reading & Womelsdorf Electric Railway, between Reading and Womelsdorf, a distance of 15 miles. The stock to be issued amounts to \$250,000, and the road will occupy the Berks and Dauphin turnpike. The company was chartered last March, and has settled damages with the Berks and Dauphin Turnpike Company. In condemnation proceedings the jury awarded the turnpike company \$35,000 for the right of way to Womelsdorf. John A. Rigg is the president, and M. C. Aulenbach the secretary and treasurer of the Reading & Womelsdorf Company, and the road will be built and owned by this company, but it will be operated under a contract by the Reading Traction Company. The connection with the Reading Traction Company's system will be made by laying tracks across the county bridge, at the foot of Penn street. The Traction company is to pay \$600 for the privilege.

**Judgment Against Brooklyn Company.**—A judgment for \$22,500 has been given by a jury in Brooklyn in favor of Annie Tholen, the eight-year-old daughter of John S. Tholen, in her suit against the Brooklyn City Railroad Company. The girl had lost both her legs by being run over by a Third avenue trolley car. The father also recovered \$3,000 from the company for the loss of his daughter's services. The company appealed in each case. Last week the General Term handed down a decision sustaining both verdicts. The court says: "It was clearly the duty of the motorman to keep a careful lookout in front of him, and if he had done so he would certainly have seen this little child traversing the space of over 23 feet before she reached the track he was on, and, seeing her approaching his track, it was his plain

duty to have slowed down and obtained such control of the speed of the car as would have enabled him to avoid injuring the child in case she fell, as she did. The motorman did not pursue this course, as the car went 40 feet after striking the child before it stopped."

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# Street Railway Gazette.

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Cars Passing at Street Crossings. It is announced that an order has been issued by the Syracuse Street Railway Company

providing that electric cars shall not pass each other within 30 feet of street crossings. When cars are approaching such a crossing, the regulation provides that the outgoing car is to wait until the incoming car has discharged or taken on board its passengers. Such a rule has much to recommend it and no great objections are apparent. The practice is followed by steam railroad companies, and the engineer who violates the rule is likely to enjoy an enforced vacation for a week or more. Such a regulation should tend to prevent a great many of the accidents that are due to the carelessness of passengers, who, after alighting from a car, pass in front of a car coming from the opposite direction.

Street Railways of St. Louis. St. Louis owes a great deal to its electric railways. Not alone have they been a most

important factor in increasing the city's material prosperity, but they have served mightily to advertise the city to the world over, and municipal corporations, no less than business houses, appreciate nowadays the value of advertising. The claim of St. Louis that it possesses the best street railway system in the world will not, perhaps, be admitted everywhere, but certainly few cities would care to compare their transportation facilities with those of the city on the other side of the bridge. The St. Louis system evidently has no more sincere admirer than W. H. Bryan, of that city, whose article tracing its development appears elsewhere in this issue.

Sunday Street Cars. This brief extract from a recent sermon on Sunday observance by the Rev. Dr.

Rylance, of St. Mark's Church, New York City, may be of interest to some of our Canadian friends who are so opposed to the operation of cars on the first day of the week: "Class legislation should not be tolerated. Masses have been alienated from the churches because preachers had two gospels, one for the rich and one for the poor. Dives may harness his horses and ride forth in state to church on Sunday, but if the poor man avail himself of a street car on that day it is desecration. The rich may enjoy the free air of their country places on Sunday, but it would be considered profanation for the poor man to go forth and sniff the fragrance of the wild flowers or the invigorating breezes of the sea."

Talking and Acting in England. Two articles are presented in this issue, one illustrating

how the English talk and the other how they act in the matter of electric railways. The British engineers turn envious eyes toward this country, where street railway facilities are so ample and excellent, and implore their officials to show a little more liberality toward electric traction enterprises. The latter are entirely non-committal and simply advise the exercise of humble patience. The English, however slow they may be in the matter of electric traction generally, are not afraid to undertake city underground enterprises such as our engineers have not been obliged to at-

tempt. The plan for constructing the Waterloo underground electric railway, which will accommodate almost 100,000 suburban residents of London, is illustrated elsewhere in this issue. The project is a huge one, and it shows that London is waking up to the necessities of rapid transit, for this particular improvement has been urgently demanded for the last decade.

Cleanliness in Street Cars. The modern rapid transit car differs as much in point of cleanliness as it does in other

respects from the old-fashioned horse car. One form of decoration of the latter in winter time was its loose hay or straw floor covering, which was supposed, although erroneously, to aid in contributing to the comfort of the passengers. This abomination is no longer to be encountered, as it is condemned as uniformly by street railway managers as it is by public opinion. The typical old time car was never kept in a proper state of cleanliness in other respects, for the simple reason that imperfect facilities for washing the interiors were provided in the barns. With the introduction of improved methods of operation, new cars were put into service that compare in point of comfort with those used on the best steam roads, and provision for keeping them clean and in proper order is made in constructing the buildings for housing the rolling stock. In fact, the companies that operate the best surface roads, so remiss a few years ago in car cleaning, now pay far more attention apparently to this important matter than elevated lines. The latter ran coaches that are frequently abominably dirty and foul smelling. This charge cannot often be brought against street railway companies that are operating modern cars. The matter of cleanliness of public conveyances has recently been brought before the Brooklyn health authorities, who rather incline to the belief that consumption has been spread through the medium of imperfectly cleaned public vehicles. Dr. Wilson, the bacteriologist of the health department, reported that he had produced a fatal case of consumption in a guinea pig in his experiments with the dust and other substances taken from the cars and railroad stations in the city. A committee of the Kings County Medical Society recently recommended that an ordinance be adopted providing that it be made a misdemeanor for a person to expectorate in a public conveyance. A few days ago a conference of the surface and elevated railroad officials of the railroad and ferry companies was held at the office of the health commissioners, and the matter of securing their co-operation with the health department was discussed somewhat at length. It was suggested that cocoa mats in use in the cars and ferry boats be discarded, as it was the belief of the authorities that they were a contributory factor in the spread of disease. After listening to arguments on this subject, all the officials agreed to abolish the objectionable mats and substitute wooden mats. It was also agreed that the cars should be sprinkled with a disinfectant every day. It is a gratifying fact to know that the transportation companies agreed so willingly to co-operate with the health officials, and it is unquestionably true that this is the wisest policy from every point of view. Cleanliness in street cars is not only desirable, but it pays in dollars and cents, for it attracts patronage.



### ELECTRIC TRAMWAYS FROM AN ENGLISH POINT OF VIEW.

At the annual dinner of the Institution of Electrical Engineers, of London, Dr. John Hopkinson spoke of the development of the electric railway in America. There were thousands of miles of electric tramway, he said, and thousands of cars running on them. They thought nothing of allowing those cars to run at the rate of 15 or 20 miles an hour. He would suggest that it should be possible that in England they should have some modicum of the freedom granted to electrical engineers in America. They did hear of people being killed once in a way, but he doubted whether that would be the case in Great Britain. But even granting that once in a way someone might be killed, he would suggest that Mr. Bryce, president of the Board of Trade, should confer not only with Mr. Bryce, the author of "The American Commonwealth," but also with Mr. Bryce, the mountain climber, and consider with them whether a victim rarely sacrificed on the altar of civilization would not be amply compensated for by the greater help thousands would enjoy by the extended use of the electric light, by the greater health which millions would enjoy by being able to get to their work at a distance, and rearing their families in a healthier atmosphere.

Mr. Bryce, in making a response, said that while it was true that far more had been done in the electric lighting of cities in America, he did not think the electric lighting of private houses had progressed much more rapidly in many parts of America than in London. He had observed that far more had been done in the way of running electrical tramcars and railroads than in England. This was a subject upon which he hoped they would have some light from electricians when they came to consider, as at the Board of Trade they proposed to do, what could be done to facilitate the creation of light railroads and tramroads. He must, however, congratulate them upon having been far more tender to human life than their American brethren had been. Without entering upon the delicate question which Dr. Hopkinson had raised as to how many lives must be sacrificed in order that public convenience might be increased, he thought they would agree with him that electrical engineering was likely to progress more rapidly, to be more largely extended, and to be regarded with more general popular favor, if they could accompany it with regulations for public safety which would remove prejudice and apprehension in the public mind, and which would prevent the recurrence of such accidents as unfortunately occurred a few years ago in America. He did not think any pains taken for the public safety would be thrown away, even putting the matter in its lowest commercial aspect.

### A RAILWAY ADVERTISER'S SUIT.

Michael Wineburgh, of New York, has instituted a suit for \$75,000 for libel against George Kissam, of the firm of Carlton & Kissam. The suit was instituted upon the contents of a letter dated Dec. 6, 1893, from Carlton & Kissam to Samuel Little, President of the West End Street Railway Company, of Boston. The letter has the firm signature, but, it is alleged, is in the handwriting of Kissam. Bids for the advertising in the company's cars had been solicited and Wineburgh bid \$47,000 a year. The letter began by stating that the undersigned had heard that Wineburgh had secured the advertising, and continued:

If this is indeed true we regret to learn it, as you will find in experience that you have got a Tartar. This man Wineburgh is one of the most unprincipled rascals in existence; he is also the biggest liar.

The man's whole career has been one of sharp practice and treachery, and every person who comes in contact with him in a business way had had to buy him off or kick him out. He has a few respectable gentlemen associated with him, but they have only been there a short time. The last

party with whom he was in business got rid of him very quickly; that was ex-Mayor Grant of this city.

Then follows a bid of \$51,000 a year for five years for the advertising in the Boston cars. In his complaint Wineburgh says he was, by reason of this letter, compelled to give Mr. Little a bond of \$50,000 from the American Surety Company of this city.

### THE HESTONVILLE LINE, PHILADELPHIA.

The Arch street line of the Hestonville, Mantua & Fairmount Passenger Railway Company, Philadelphia, was formally opened on last Saturday, and the road is now in regular operation. On Saturday a party composed of the officers and stockholders of the company, and representatives of the contractors who have installed the system, made a thorough inspection of the line in special cars, and then visited the power station at Twenty-sixth and Callowhill streets. The cars were in charge of the assistant engineers of the company, and the party was heartily cheered as it proceeded along the line.

The Arch street line has been thoroughly reconstructed. East of the Schuylkill the company has paved the street with granite blocks, and in West Philadelphia the pavement is asphalt, with blocks between the rails. All the feeder cables are buried, with the exception of those on a part of Lancaster avenue, where they are carried on poles in the middle of the street, the cables of the Philadelphia Traction Company being attached to the same poles. The tracks are laid with 90 pound Johnson girder rails. The engines in the power station were made by the Providence Steam Engine Company and are three in number, aggregating 1,500 H. P. The generators, which are directly coupled to the engine shafts, are of 400 kilowatts capacity each. At the present time only one generator and one engine are in operation. The generators were furnished by the General Electric Company, and the boilers by the Babcock & Wilcox Company. The cars which are to be used on the line were manufactured by the St. Louis Car Company and are finished in red, which has been adopted by the company as a distinguishing color. The interior of the cars is finished in mahogany in a very attractive way and the upholstery is of the most modern description. Oxidized silver electroliers are used and the interior mountings are of the same material. The cars will be heated by electric heaters.

### BOSTON WEST END STOCKHOLDERS ANNUAL MEETING.

The annual meeting of the stockholders of the West End Street Railway Company, of Boston, was held last week. The annual report, which was published in the STREET RAILWAY GAZETTE of Nov. 24 was presented and accepted, after which President Little made the following address:

Unlike the machinery of a manufacturing establishment, which has its season of rest, and can be inspected and repaired at leisure, our several power houses and our cars with the electrical apparatus connected with them, are called upon for service day and night during every day of the year. This can only be met by the most constant and thorough oversight, and the most prompt attention to needed repairs. The fact that our cars have not failed to meet the demands of the public even during the heavy snow storms of the last winter, when many of the steam roads were unable to respond, reflects great credit, not only upon the officers of the company in charge of its power plants and its electrical departments, but also upon those charged with the duty of keeping our tracks free from snow obstructions and in order for the successful running of our cars.

Nineteen millions of miles run and the carrying of 137,000,000 of passengers over our 272 miles of track, with the immense traffic on our streets from other sources, means a constant and severe wear and tear upon our tracks which require a large outlay to meet.

While the policy of the directors has been a most

conservative one in carefully considering all expenditures, it has been a liberal one in making needed appropriations for all necessary repairs and additions required to our system. The extensions of track made have been constructed in the most substantial manner. The power house and the car houses which have been built are plain, strong structures, well adapted to the business of the company, and were built at an expense as small as a due regard for the needs of the localities in which they are situated would warrant.

Your directors feel that the property of the company in all its departments has been cared for and its efficiency maintained in a manner that will be satisfactory to the stockholders.

A beginning has been made in placing the feeder wires of the company underground, and has been nearly accomplished in the district designated by the commissioner of wires as the work to be done the present year. The important work entrusted to the commissioner has been entered upon by him with vigor and in a most businesslike manner. The officers of this company have heartily co-operated with him, and I trust will do so in the future, that nothing may be wanting on their part to accomplish the work entrusted to him.

The past year has been an active one for the company, with the ordinary repairs, with the extensions and building of several car houses and a power house, and it can hardly be expected with the business so extended but that every year will bring its demands which must be met, yet with so large a percentage of our system completed for electricity and much of the remainder practically completed, the work of reconstruction of horse car lines to electricity is nearly at an end.

The board of directors was re-elected with the exception of Eustace C. Fitz, in whose place Albert C. Houghton was elected.

### TRANSFER AGREEMENT IN PHILADELPHIA.

It is announced that the Electric Traction and People's Traction companies of Philadelphia have reached an arrangement for the transfer of passengers at almost every point where the two roads intersect. Negotiations looking to this and have been in progress for a considerable time, and have given rise to many persistent rumors that the two companies were to be consolidated. While it is positively announced that there is no truth in this report, the traveling public gains all the advantage that would follow an actual consolidation of the two systems. The new arrangement is to go into effect at once, and transfer will be issued at 46 new points. The results of the arrangement is practically to place the street railways of the city into two great systems—the new combination and the Philadelphia Traction Company.

### CONNECTICUT STREET RAILWAY ASSOCIATION.

The Connecticut Street Railway Association held its annual meeting recently in the offices of the Winchester Avenue Railway Company in West Haven. The meeting was principally devoted to a discussion of the plan of work that could be followed to the best advantage by the association, and to the best means of interesting other companies in the State in the organization.

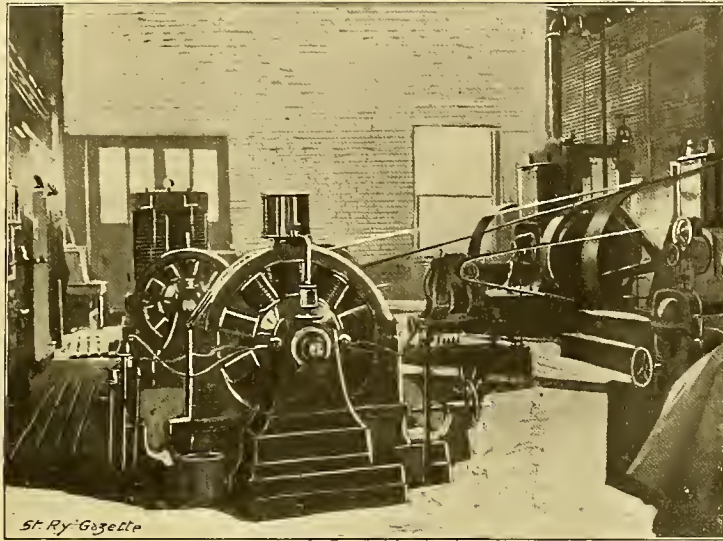
Representatives of the following companies were present: The Winchester Avenue Railway Company, of New Haven; the New Haven Street Railway Company, of New Haven; the Fair Haven & Westville Street Railway Company, of New Haven; the Hartford Street Railway Company, of Hartford; the Waterbury Traction Company, of Waterbury; the Stamford Street Railway Company, of Stamford; the Norwalk Street Railway Company, of Norwalk; and the Derby Street Railway Company, of Derby.

The following officers were elected for the ensuing year: President, H. H. Wood, of Derby; vice-president, H. S. Parmelee, of New Haven; secretary, R. A. Fosdick, of Stamford; treasurer, E. S. Goodrich, of Hartford; executive committee, the officers and I. A. Kelsey, of New Haven; A. M. Young, of Waterbury; and G. A. W. Dodge, of New Haven.



**PLAINFIELD STREET RAILWAY.**

There is every reason to believe that the number of combination electrical plants will be greatly increased within the next few years. In a great many small towns where an electric railway is urgently demanded, the traffic would be so small that the enterprise could not be properly supported



PLAINFIELD POWER PLANT.

were it conducted as an entirely distinct undertaking. If, however, an electric plant is constructed that will supply current for electric light and stationary motors as well as for the street railway, the investment may prove highly profitable. A considerable number of such combination plants are already proving remunerative, and one of this number is illustrated in the accompanying engraving.

The Plainfield Street Railway Company operates about three and one-half miles of road, part of which is single and the remainder double tracked. Six motor cars built by the J. G. Brill Company, of Philadelphia, are in service. These are 16 feet in length and are mounted on Brill trucks, four of the number being equipped with one 15 H. P. General Electric motor each, and the other two operated by two motors each, each of the same make and capacity. The track is laid with 72 pound girder rails supplied by the Cambria Iron Company. The bonding is double and the rails are cross bonded at every second joint.

Power is supplied by one 150 H. P. Westinghouse engine, which drives a 60 K. W. General Electric generator. The engine and generator are located in the electric light station of the Plainfield Gas and Electric Light Company. The power station is situated on Madison avenue adjoining the tracks of the Central Railroad of New Jersey. The building is brick and is about 60 by 75 feet. The lighting plant consists of three Westinghouse engines of 150 H. P. each and one 100 H. P. engine of the same make, each directly belted to an alternating current generator. There is in addition a C. & C. continuous current generator of 40 K. W. capacity for supplying current for stationary motors. The belting used in the plant was supplied by the Shultz Belting Company, of St. Louis; the Page Belting Company, of Concord, N. H.; and Charles A. Schieren & Co., of New York. The boiler-room is 30 by 60 feet, and the equipment consists of five 100-H. P. horizontal return tubular boilers, each 5 feet 6 inches in diameter by 16 feet in length. Four of the boilers were made by Bigelow, of New Haven, and one by McEwen, of Wellesville, N. Y. The feedwater pumps are of the Worthington and Hall makes, and an injector is also provided in case of an accident to the pumps. The feedwater is supplied from a well, and a connection may also be made with the city water mains in case of any failure in the regular supply. A siding from the Central

Railroad of New Jersey extends to the power station, and coal is dumped directly from the cars to a coal-storage opening into the boiler-room. The company furnishes light for Plainfield and Fanwood, and provides illumination over an area of about five miles. The railway engine and generator are giving entire satisfaction and require very little attention. The company owns a large

Company, of St. Paul, and subsequently became interested in the Great Western Electrical Supply Company, of Chicago.

The new organization absorbed the last named company, the Chicago Insulated Wire Company and the Bain Electric Manufacturing Company, of Chicago. The president of the Bain Company, Force Bain, became the electrical expert of the new concern. A great deal of Duluth capital was invested in the new concern, and the factory was located in that city. Ex-United States Senator Lyman R. Casey, of North Dakota, is president; S. J. Young, of the Union National Bank, Brunswick, Me., first vice-president, and one of the directors is J. L. Dodge, president of the Mahanic National Bank of Great Barrington, Mass. Of the \$1,500,000 capital stock, over \$700,000, it is stated, has been paid in.

The company has been hard pressed financially for some little time. Collections have been slow and the company has been obliged to carry electric railways for which it had furnished machinery. The liabilities are estimated at \$300,000, and the assets are valued by the company at \$700,000.

Some of the creditors who had been pressing the company during the last few months were paid by borrowed money, but a few days ago several of the principal creditors became alarmed and a crisis was reached. The Electrical Corporation of Boston was negotiating to buy some of the concern's securities for \$100,000 cash, but when the creditors pushed their claims only \$25,000 was realized.

The officers contemplate a reorganization which will pay off all the pressing claims and place the concern on a solid foundation. A bill of sale for the Chicago offices and the contents of the warehouse was given last week to the First National Bank of Chicago, which had loaned the company nearly \$100,000. A confession of judgment today in the United States Court for \$15,000 borrowed money precipitated the failure. The rec-

plot of ground adjoining the power station on which the building may be extended. Excellent service is given by the company and, as Plainfield is rapidly growing, extensions will, without doubt, be made in the near future.

**GREAT WESTERN ELECTRICAL MANUFACTURING COMPANY EMBARRASSED.**

The Great Western Electrical Manufacturing Company, with offices in Chicago and Duluth, has



PLAINFIELD POWER STATION.

become financially embarrassed. The company was organized by E. R. and H. K. Gilman, who were interested first in the Northwest Electric

ords of the courts in Chicago show half a dozen suits against the company since last April for large sums.



## THE STREET RAILWAYS OF ST. LOUIS.\*

BY WILLIAM H. BRYAN, M. E.

No American city has had a wider or more interesting experience with the various forms of street railway construction and operation than St. Louis. Even in the early days of horse car lines she was progressive and liberal. As the traffic assumed more extensive proportions cable lines were extensively introduced, and she now takes front rank with the greatest amount and most improved forms of electric railways. This inland municipality has long called itself "The Electrical City" of America, basing its claims to the title not only upon its extensive arc and incandescent lighting plants—among the largest in the world—but principally upon the enormous extent to which electricity is employed in its street railway traffic.

This preeminence of St. Louis is in a large measure due to the far-sighted and liberal policy pursued by the municipal authorities in dealing with street railway companies. In this they have been supported by an intelligent and progressive public sentiment, which has insisted upon improved rapid transit, limited, of course, by reasonable restrictions as to routes, character of construction, speed, rates of fare, etc. St. Louis has been so fortunate as to escape the effects of the bugaboo of "the deadly trolley" in the hands of the sensational press. It has been shown beyond question that the electric car is one of the safest modes of travel, and is under absolute control. There have been accidents, it is true—some of them serious—but these necessarily accompany any improved system in the narrow and crowded streets of a great city. Since the days of George Stephenson rapid transit has necessitated not only increased skill and care upon the part of the operators, but greater caution on the part of all who use the public streets and highways. Although the people of St. Louis early recognized these facts, they preferred to accept the conditions imposed rather than remain indefinitely in primitive indifference, awaiting the development of an ideal system which should be absolutely dangerless.

The fare on all the lines is five cents, except for children. No forms of commutation or rebate tickets of any kind are sold. Recent combinations of different lines under consolidated managements have resulted in the widespread adoption of the transfer system, so that it is now possible to board a car at Calvary cemetery, in the extreme north-western portion of the city, and ride with but one change of cars to Carondelet—a distance of some 13 miles—for a single fare. Under such exceptionally favorable conditions it would be natural to suppose that many interesting and valuable street railway experiences have been had in St. Louis.

Not the least among them is the increase of travel which has followed the introduction of rapid transit, particularly with roads whose motive power has been changed from horse to electricity. It has not always been easy to account for this improvement. Competing lines suffer to some extent, but their losses do not account for all the gain. There is an increase in the grand total of travel, due no doubt to the adoption of better methods and more attractive surroundings. Rapid transit shortens distances, thus bringing together the residence and business districts, and building up outlying areas, hitherto inaccessible. It permits the man of modest means to enjoy the comforts of his own roof and his little plot of ground within reach of his office or shop. Who can tell how much has thus been added to the sum total of human happiness?

With more miles of electric road than any city in the world, and with an important showing of the most improved and modern cable line construction, St. Louis may well claim an advanced rank in rapid street railway transit. The total length of electric, cable and horse lines is 271.32 miles single track. Not a bad showing for a city of 600,000 inhabitants. Much of this track is used jointly by different lines. If the distances were computed from the actual trip lengths the total would be at least fifty miles greater. Legislation has been secured and plans are already practically complete for the change of the remaining horse roads to electricity. The last vestige of prehistoric modes of urban travel will then vanish, and the change from "mule to fuel," as it has been aptly termed, will be complete. Nor is new construction at a standstill.

The total business for all the roads covering the second quarter of the year 1894, as indicated by returns filed with the city register, was 1,433,421 trips, and 24,773,660 passengers. For the same period of the year 1893, the totals were: trips, 1,625,799; passengers, 26,186,742. This indicates the slight extent to which the traffic was affected by the widespread business depression of the year 1894.

St. Louis has had little or no experience with

other forms of motors. Nothing has been done, nor is likely to be done, with steam dummies, gas, ammonia, or compressed air motors. The lines are all on the surface. Franchises have been secured for elevated roads, but their great first cost and the doubt as to their improving to any great extent upon existing methods, has kept them from advancing into favor either with the public or capitalists. In the early days of the electric railway problem, the Lindell Railway Company spent about six months in trials of storage batteries, using Brush-Julien cells. These experiments, however, were finally abandoned on account of the weight, excessive depreciation, low efficiency, and high first cost.

Several cable roads which proved unsatisfactory were changed to electric lines, with the result that they became successful at once. The St. Louis & Suburban, built in 1876, was operated originally as a narrow gauge steam railway, over its own right of way from Grand avenue and Olive street to Florissant, in St. Louis County. In 1885 the down-town portion, from Sixth and Locust streets, was constructed as a cable road. Being the first road of this character in the city it was immediately successful and compelled prompt action on the part of parallel lines to secure rapid transit. The Suburban company's franchise was granted by an unfriendly council, and its right of way was a roundabout one, with many curves of short radius. Rapid transit on the more direct lines caused a falling off of its traffic, and the excessive operating expenses, due to the power required and the wearing out of cables soon bankrupted the road. A reorganization being effected it was decided to reconstruct the entire line and equip it with electricity as the motive power.

This line was the first street railway in this country to be used regularly as a United States mail route. The service has been in very satisfactory operation for a period of more than two years. There is a full equipment of regularly furnished and specially fitted mail cars, which go over the entire route twice a day. These cars run on a regular schedule and are due at definite times at certain corners, where mail is delivered to carriers for distribution over their respective routes. So successful is this service that it has been adopted in other large cities.

The Suburban is not the only road, however, which has found it wise to change from cable to electricity. The Grand avenue branch of the Citizens has undergone a similar transformation with the most gratifying results, and the main line of the same company is now being reconstructed.

It has been possible in St. Louis to make comparisons as to the relative cost and operating expenses of cable and electric roads. The most recently built electric road is the Cass avenue system, which embodies the best features of modern electric railway construction. Among the last cable roads constructed was the Citizens, which was well built in accordance with the best practice of that day. These lines are operated under the same management, and an excellent system of records is kept by the company's engineer, Mr. Richard McCulloch, E. M. The conditions here are favorable for a fair comparison between the two systems. The number of cars operated, trips made, passengers carried, character and hours of travel, grades and speed, are all of the same general character. If anything, the conditions appear more favorable to the cable than to the electric road, on account of the short length of the former and the few curves. The records for the month of March, 1894, are as follows:

On the Citizens' (cable) line, the average number of trains (two-car) was 35, running each 107 miles daily. The horse power per train, gross (including cable), was 18.32, and horse power, net (exclusive of cable), was 6.38. Coal consumed per train mile was 11.18 pounds. Coal consumed per horse power hour was 5.18 pounds. Water consumption per horse power was 23.93 pounds. The average total load was 413 horse power. The average friction load—cable only—was 2.69 horse power or 65.13 per cent. of the total.

The engines are of the ordinary Corliss pattern, single cylinder, non-condensing. The boilers are of the horizontal return flue type, with 6-inch flues. The coal is the ordinary soft bituminous of southern Illinois, such as is used almost exclusively in St. Louis. It averages in calorific power about 10,500 British thermal units per pound, and 15 per cent. ash.

On the Cass avenue and Fair Grounds Electric Railway the average number of motors was 69, each running daily 125 miles, and 26 trailers, averaging 62 miles. The average horse-power per motor car was 15.52. The coal consumption per motor mile was 7.76 pounds. The coal consumption per train mile was 8.15 pounds. The water consumption per horse-power hour was 25.21 pounds. The coal consumption per horse-power hour was 4.22 pounds.

In computing these totals four trailers were assumed to be equivalent to one motor car. The latter are of the large single truck pattern, with

21 feet bodies and 7 feet wheel bases. Each is equipped with two 25 horse-power motors.

The engines are of the Corliss pattern, single cylinder, non-condensing. Three of them are 34 × 60, speed 92 revolutions, initial steam pressure 85 to 95 pounds, directly connected to 750 kilowatt multipolar generators. There is also an 18 × 36 Corliss running 150 revolutions, directly connected to a 250 kilowatt generator. The boilers are the same as at the Citizens' plant, except that they are set with down-draft smokeless furnaces.

The above figures show that the average horse-power used for each motor car is 15.52, and for each cable train 18.32—a difference in favor of the former of about 15 per cent. It must not be forgotten, however, that the cable or friction load being constant, additional cable trains would require but 6.38 horse-power each, while additional motors would call for 15.52, considerably more than twice as much. The electric system, however, covers a mileage over three times as great as that of the cable. If the latter served as large a mileage, more length of cable would be required, and the power for the same number of cars would be greatly increased; while if the number of cars were enlarged at the same time the power per car would be reduced to approximately the same figures given above.

These results, however, are from a single pair of roads. There are cable roads using less power per train, and there are electric roads using more. A considerable proportion of the saving in fuel is undoubtedly due to the better steam plant of the Cass avenue system, which requires but 4.22 pounds of coal per horse power hour, while that of the cable line consumes 5.18. Furthermore, the Cass avenue system is new in every part, while the Citizens' line has seen five years of very severe service, and as a result its operating and maintenance expenses have increased.

These figures point clearly to the conclusion that where a traffic exists sufficiently large to justify numerous trailers and close spacing, on a comparatively limited length of line, the cable is to be preferred. On the other hand, where the amount of track is extensive, and where the traffic per mile is less, electricity clearly has the advantage.

This, however, is not the whole story. Sometimes local conditions determine absolutely whether cable or electricity is the better. No electric road, whatever its traffic or extent of line, could operate successfully on such steep grades as are handled satisfactorily by the cable in San Francisco and Kansas City. On the other hand, such curves as are frequently necessary in St. Louis and Boston would prove disastrous to any cable line.

There are two troubles which seriously hamper the cable road. One of these, the closing of the slot in cold weather, has caused some of the St. Louis roads untold annoyance and expense. The other is the wearing out of the cable, and the expense attending its renewal. Now that the repairs to armatures have been reduced to only nominal cost, there are no corresponding outlays in electric railway work.

It would be difficult, if not impossible, to make up accurate tables showing the relative first cost, and the cost of operation of cable and electric roads; and when made, they would apply only to the particular roads to which they refer. In general it may be said that for roads operating more than 20 cars, the first cost of the electric plant complete is in the neighborhood of two-thirds of that of the cable, presuming the construction to be equally good in each case. The experience of St. Louis roads indicates that the operating expenses are nearly the same, estimated at about 65 per cent. of the gross receipts. A new electric road has some advantages over an old cable road, while a cable line in good repair and with few curves, might show better results than an older electric line.

It is clear, therefore, that while certain general principles may be stated, no positive opinion can be given regarding a particular road, nor can a definite recommendation be made, except after a thorough study by a competent engineer of the local conditions affecting that special case.

## GEORGIA STREET RAILWAY ASSOCIATION.

A street railway association in Georgia is to be organized. Officers of several of the street railways met a short time ago in Atlanta and appointed the following committee to take the necessary steps to form an organization: Joel Hurt, president of the Atlanta Consolidated Street Railway Company; Col. D. B. Dyer, president of the Augusta Railway Company; and J. King, president of the City Electric Railway Company, of Rome.

\* Abstract of an article in the *Engineering Magazine* for November.



**RAIL BOND.**

The accompanying cut represents a rail bond for which a patent has been applied for by F. Foley Robinson, of London. The claim of novelty is for the short metal tubes expanded into the webs of rails in the manner adopted by boiler makers to secure tubes in metal plates. It is claimed that the bond is cheap and presents large and excellent contact area. The London *Electrical Review* states that it has been proved by experiment that the holding-power of

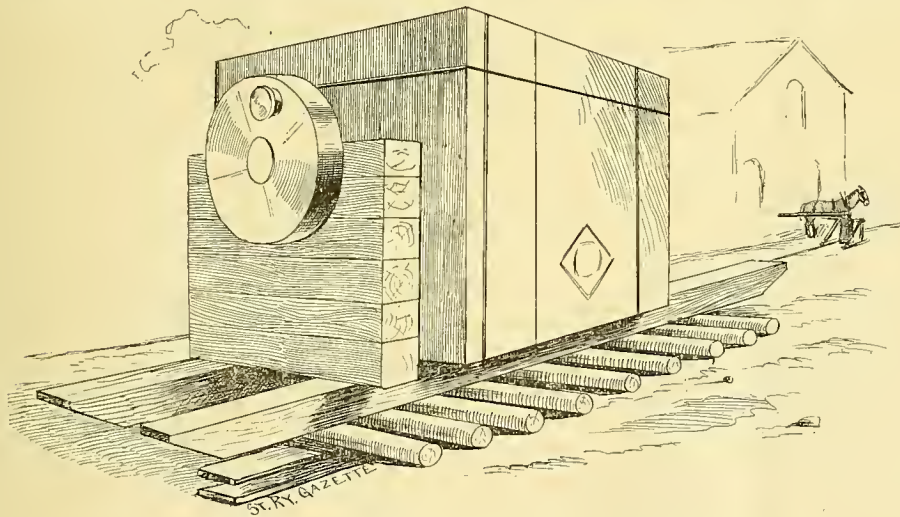


Rail Bond.

a 2-inch tube, expanded in the ordinary way, is at least 8 tons, and that the effect of "rolling" is not merely to bring the two surfaces in contact, but to cause pressure one against the other. The West End Railway Company, of Boston, has, we think, used a bond that is similar in design to that shown in the illustration.

**TRANSPORTING GENERATOR ARMATURES IN CHICAGO.**

The accompanying illustration shows the manner in which the armatures of the huge generators for the Metropolitan West Side Railway Company of Chicago are moved from the railroad tracks to the site of the company's power station. These machines, which were built by the General Electric Company, are of 1,500 kilowatts capacity and are designed for direct connection with the engines. The power station is located on Throop near Van Buren street and is about 300 feet in length and 90 feet wide. The armatures are brought on flat cars to Sixteenth street and Loomis avenue, and from that point are slowly transported by means



TRANSPORTING GENERATOR ARMATURES IN CHICAGO.

of windlass and rollers, as shown in the engraving. It is stated that it took about three days to move the armature from the railroad tracks to the station.

The power station of the Metropolitan Company will ultimately have a capacity of about 6,000 H. P. At the start 12 300-H. P. Babcock & Wilcox boilers will be installed in 6 batteries. The engines will be 4 in number, 2 of 2,000 H. P. each and 2 of 1,000 H. P. The generators will be directly coupled to the engines, 2 of them being of 1,500 K. W. capacity, and 2 of 800 K. W. capacity.

**RECEIVER FOR J. W. FOWLER CAR COMPANY.**

An application was made before Vice-Chancellor Van Fleet in Newark last Thursday for the appointment of a receiver of the J. W. Fowler Car Company, of Elizabeth, N. J. It was stated in the application that the liabilities of the company

would amount to \$130,000, while the assets, including the stock, are estimated at about \$128,000. This includes a large number of mortgages. The application for the receiver was made by the treasurer of the company, with the consent of the officers and stockholders, on the ground of insolvency. John W. Wheelan, of Elizabeth, was appointed the receiver, under a bond of \$15,000.

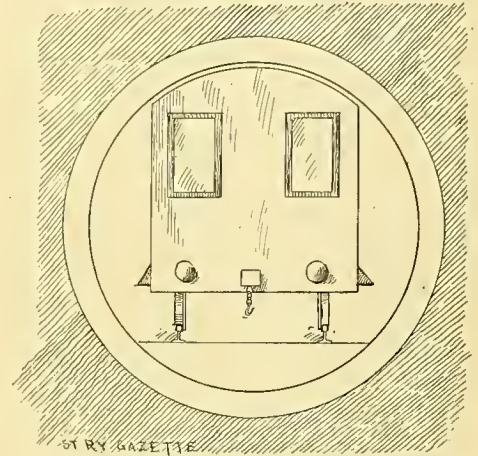
**THE WATERLOO ELECTRIC UNDERGROUND ROAD, LONDON.**

The success of the City & South London Underground Electric Railway has been such that several similar roads are now under consideration. The first railway to be constructed will undoubtedly be the underground electric line which will extend from Waterloo Station, the terminus of the London & Southwestern Railway, on the Surrey side of the Thames, to the Mansion House, on the Middlesex side. There seems to be a very urgent demand for the construction of this road, inasmuch as it will be of very great convenience to the residents of Twickenham, Richmond, Wimbledon any many other suburban places on the London & Southwestern Railway. At the present time the facilities for reaching the heart of the city are very inadequate. The only existing means of reaching the city are: first, to patronize the rather infrequent trains on the Charing Cross & Cannon street line, connecting the latter station with Waterloo; second, to take an omnibus; or third, to cross the river to the Temple station and there board a train on the Metropolitan Underground Railway. This last plan involves a walk of fully half a mile.

It will be seen from the accompanying illustrations that the new line is to be operated in deep tunnels, and in the excavation provision must be made for crossing under the Metropolitan Railway at Queen Victoria street, and also the low level sewers at that point. It is probable that the road will be equipped with electric locomotives, as in

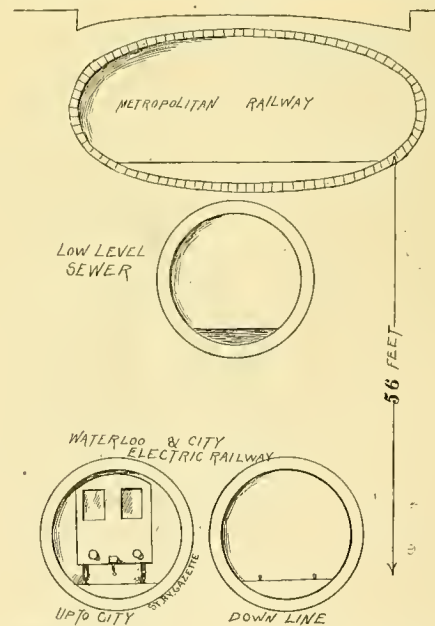
the Victoria embankment on the Middlesex side in front of the City of London School, where the rail level will be 78 feet below the surface of the roadway, and a few yards farther on the railway goes under the Metropolitan Railway and terminates opposite the northeastern corner of the Mansion House. From the indication of the gradients it will be gathered that the railway rises and falls like a switchback road.

There will be an up and a down line, each occupying a separate tunnel, running parallel to



Section of the Waterloo & Mansion House Railway Tunnel.

each other 4 feet apart. Both tunnels will be of cast iron, and where the railway is straight or on a flat curve the internal diameter will be 12 feet, but at points where the curves are sharp the tunnels will be enlarged to 12 feet 9 inches in diameter, so that the long carriages—they will be about the same size as the cars on New York elevated roads—which are to be used, may not strike the sides. Electricity is to be the motive power, and



Relative Depths of Underground Tunnels in London.

it is expected that the railway will be completed in about two and a half years.

The station at the Mansion House will be entirely underground, and passengers will be taken to the surface in hydraulic elevators. The station tunnels will also be of cast iron, built on the Greathead principle, and will be 23 feet in diameter internally.

The strata that will be encountered include clay, gravel and rock, the last being most frequent under the bed of the river. Work was begun last June on the Surrey side of the Thames, near the west side of Blackfriars' Bridge, where a long platform has been erected for the excavation of a tunnel running diagonally under the river.



## QUESTIONS AND ANSWERS.

### ALTERNATING CURRENT AND OHM'S LAW.

Does Ohm's law apply to alternating currents as well as to direct currents?

ANSWER.

Yes, if the *effective* electromotive forces and resistances be taken instead of the impressed electromotive forces and ohmic resistances. In an alternating current the impressed electromotive forces are constantly varying between a maximum positive and a maximum negative value, never being exactly the same at any two successive moments. The *effective* electromotive force at any one moment is the difference between the impressed and the counter electromotive forces at the same moment, and the mean of an alternating current electromotive force is equal to the square root of the mean square of the impressed electromotive forces.

The ohmic resistance of a wire is a given quantity with all values of current and electromotive forces, and is the true resistance of the wire. With alternating currents, however, there is introduced another factor, called "reactance," which varies with the same wire under different conditions of current and relative positions of the outgoing and return wires. This factor, sometimes called the "wattless resistance," acts at right angles to the true ohmic resistance, forming with the latter two sides of a right-angled triangle, whose hypotenuse represents the actual resistance to flow in the circuit. If this value, which will be the square root of the sums of the squares of the ohmic resistance and the reactance, be substituted in Ohm's law for  $R$ , and the square root of the mean square of the impressed electromotive forces be substituted for  $E$ , the adaptation of Ohm's law to periodic currents is complete.

### SHUNT AND COMPOUND WINDING.

What is the difference between shunt and compound winding of a dynamo?

A. S., Paducah, Ky.

ANSWER.

In a shunt-wound machine the fields are excited by coils of fine wire which divert a portion only of the current generated. These coils are purposely of high resistance in order that they may not take too much of the current, for all that they take is diverted from use in the outer circuit. The requisite number of ampere turns for field excitation are obtained by making these coils in many turns. If the demand on the outer circuit be excessive, a "drop" in potential will occur because the magnetism of the field is not by this method of winding increased by this increased demand. To compensate for this drop the device is resorted to of causing the *main* current to pass a few times around the field also. To this end a second coil of a few turns of large wire are put on the fields and these are connected in series with the outer circuit. As the demand for current is increased or decreased, these series coils add more or less magnetism to the fields, and the resultant E. M. F. will therefore vary in the same way. Thus a machine may be "compounded" for any desired loss, viz.: enough series turns may be put on to compensate for any given drop. It may also be wound so that the E. M. F. will actually increase with the load by putting on more turns in the series coil than just sufficient to compensate for the drop. Such a machine is said to be "over-compounded." For further particulars see "Perry's Electric Railway Motors: their Construction, Operation and Maintenance," where this subject is fully discussed with the aid of diagrams.

### BANK BOOKS FOR EMPLOYEES.

On Nov. 1 each employee of the New London (Conn.) Street Railway Company received a copy of the following letter:

The directors of the New London Street Railway Company desire to express to the employees of the company their appreciation of the intelligent and faithful service which has so materially contributed to the success of the company, and to

thank each individual employee for the personal interest shown in the welfare of the company.

In further testimony of existing good will, and in the hope of its continuance, the directors have deposited in the Savings Bank of New London the sum of \$13.50 in your name, and a book for that amount will be given you on application at the bank.

WINTHROP COFFIN, President.

### CONDUIT ELECTRIC RAILWAYS: IS THERE A SOLUTION OF THE PROBLEM?

#### PART IV.

After the paper on "Conduit Electric Railways: Is there a Solution of the Problem?" by Joseph Sachs, which was read at a recent meeting of the New York Electrical Society, and which has been reproduced in the last three issues of the STREET RAILWAY GAZETTE, the following discussion took place:

#### DISCUSSION.

TOWNSEND WOLCOTT: I object to a three-wire system as being inconvenient. If we build a conduit that can stand 220 volts it will be a great deal better to use 220 volts. Now, Mr. Sachs says that he wants to get his voltage as low as possible. Get down below 500 volts, then the two wires in that three-wire system—the two outside wires—would not be much over 500 volts, and it would not be very hard to build a motor that would stand across the two outside wires, and there would be no use for the neutral wire.

Mr. SACHS: I am somewhat hasty, perhaps, in trying to answer Mr. Wolcott right away, but I simply proposed the three-wire system as a possible solution; there is certainly a saving of copper. We have a low voltage between this wire and the structure and between that wire and the structure; but we would certainly have twice this voltage between the two wires themselves. This would be the case if we put both wires in a single conduit, and there would perhaps be no great advantage in that case. In a double-track system, however, there is certainly a big advantage in cost of copper. But I merely proposed the matter.

Mr. WOLCOTT: That is the point I was speaking of. When it is perfectly easy to build a motor to connect to the two outside wires, what advantage there is in using the neutral I do not see. You do not decrease the insulation any by using the neutral wire.

Mr. SACHS: You may not decrease the strain on the insulation between the outside wires, but you decrease the cost of copper when equipping two tracks.

Mr. WOLCOTT: What is the object of using a low voltage to begin with? Is it on account of the trouble of insulation?

Mr. SACHS: You may not perhaps have any very great advantage in using a single conduit with the two outside wires located directly in the conduit, but where we have, for instance, two conduits and simply a single wire in each conduit, as I described, it strikes me that there would not be very much chance of the wires coming together or very much chance of leakage, and then you get the advantage of the lower voltage at a lower cost of copper. I simply offer the suggestion.

Mr. WOLCOTT: As I understand it the only objection in using a low voltage is on account of the difficulty of insulation.

Mr. SACHS: Yes.

Mr. WOLCOTT: I don't see that there is anything to be gained by having the three-wire system. The object of using three wires, as I said before, is to have a low voltage.

Mr. SACHS: The difficulty of using the two-wire system or the high-voltage system is because we cannot make the conduit stand the strain of high voltage. Suppose we have here a 500-volt system and use a single wire and structure return. Now all you would have would be one insulator here to stand the strain of 500 volts.

Mr. WOLCOTT: Yes.

Mr. SACHS: Now in the same conduit let us place two wires and then we have two insulators to stand the 500 volts. Now all there is done in the three-wire system would be that one of these wires would be placed in one conduit, and the other in the other, the conduit forming the neutral. We would now have the same amount of insulation to stand the strain of 500 volts, but the copper formerly used for one track would be used for two. A graphic illustration would be better than a verbal one: there are two conduits (indicating); now, what have we got? Here are two conduits side by side; with a two wire system and double wire we would have four wires in both conduits; with the three-wire system only two. While the voltage between them remains the same the voltage between each and the neutral (the structure) is one-half, and therefore the insulating medium need only be one-half. We thus get a low voltage on each conduit, a lower cost of copper.

ALBERT STETSON: I believe the complete question in reference to a conduit is to persuade business men—men who run railroads for money—that they could get something sufficient to answer their purpose. You can put down an expensive conduit in but few places in this country. Your conduit must be cheap or you cannot put it down. When the car is tied to a cable it is moved cheaper than it is by electricity. That is what I think we have got to face in our work on the underground conduit system. Probably with the increased cost of real estate, with less plant required for the electric traction, the electrical engineer would claim the advantage; but he has simply that margin, in my opinion, to work on. I hope, instead of hearing from those who have worked on it and who have already said a good deal on the subject, to hear from some of those who have new ideas, perhaps have some new system of traction to bring up.

The PRESIDENT: There is one point I think Mr. Stetson is right about. If you expect to find philanthropists among street railway people you will have to travel a long distance. There is one point that has to be borne in mind, and which affects the conduit system, and that is the cost of the track equipment; for in considering the total cost per track mile we must not only take in the track alone, we must take in the total cost of equipment per mile of track. Now the great argument that has been advanced against all electrical systems has been that owing to the cost of electrical machinery in the car, the motor equipment, when you come to take a mile of track equipped with so many cars per mile, the total cost is greater than with the cable system, because, once given a cable system, the car itself costs relatively little.

C. B. FAIRCHILD: The question has been studied quite thoroughly and some of the large electric companies have made designs for an underground system, and one of the companies, which at one time proposed to put in a system here in the city, withdrew from the field. After studying it they realized, they told me, that there was not a demand for it, and that a successful underground system would be a great calamity for the street railway interests of this country, from the fact that if one were adopted every little city throughout the country would demand that all the wires be put underground, and it would run nine-tenths of the street railways of this country if they were compelled to operate under such a system. So it is a question whether such a system is demanded or not. In cities where wires have been put up there is no great objection to them. I am simply quoting—I am not giving my opinion.

In regard to the later systems and the cost, I had the privilege last week of inspecting the drawings that have been provided by the Metropolitan Street Railway Company, of Washington, which company has been obliged to put in the underground system by act of Congress. All the street railways of the District of Columbia are directly under the control of Congress, and Congress passed a bill at the last session requiring them to put in the underground system, as overhead wires were not allowed in the city. They do not allow them to put in a cable and they must put in the underground system, and they are going ahead with the work. The voke is about the same as has been used in Washington on the cable construction—a little heavier perhaps—the conduit is about 25 inches deep and 18 inches wide, and the conductor is the same as illustrated in the General Electric Company's system—4 inch channel iron, 4 inches deep—supported, however, from the top instead of from the bottom. They are to be supported on double corrugated porcelain insulators headed with trunnion bands to provide for expansion. The cost is estimated to be more than the cost of cable construction, and that is a point that I have learned from the engineers. Even the Siemens-Halske Company, who proposed at one time to put in an underground system, told me the estimated cost would be more than the estimated cost of ordinary cable construction. But that depends on the condition of the street. I am asked what is the cost of cable construction. If there are obstructions in the street, as in the case of Broadway and Third avenue, the cost is very large. I suppose neither of those roads was built for less than \$150,000 a mile of single track. I know that is the figure for one of those roads; I will not tell which. Cable construction is now being put down in Washington very cheaply indeed—about \$36,000 per mile single track; steel rails are cheap and cable construction is put down cheaper than ever before; but ordinarily the construction will be from \$60,000 to \$75,000 per mile of single track.

The lecturer did not speak of another of the difficulties that are met with in underground conduit construction; he said very little about the conductors or about the liability to change. In the Halske system they are using an iron conductor. The difficulty with copper, I suppose, has already been touched upon, but it is pretty difficult to provide for the expansion and contraction, and that is a very important fact in connection also with the iron conductor. But I was told the other day in



Washington by a manager of a system there that the temperature varied on their line from below freezing to 145 degrees, so that they were having a great deal of difficulty there with their conductor, so much so that they proposed to employ a copper conductor, angle bar backed by an iron bar. The size of the wire now used by the Love Company is about one-half inch in diameter. Then, again, there are the difficulties of under-running contact. The Love conduit has an under-running trolley and the Siemens-Halske has a side contact.

Now I fear they will have difficulty in the Washington system in using a porcelain insulator. I think it will require some material on which the moisture will not condense as on porcelain; probably mica or something of that kind. The great difficulty in the underground system in this country has been with the moisture that collects and the gas in the conduit. There are very serious difficulties that those of us who have not had actual experience cannot appreciate. I remember in studying the system in Boston, about two years ago, where it was impossible to tell what became of the current. Perhaps the cars would run all day without any difficulty—everything perfectly right; it would begin to run the next day, and then the current would be gone, and they would hunt for an hour or two hours and not find what had become of it, but presently it would be all right and the cars run. I never knew and have never heard an explanation how the current went away. It seemed to go through the gas or moisture that accumulated in the conduit. It is a good conductor; it is different from anything I have ever known. What it is the engineers have never, so far as I know, been able to discover. Then again the moisture in a conduit of that kind is very great. If you have never been down in the cable conduit, or looked into one, or saw a cable come through after making a trip, you will hardly realize the filthy condition of the interior of those conduits, and it is simply impossible to prevent the current from vanishing without increasing the insulation, and there is no economy in that. I might say that you cannot run an economical street railway with a 300 volt current—we must have at least 500 volts—and I find in my travels through the country that the roads run up to 550 and 600 volts.

Now as to the cost. It will cost considerable if you put in a large conduit, 25 inches deep—the Washington conduit is about 25 inches. You have got to provide a strong support for the surface of the street, as you do for cable, and it will require just as heavy and strong a yoke for electrical cars as for cable. In fact it will require a heavier construction to support the electrical cars over the conduit than with the cable, and the cost will be correspondingly great.

(To be continued.)

**BOSTON RAPID TRANSIT.**

The Boston Transit Commission has just published its first official report, which classifies engineering work as follows:

1. Surveys of the route of the subway.
2. Borings to determine the character of the ground.
3. Excavations and measurements to ascertain the depth and character of the foundations of buildings along the line.
4. Excavations and studies to determine the location and sizes of pipes, sewers, etc.
5. Investigations as to the plans to be followed in the reconstruction of these pipes and sewers.
6. Miscellaneous studies and designs of various kinds.

The commission states in regard to work under the sixth head:

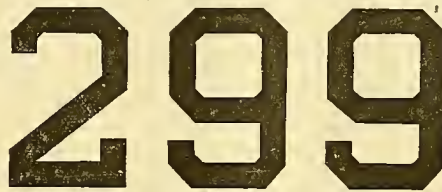
A large amount of miscellaneous work has been done by the engineers. Studies have been made of the dimensions of cars, both on street railroad and steam railroad; studies have also been made and plans prepared showing the routes of electric cars, with number of cars daily and maximum number of cars per hour on each route, for all routes that would be affected by the subway; studies have also been made of the roof of the subway, and different plans prepared for iron and masonry roofs, with estimates of cost for each; the same has been done with regard to the side walls of the subway; studies have also been made and many plans prepared showing different methods of arranging the south entrances to the subway, with estimates of cost of each.

The engineering work is progressing with thoroughness and as rapidly as is consistent with accuracy.

**Hestonville Earnings.**—On Sunday last the earnings of the Hestonville (Philadelphia) road averaged \$27 per car. With animal power the earnings averaged \$7 less.

**INTERNATIONAL STATIONARY REGISTER.**

In the accompanying cut is illustrated a numeral disc stationary fare register, which has been recently perfected by the International Register Company, of Chicago. In the manufacture of this device the company has not made any experiment, as it is practically an exact reproduction of its well known Pratt portable register, which for years has given great satisfaction on many roads. The new register is simple and substantial in construction. The machine is a double register of a numeral disc design, having a tally or permanent register with a capacity of 100,000 fares, and a trip or changeable register with a capacity of 299 fares, the latter capable of being returned to zero. The permanent register is composed of a series of five wheels or dials arranged in a horizontal row across the face. The figures on these dials are large and plain, and easily distinguished at a distance. The method of constructing this permanent register is entirely new. It is made entirely of machine-cut gears,



Exact Size of Register Figures.

without any springs or pawls whatever. Each wheel is rigid, or permanent, and all are dependent on the first or unit wheel for movement. This unit wheel is protected by safety dogs in such a manner as to be movable only by pulling the cord and actuating the whole mechanism of the register. Thus, if the glass over the dial should be broken, or access gained to the whole mechanism, it is impossible to change the reading of the tally, backward or forward, even though the whole mechanism is exposed. The great value of such an arrangement is apparent, as it overcomes the possibility of tampering with the total record, which is the most important part of a fare register.

The trip register is composed of three large revol-

With large, plain figures like these the trip register can be read at a glance. At the end of the trip or run these trip dials are returned to zero (00) by pushing in the handle on the left and turning it to the left. With this operation a red curtain will be thrown into the trip window, remaining there until the register is entirely reset. This shows that the other mechanism of the register is locked and cannot be operated until the red curtain disappears.

The register has a stroke five inches long, which obviates the practice of ringing up a number of fares in such quick succession as to make it almost impossible to tell how many fares were actually recorded by counting the vibrations of the bell. Such a long, easy stroke is considered preferable, as it will also prevent passengers from ringing up fares when meaning to signal the conductor, as the register will not operate with a short, quick pull. As in the standard stationary machine manufactured by this company, satin finished aluminum dials are used. The size of this new register is 10 1/4 inches in diameter and 4 3/8 inches thick, including the back part and actuating mechanism. It is made to be operated with the regulation cords and pulleys, or with rod and handles running lengthwise of the car.

The cases are finished in either nickel, antique bronze, lacquered brass or steel blue electroplating. The manufacturers recommend the latter as being the most durable, as well as making the greatest contrast with the white aluminum dials, and thus make the latter stand out plainly.

**MARVELOUS UNDERGROUND SYSTEMS.**

Enthusiasts who believe that a beginning has just been made in the electrical field are not all dead yet, although the electrical press insists very properly that all persons who publicly remark that electricity is still in its infancy should be promptly killed off. The *Mail and Express* of New York has recently found a man who is predicting wonders in electric railway invention as follows:

It is my opinion that the overhead trolley will be a thing of the past within the next five years. There are two electricians at work on a plan in this city now—the exact nature of which I am not at liberty to state—that will revolutionize the present methods entirely. It will be as great an



INTERNATIONAL REGISTER.

ing discs, the figures on which are seen through the aperture to the left of the center. In making this part of the register the manufacturers claim to have produced something plainer, larger and more easily read than anything heretofore attempted. The figures on these trip dials are full inch high and five-eighths of an inch wide, as shown by the accompanying cut, which is the exact size.

improvement, too, over the Budapest underground trolley system as that system is over the mid-air wire, or the mid-air wire is over the horse car. We have not passed the infancy stage in electricity. Its possibilities are absolutely limitless, and the growing generation will live to see the day when it will take the place of steam as a motive power on the sea as well as on the land. The electric steamship is as sure to come as to-morrow's sun.



## CANADIAN NOTES.

(From our Special Ottawa Correspondent.)

**Toronto, Ont.**—An application has been made by the Toronto & Suburban Railway for a franchise for the extension of its system westward to Lambton and Islington along Dundas street. If the application is successful work will be started immediately.

**Vancouver, B. C.**—Rumors that the property of the Vancouver (B. C.) Street Railway Electric Lighting Company has been sold to an English syndicate are confirmed. All employees have received notice of dismissal, as the new company intends to completely reorganize the staff.

**Ottawa, Ont.**—From Ottawa to Aylmer by electric cars by way of Hintonburg, Shad's Mills and Britannia, crossing the Ottawa River at Deschene Rapids on a bridge that is to cost \$150,000, is the move the Canadian Pacific Railway and the Ottawa Electric Railway have combined in. H. B. Spencer, assistant superintendent of the C. P. R., and Mr. Ahearn, manager of the Ottawa Electric Railway, admitted that the scheme was under contemplation and would be begun soon.

**Hamilton, Ont.**—One of the most extensive electric railway schemes yet contemplated in Canada is the Hamilton Radial Electric Railway. The intention is to build a network of railroads, steam and electric, radiating from Hamilton and connecting with the more important cities and towns of Western Ontario. It is intended to build a first-class road and connect at Woodstock, Toronto and other points with the Canadian Pacific Railway. The electric part of the system will likely be the lines to Berlin and Guelph, and on these the construction will be fully up to the first-class steam railway requirements. The Niagara Falls branch will be continued to Buffalo.

## NEWS OF THE WEEK.

**Duluth, Minn.**—The street car barn at Woodland was burned recently. The loss was about \$3,500.

**Crawfordsville, Ind.**—The contract for building the Anderson & Marion Electric Railway has been awarded to C. E. Loss & Company, of Chicago, for \$525,000.

**Poughkeepsie, N. Y.**—The formal opening of the Wappingers Falls branch of the Poughkeepsie & Wappingers Falls Electric Railroad Company took place last week.

**Pottstown, Pa.**—Chief Burgess W. H. Eck has vetoed the ordinance giving to the Citizens Passenger Railway Company the right to build tracks on several streets.

**Hoboken, N. J.**—The stockholders of the Bergen Turnpike Company have passed resolutions authorizing the directors to issue bonds to build a trolley road from Hackensack to Hoboken.

**Boston, Mass.**—The West End Street Railway Company has ordered over 50 new car equipments, which will be furnished equally by the General Electric Company and the Westinghouse Company.

**Fall River, Mass.**—The Globe Street Railway Company has made its annual distribution of \$400 in gold to such of its employees as have distinguished themselves by meritorious service during the year.

**Binghamton, N. Y.**—J. P. E. Clark, who is at the head of the enterprise to build an electric railway to Union, announces that operations on the line will be commenced next spring and will be rapidly pushed to completion.

**Kansas City, Mo.**—President Kohler of the Kansas City Traction Company has denied the rumor that the Metropolitan Street Railway Company has purchased a controlling interest in the Kansas City Traction Company.

**New Orleans, La.**—The New Orleans Traction Company has fitted up reading-rooms for its employees at three of its barns. The rooms are comfortably and attractively furnished. Books and papers are supplied in abundance.

**St. Louis, Mo.**—The car barn of the East St. Louis Electric Railroad Company was almost entirely consumed by fire last week. The total loss was about \$30,000. It is stated that the fire was caused by an explosion in a car heater.

**Watertown, N. Y.**—It is announced that the Watertown & Boonville Street Railway Company has been victimized to the amount of \$7,200 within the last two years by receiving bogus tickets, which it is believed have been printed and sold in the city.

**Brooklyn, N. Y.**—Judge Clement in the City Court, has decided that the Nassau Electric Railroad Company has no right to lay tracks in Marcy avenue, as he finds it has failed to get the necessary consents of property-owners. The company will appeal.

**Holyoke, Mass.**—The Chicopee aldermen have granted the Holyoke Street Railway Company per-

mission to make several extensions, so that the construction of an electric railroad from the foot of Mount Tom to Forest Park in Springfield is said to be assured.

**San Francisco.**—A cable car on the Hyde Street line was wrecked on Nov. 28 while going down a steep hill and 12 passengers were injured, some seriously, though none fatally. Railway men say that the accident was caused by boys putting a bolt in the cable slot.

**Tiffin, O.**—It is stated that the electric railway between Tiffin and Fostoria will be completed at once. The franchises have been changed to suit the projectors of the company, and it is now stated that there will be no difficulty in raising the necessary money.

**New Britain, Conn.**—The contract for grading and filling in the new line to Berlin has been awarded by the Central Railway & Electric Company to Redfield & Sons, of New Haven. The contract for paving and laying has been let to Fred Lay, of Springfield, Mass.

**Baltimore, Md.**—It is stated that the work of converting the Gilmor Street cable line into an electric road will be completed during this month. President Brown has estimated that the company will save from twenty to thirty thousand dollars a year in operating expenses when this change is made.

**New York, N. Y.**—At the last meeting of the Rapid Transit Commission a certified copy of the vote cast at the last election upon the matter of municipal construction of a rapid transit system was received. There were 184,035 votes cast, of which 132,647 were in favor of rapid transit, 42,916 against, 399 defective and 8,073 blank.

**Brooklyn, N. Y.**—A test of a new fender invented by James Carey and David Hatlee, of Schenectady, was made on the Smith street line of the Brooklyn Heights road this week. The inventor, in order to demonstrate the practical working of the fender, allowed the fender to strike him while the car was in motion. It picked him up successfully twice.

**Philadelphia, Pa.**—Mr. John A. Brill has filed a bill in equity against the Hestonville, Mantua and Fairmont Passenger Railway Company, charging infringement on four patented improvements. The patented improvements are in trucks for electric motors; in means for supporting motors in electric locomotives; in car trucks, and in railway cars.

**Oshkosh, Wis.**—The work has been begun on the Oshkosh electric street railway, for which a franchise was granted to J. K. Tillotson, of Toledo, O. The franchise provides that eight miles must be completed within four months and 20 miles before January 1st, 1896. A stock company, with a capital of \$1,000,000, is being organized to construct this line and also a line from Oshkosh to Kaukauna.

**Philadelphia, Pa.**—Nelson C. and Virginius F. Graves have commenced a suit against the Diamond Street Omnibus Company and James L. Stevenson, former president. It is alleged that the company is insolvent and a receiver is asked for. A preliminary injunction has been granted restraining Mr. Stevenson from filing a judgment note for \$35,000, which the directors authorized to be given to him to cover money alleged to have been advanced to the company.

**Brooklyn, N. Y.**—The Board of Aldermen has adopted a resolution providing that all electric cars must be equipped with fenders of a style that shall be satisfactory to a committee of seven, three to be appointed by the president of the board, three by the street railway companies and the seventh by the other appointees. A penalty of \$50 is provided for violations of the ordinance. The resolution also provides that open cars must not be operated when the temperature is lower than 60 degrees.

**New York, N. Y.**—The Columbus avenue cable line will be in regular operation within a few days. The cable runs from Fiftieth street and Sixth avenue to Seventh avenue, and then parallels the Broadway cable to Fifty-third street, where it makes a turn into Ninth avenue and continues to Ninety-eighth street. The length of the cable to be operated is 31,800 feet. The rope is operated from the Fifty-first street power station, and two additional driving drums have been mounted on the main shaft in the power plant.

**Fall River, Mass.**—The Fall River Street Railway Company has been organized, and the stockholders will subscribe \$50,000 if a franchise is granted. The syndicate is composed of local men. The directors are Wendell E. Turner, Arnold B. Sanford, Albert S. Dow, Herbert Field, James E. Osborne, Frank M. Shove and Michael T. Hudner. They have signed articles of agreement for the construction and operation of an electric road to run from Pleasant street across Twelfth, up Robeson street to St. Patrick's cemetery on Highland road. The route, as laid out, will be about three miles long, and will be extended according to demands of the traveling public.

**Watkins, N. Y.**—A project is well under way to construct an electric railway between Watkins and Havana. The articles of incorporation have been made out and a portion of the necessary property right has been secured. The principal incorporators are the Hon. W. H. Wait, the Hon. O. P. Hurd, L. H. Durland and C. S. Frost, of Watkins; Gen. John E. Mulford and Dr. C. D. Clawson, of Havana, and C. L. Hathaway and C. H. Baldwin, of Chemung County. The incorporation will be known as the Watkins & Havana Railroad Company and its capital stock will be \$50,000. It is probable that when the Watkins & Havana road is completed it will soon be extended to Horseheads and Elmira.

**Islip, L. I.**—Application has been made to the Islip Town Board by a syndicate composed of the Austral Hotel Company and the Electrical Construction Company of New York for a franchise to run a trolley line from Brentwood, southward to Bay Shore, and thence to the westerly boundary line of the town. If the franchise is granted a similar application will be made to the Babylon officials. The road will be less than 10 miles in length, but will be the means of connecting the middle section of the island with the south shore. It is thought that the road may be the means of making Brentwood a winter resort. The company will be incorporated with a capital stock of \$100,000. It expects to complete the road before Dec. 1, 1896. The Town Board has practically agreed to grant the franchise at its next meeting, and work on the road will begin in January. Stations will be put up at points along the line.

## NEW INCORPORATIONS.

**Carlisle, Pa.**—The Greensburg, Jeannette & Pittsburgh Street Railway Company has been incorporated with a capital stock of \$150,000. The promoters are W. F. Sadler, A. A. Thomson, W. F. Sadler, Jr., of Carlisle, Pa.

**De Land, Fla.**—The De Land Electric Railroad and Power Company has been incorporated with a capital stock of \$300,000. The promoters are John B. Stetson, Theodore Search, Philadelphia, Pa.; John F. Forbes, of De Land, Fla.

**Portland, Me.**—The Portland & Yarmouth Railway Company has been organized. Edward S. Perry, of New Haven, Conn., is president of the company, and James O. May, of Naugatuck, Conn., treasurer. The new line will be an electric road and it will be immediately surveyed.

**Ravenna, O.**—The Ravenna Electric Street Railway and Power Company has been incorporated with a capital stock of \$50,000 to operate electric railways within the limits of Portage County, O., and elsewhere, and furnish electric power, light, heat, etc. The promoters are Geo. H. Worthington, Wm. J. Akers, Geo. W. Gardner, J. H. Evans, R. B. Carnahan.

**Corning, N. Y.**—The Corning and Painted Post Street Railway Company has been incorporated to construct a street surface road about five miles in length to be operated by electricity. The capital is \$100,000, and the directors are Edward W. Shedd, William H. Tylee, of Worcester, Mass.; H. A. Clark, Caleb L. B. Tylee, Frank H. Viele, John L. Miller, Edwin J. Carpenter and Morris E. Gregory, of Corning; and John W. Clark, of Waverly.

**Batavia, N. Y.**—The Batavia & Northern Railroad Company has been incorporated to construct a railroad 18 miles long, to be operated by steam or electricity, between Albion, Orleans County, and Batavia, in Genesee County. The capital is \$352,000, and the directors are George A. Wingate, Jacob Cole and William H. Hazzard, of Brooklyn; Robert Avery and James H. Cox, of New York city; Ernest Wende, of Buffalo; Oren C. Steele and David D. Lent, of Batavia, and Dwight S. Beckwith, of Albion. The principal office of the company will be in Brooklyn.

## PERSONALS.

**Mr. Charles E. Newton**, of the Jewell Belting Company, of Hartford, Conn., was in New York this week.

**Mr. J. H. Graham**, of the Graham Equipment Company, of Providence, R. I., was in New York this week.

**Mr. James M. Price**, of the Price Railway Appliance Company, of Philadelphia, was in New York this week.

**Mr. Frank X. Cicott**, manager of the railway department of the Pettengill-Andrews Company, of Boston, sailed for England on the *Lucania* last Saturday.

**Mr. F. L. Hart** has been appointed chief engineer of the Baltimore City Passenger Railway Company. Mr. Hart has been connected with the operating departments of the Third Avenue Railway Company and the Metropolitan Traction Company, of New York City.



TRADE NOTES.

Westinghouse, Church, Kerr & Co. have removed their New England office from 620 Atlantic avenue to Exchange Building, 53 State street, Boston.

The Western Electric Company, of New York city, has been appointed wholesale agent for the sale of hot-pressed steel pinions manufactured by the United States Projectile Company, of Brooklyn.

The Sargent Company, of Chicago, has just issued an unusually attractive little pamphlet entitled "The Wheel, the Rail, and the Shoe." Some interesting information on brake shoes in general and the Sargent tire-dressing brake shoe in particular is presented.

W. P. Seguire, of the Frost Veneer Seating Company, New York, recently invented a new waterproof and heatproof glue, which it is thought will prove valuable in the construction of cars and in many other industries. The right to use the glue for veneer has been secured by the Frost Company, but it is stated that the rights for its use in other industries have not been disposed of.

The Safety Car Heating and Lighting Company, of New York, recently equipped 80 cars of the Columbus Street Railway Company with its system of illumination by Pintsch gas. While this system has become popular on steam roads and cable lines, this is the first application of gas

for the lighting of electric cars. It is stated that the new illuminant gives the very best of satisfaction.

The R. A. Crawford Manufacturing Company, of Pittsburg, Pa., recently received an order from New Orleans for 66 of its patent pick-up car fenders. Orders have also been received for the equipment of the cars of the Paterson Central Railway Company, of Paterson, N. J., and those of the McKeesport & Wilmerding Street Railway Company, of McKeesport, Pa., and the Paterson Railway Company.

The Penn Bridge Company, of Beaver Falls, Pa., is constructing a new bridge across the Monongahela at Glenwood, Pa., for the Second Avenue Traction Company, of Pittsburgh. The bridge, which will form a new line to Homestead and McKeesport, has a center span of 520 feet and two spans 300 feet each, in addition to the approaches on each side of the river. The same company is building a five-span bridge for the Wilkes Barre & Wyoming Valley Traction Company.

J. H. Bickford, of Salem, Mass., is now constructing nine miles of electric railway between Long Island City and Flushing, N. Y. The road, which will extend through the villages of Woodville, Winfield, Newtown and Corona, will be double-tracked as far as Newtown village. For about one and one-half miles after the road leaves the village of Corona it passes over a trestlework structure. The power to operate the line will be furnished by the Steinway Railway Company,

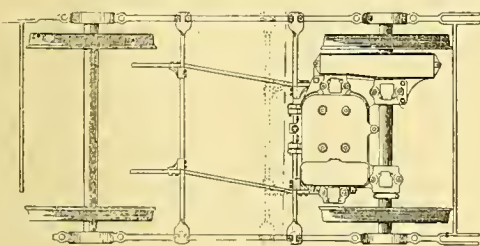
Astoria, L. I. Mr. Bickford is also constructing the Manchester (N. H.) Street Railway, which comprises about 15 miles of line.

The McGuire Manufacturing Company, of Chicago, has recently received a large number of orders for its trucks, and the business shows signs of great improvement. Among the recent orders are the following: Consolidated Traction Company, Jersey City, 22 Columbian trucks and 117 of its Columbia A1 S; Norwalk Street Railway Company, Norwalk, Conn., 13 Columbian trucks; American Car Company, St. Louis, Mo., 12 adjustable traction trucks; Augusta Street Railway Company, Augusta, Ga., 10 A1 suspension trucks; Allegheny Traction Company, Pittsburgh, Pa., 10 A1 suspension trucks (being a duplicate order); Consolidated Electric Railway Company, Los Angeles, Cal., 40 A1 suspension bicycle trucks; the Chicago City Railway Company, 60 Columbia trucks; Northeast Street Railway, Kansas City, Mo., 10 Columbian trucks; and the Inter-County Street Railway Company, 7 trucks, 1 Columbian truck for export, 1 A1 suspension, Walker Manufacturing Company, 6 A1 suspension trucks; Citizens' Street Railway Company, Memphis, Tenn.; Toledo Consolidated Street Railway Company, Toledo, O., 2 combination track sweepers and snowplows; Citizens' Street Railway Company, Indianapolis, Ind., 2 combination snowplows; and the La Crosse City Railway Company, La Crosse, 1 combination snowplow. It also reports orders for nearly 700 heaters for the month of October.

RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Nov. 27, 1894.

529,688. Means for Supporting Motors in Electric Locomotives; Walter S. Adams, Philadelphia, Pa., Assignor to John A. Brill, same place. Filed Nov. 9, 1893. There is a separate motor suspension frame



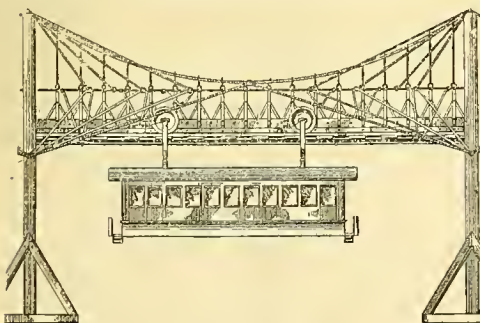
No. 529,688.

with longitudinal bars included, which is suspended between the side bars and wheels of the truck, extending longitudinally of the truck, and has its sole support on the side bars. The motor is supported at one end by one of the axles of the truck, the motor and its separate frame being connected at a point within the outer limit of the motor or its casing, so that the major portion of the weight may be taken upon the ends of said longitudinal bars, and the truck axle relieved therefrom. (See illustration.)

529,704. Closed Conduit Electric Railway; Charles G. Burke, Brooklyn, N. Y. Filed Feb. 10, 1894. The car motors receive current from the line of rails. Contact terminals in a conduit beneath the track are connected at intervals with the rails. Insulated movable terminals are connected at intervals with an insulated supply conductor in the conduit and extend through openings into a lower chamber in the conduit. An arm extends from a car into this lower compartment, and here are a series of levers with which the arm engages and which are adapted to raise the terminals successively upward into contact with those connected with the rails. A spring acts on an arm and tends to raise it from the conduit.

529,723. Car Heater; Egbert H. Gold, Chicago, Ill. Filed June 1, 1894. This storage car heater comprises an outer shell having a steam inlet and an outlet, an internal storage tube and a filling of clay or terra cotta for the internal tube.

529,726. Street Car Fender; Henry Grieser, St. Louis, Mo., Assignor of two-thirds to Charles L. Hood and Charles B. Tomlinson, same place. Filed April 4,



No. 529,749.

1894. Angle plates are fixed to and extend downwardly from a car platform, angle arms being fulcrumed in the angle plates and an apron being hinged to the forward ends of the angle arms. Yielding pressure devices are interposed between the angle arms and apron, a ratchet bar being pivotally connected to the apron

and adapted for engagement with one of the angle plates. A chain is fixed to the apron and is adapted for attachment to one of the remaining angle plates.

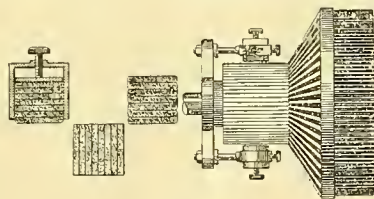
529,747. Metallic Pavement; Esprit Perrody, Geneva, Switzerland. Filed March 16, 1894. Patented in Belgium Nov. 24, 1893, No. 107,532; in England Dec. 2, 1893, No. 23,180; in Italy Dec. 13, 1893, LXIX., 216, and in France Jan. 29, 1894, No. 289,740. The metallic pavement is illustrated elsewhere in this issue.

529,749. Elevated Railway; Albert St. J. Pickett, Delaware, O. Filed Nov. 15, 1893. A suspension cable passes over the top of upright frame. A track is suspended from the cable, and side bracing cables pass around the outer sides of the towers and are connected between the towers to the central point of each span of the cable. (See illustration.)

529,782. Commutator Brush for Dynamos; George Ferbes, London, England. Filed Aug. 8, 1892. Renewed April 14, 1894. The brush consists of flexible or fibrous material, such as cloth made into an electrical conductor. (See illustration.)

529,797. Closed Conduit for Electric Railways; Frederick L. King, Chicago, Ill. Filed Jan. 15, 1894. In a conduit for enclosing the conductors of electric railways, a hinged cover is provided with journal boxes open on one side, in combination with the journals suitably supported and adapted to such boxes. (See illustration.)

529,803. Fare Register; Albert Pfaff, Dayton, O. Filed May 21, 1894. The trip registering wheels are pro-



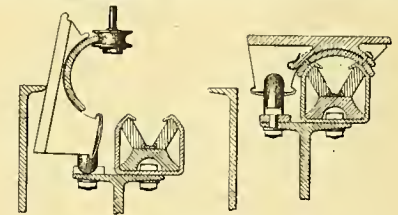
No. 529,784.

vided each with a tooth on its inner rim, ratchet wheels being fixed to the face of these wheels. A series of pawls composed of two members is adapted to rotate the trip registering wheels in one direction, and to yield when the wheels are rotated to indicate the fares. A pawl provided with a plurality of teeth is adapted to engage with the ratchet wheels on the trip registering wheels, and there is a slide to which the pawl is immediately pivoted. A spring between the shank of the pawl and the slide exerts pressure to maintain the pawl in normal engagement with the ratchet wheels, a bell crank being provided for actuating said slide.

529,829. Trolley Wheel; Fredrick Lapper and William Wighton, Toronto, Can. Filed Sept. 27, 1893. The trolley wheel comprises the body portion having an exterior wire receiving groove, and a chamber divided by integral radial walls or ridges into a plurality of segments. The walls extend from the interior projection of the groove, and are tapered upon opposite sides toward the center of the wheel, the tapers extending upon both sides from the peripheral edge of the walls to the central point and at right angles to the axis of the wheel. A hollow bushing is in the center of the wheel, with radial openings opposite the points of the walls and in the same radial line. The points extend into close proximity to the openings, and a tube is seated in an opening in the side of the wheel, having a plurality of openings near its rear end. A rubber ball valve is arranged in said tube and is adapted to be seated against the partially closed outer end thereof, the spring bearing against the ball and at its inner end supported by one of the ridges against which also the tube rests at its inner end.

529,836. Conduit Electric Railway; Leonidas C. Pressley, San Francisco, Cal. Filed Feb. 6, 1894. The trolley rails extend within a conduit, and are made in sections insulated from each other. A conducting wire

extends parallel with the line of track in a sealed insulated channel, and electromagnets, one of which is fixed to the trolley rail and the other to the rod are provided, whereby the sections of the trolley rail are charged successively from the wire while the car is



No. 529,797.

passing and the current cut off therefrom after the car has passed. (See illustration.)

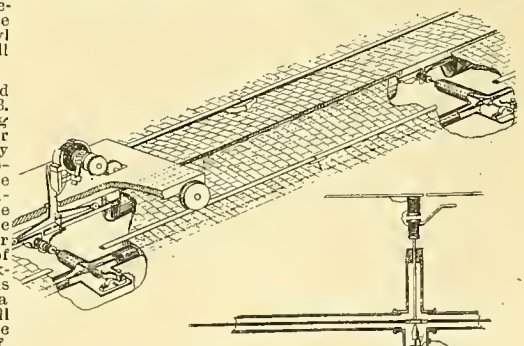
529,897. Brake-shoe; Edward Cliff, Newark, N. J. Filed July 2, 1894. The brake-shoe has a case formed integral with the fastening lug, projections extending from the inner side of the case toward and to the bearing surface of the shoe. Perforations extend longitudinally through the projections, and a filing of metal differing from that of the case between the projections extends to the bearing surface of the shoe.

529,903. Trolley-wire Support and Coupling; Aaron P. Gould, Canton, Ohio. Filed March 7, 1894. The body portion support has at its lower edge a projecting ledge, the cap having elongated apertures, and the binding screws.

529,920. Signal for Cable Railways; Gottfried F. Klafky and Frank Pallinowsky, New York, N. Y. Filed May 8, 1894. The electric circuit includes a signal and a circuit controller fixed within the circuit. A flat spring covers the controller and means are carried by the car and adapted to be set from the car to press upon the spring and operate the controller.

530,033. Supply System for Electric Railways; Zebulon Foster, Chicago, Ill. Filed March 7, 1894. The line conductor has a series of branches. A conductor made up of independent sections is arranged adjacent to the terminals of the branches. Contact blocks, fastening devices to automatically lock the sections in circuit, and an automatic means for releasing the locking mechanism are provided.

530,067. Street-Car Register; Ephron Catlin and Gustavus Rein, St. Louis, Mo., assignor to the St. Louis Register Company, same place. Filed Dec. 11, 1893.



No. 529,836.

This is the combination with the trip register, and a resetting mechanism comprising rotary devices for turning the trip register, of a catch independent of said rotary devices, and acting to lock said mechanism against retraction.



## FINANCIAL NOTES.

**Improvements in the Manhattan Elevated.**—Russell Sage is authority for the statement that the Manhattan Elevated road intends to improve its service by constructing several crosstown branches. An improvement of this sort is certainly urgently demanded by the public.

**Newton (Mass.) Street Railway Report.**—The following figures are taken from the annual report of the Newton Street Railway Company: Gross income, \$70,759.93; operating expenses, \$47,033.07; net income, \$23,726.87; net income after all deductions, \$14,173.62; total number of passengers carried, 1,381,359.

**Schenectady Street Railway.**—The United States Circuit Court has made a decree to the effect that the property of the Schenectady Street Railway Company will be sold at auction in Schenectady on January 3. Included in the assets of the company are 797 shares of the capital stock of the Schenectady Illuminating Company and 658 shares of the stock of the Schenectady Gas Light Company.

**West Chicago Earnings.**—While he was in Philadelphia recently, Mr. Yerkes, president of the West Chicago Street Railroad Company, was interviewed in regard to that company's prospects. He stated that the earnings were steadily increasing while operating expenses were being reduced whenever possible. He predicted a large saving in operating expenses when the electric system, which the company is introducing, has been installed.

**Russell Sage on Elevated Roads.**—Russell Sage does not share, in P. A. B. Widener's opinion of elevated roads, a synopsis of which was presented in the last issue. He says: "The criticism of the president of the Philadelphia Traction Company, that, in his opinion, the elevated roads have reached the height of their popularity, is absurd on the face of it. The Manhattan Elevated Railroad since September has carried more passengers than it had any idea of doing. Why, only the other day we carried 700,000. and how can any surface road carry that number without a delay?"

**Pooling Suggested in St. Louis.**—A coming movement of the utmost importance is now being eagerly discussed sub rosa. Capitalists who have recently visited St. Louis and those resident here have freely canvassed the situation and there is a strong belief that a partial combination or pooling of the street car companies to an extent that will not invalidate their charters, is imminent. This is not a matter that can be passed on off-hand. The first impulse would be to condemn such a proceeding as in the nature of a trust, and against the interests of the community at large, but a calm survey of the field will largely dispel any such feeling.—*St. Louis Star Sayings.*

**Street Railway Financiering in Colorado.**—At last we are to have an end of the street railway. The old ties are being dug up by the city and used for fuel at the jail. It ought to be a lesson to the city council not to donate the use of the streets to a gang of irresponsible sharks for a visionary scheme to beat somebody not acquainted with it. The so-called company got the work done on credit and beat the men out of their pay; got some old second-hand material on credit, and never paid for it, with the intention of unloading on some tenderfoot or selling bonds on the concern and pocketing the proceeds. They never made anything out of it, but the experiment did not cost them anything.—*Boulder (Colo.) News.*

**Receiver Appointed in Dubuque.**—Judge Shiras, of the United States Court in Dubuque, Ia., has appointed John Balch receiver for the Dubuque Light and Traction Company on the petition of the Old Colony Trust Company of Boston. This system of street railway has been a subject of litigation much of the time since its birth. The road is 13 miles in length, and the company operates 21 cars. The officers are: President, G. K. Wheeler; vice-president, W. J. Ballard; secretary and general manager, A. W. McLimont. This company was organized May 31, 1893, by the Boston creditors of the Dubuque Electric Railway, Light and Power Company, organized in 1890, and took the property out of a receiver's hands. Its floating debt is only \$5,000, but with a capital of \$600,000 and bonded debt of \$385,000, the latter representing the construction account, it has earned only \$1,000 in excess of operating expenses. A receiver's sale is now probable as the only means of giving the bondholders any return, as it is an-

nounced the Dubuque Street Railway Company, which has the better right of way, declines to consolidate.

**Rumored Consolidation of Cable and Elevated in New York.**—Hitherto the feeling between the elevated and cable systems has been of decidedly hostile nature. The managers of the former have viewed with increasing alarm the roads made upon its patronage by the cable roads. The adoption by the city of a rapid-transit system of its own was a sad blow to the capitalists of the existing systems, and drew them closer together. From this time forward it is believed by many that they will stand together as against the city's scheme. William C. Whitney, it is said, expects to sail for Europe this week to be gone for some time, and no important steps looking to consolidation will be made until he returns. In the meantime, however, any legislation necessary for an amalgamation of the two systems will be asked at Albany. Just what that legislation will be the directing powers of the two systems are not inclined to discuss, but it is likely to heighten the interest in the next session of the legislature. Already, it is alleged, the surface, or Whitney interests, are saying pleasant things to the senators and assemblymen, and have done their best to impress them with the justice of protecting the existing roads.—*New York Tribune.*

**Sale of Kansas City Northeast Road.**—Judge Henry has granted the application made in the name of the Jarvis-Conklin Mortgage Trust Company, trustee, by directors, of the New England Loan and Trust Company, trustee for debenture holders, for a decree providing for the sale of the Northeast Street Railway. The decree gives judgment against the company for \$292,702.50, with interest from date at 6 per cent., and provides that unless the same is paid within 30 days that special execution shall issue, commanding the sheriff to sell, after advertising 60 days, all of the property of the company to satisfy the judgment. Gardiner Lathrop, trustee, Witten McDonald, the largest creditor of the company, and other creditors were made defendants. The first mortgage bonds, for which the decree is granted, were deposited by the Jarvis-Conklin Company with the New England Company to secure debentures. The road is in the hands of Robert Gilham, receiver. It was constructed in the spring of 1890, and equipped with cars made at Centropolis. These were recently replaced by new cars and heavy electric equipment, which was burned on the 5th ult. The business of the road has improved rapidly during the last few weeks, and the owners were negotiating a sale of the property to Eastern parties, who recently inspected it.

**General Railway, Chicago.**—The annual meeting of the Chicago General Railway Company was held last week. The stockholders of this company and of the West & South Towns Railway Company are the same, and the road constructed by the latter company on West Twenty-second street, Chicago, is operated under a lease by the former company. The stockholders of the General company voted that the company issue \$10,000,000 of 6 per cent. first-mortgage bonds, the directors to determine the time of maturity, denomination and interest. The report to stockholders showed that 140,147 miles had been run by the company's cars from May 1 to Oct. 31, 1894, inclusive. Six hundred and fifteen thousand and twenty-four passengers had been carried. The cost of operating per car per mile was 10.8 cents. To carry the traffic of the road during May and June five cars were used. In July, August and September seven cars were operated. During the first two months three miles of double track were in operation and another mile was added in July. At the time of the report the double track had been extended five and one-half miles. The meeting adjourned to the second Monday in January, to which date the annual meeting is transferred from the third Monday in August. The General company is building a large power plant, car house and repair shop at Kedzie avenue and Thirty-first street. It has a capacity for 125 cars and for engines aggregating 2,400 H. P.

**Alley L (Chicago) Minority Stockholders.**—A meeting of minority stockholders of the South Side Rapid Transit Company, Chicago, was recently held at which a report was presented by a committee composed of Henry W. Leman, A. W. Wheeler, James A. Fullenweider and Edward S. Hunt, appointed some weeks ago to make an investigation into the affairs of the company and its relations with the Chicago City Railway

Company. There was an attendance of about 100. The report was a most exhaustive one, reviewing in detail the history of the road from the beginning up to the present time. In some respects it was highly sensational. The committee argued that the transfer of the controlling interest in the stock of the Alley "L" road by the Construction Company to the City Railway Company, which was afterward distributed among the stockholders of the latter corporation, in the form of an extra dividend, was clearly illegal, and that the City Railway people and the construction company could be made to account for such transaction in the courts. The committee further stated that from the best information obtainable it inclined to the opinion that the present board of directors of the Alley "L," or a majority of them, are persons whose interests are largely identified with the City Railway Company, and recommends that steps be taken to secure for the minority stockholders representation on the board. In accordance with these recommendations a resolution was adopted providing for "the appointment of a permanent committee of organization, which shall prosecute all claims of the company, attend to any business delegated to them, take such proceedings against the former officers of the Alley "L" and City railway companies as the stockholders wish, and to select candidates to be presented at the annual election in January. This committee is to represent the minority stockholders."

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# Street Railway Gazette.

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**Loop for Chicago Elevated Roads.** It now seems more than probable that a downtown loop will be provided for Chicago elevated roads. As it is stated in an article that appears elsewhere in this issue, the companies, and the property-owners who have hitherto been opposed to the building of an elevated structure in the business center, have about agreed upon a plan for a loop to be used in common by the lines now in operation as well as those not yet completed. If the project is executed the elevated roads, which have up to the present failed to yield income enough for operating expenses and fixed charges, as the termini are so far from the business center, will at once draw patronage from the surface lines, and will doubtless be put on a paying basis.

**New Brooklyn Bridge Terminal Station.** The cable railway on the Brooklyn Bridge carried almost 42,000,000 passengers last year, and its facilities are now taxed to the utmost. The traffic is increasing, and to accommodate the public the improvements which are now in progress are urgently demanded. A good idea of one of the new terminal stations now building with this end in view may be gained from an illustrated article which we present elsewhere in this issue. As a station for the accommodation of purely urban business it cannot probably be equaled anywhere.

**Better Brakes Needed.** Another disastrous accident in one of the Chicago tunnels serves to emphasize the fact that on roads where heavy grades are to be encountered better brakes are required than those with which street cars are ordinarily equipped. The grades in the Chicago tunnels have always been regarded as dangerous points; and in the last tunnel built under the river, at Van Buren street, provision for preventing accidents, in case the brakes failed, was made by laying on the side of the track a rack bar, into which a pinion could be locked if necessary, to hold a car. This device seems to have worked well; but in the older tunnels dependence is placed exclusively on the brakes, which sometimes fail to do their work, and the result is likely to be an accident. A reliable brake is cheap at almost any price; without it accidents may be occasioned, one of which may entail losses almost as great as would be required for the brake equipment of an entire road.

**Cutting Wires for House Movers.** The most unreasonable ordinance of which we have heard in many a day is now under consideration in Minneapolis. One of the local lawgivers has introduced a measure requiring electric companies to bear the entire cost of cutting wires whenever called upon to do so by house movers. It has heretofore been provided that the electric companies should sever their own wires, but the matter of the payment for the work was left to those immediately interested. The ordinance was suggested by certain of the house movers who felt aggrieved because they had been called upon to pay for the cutting of the wires. Naturally, the

electric companies of Minneapolis have united in opposition to the proposed ordinance. The only argument that appears to be advanced on behalf of the house movers is the irrelevant statement that they are poor in comparison with the companies, and therefore they are unable to stand the expense as well. While the authorities of Minneapolis may sympathize greatly with the poor, it seems impossible that they could adopt such an unjust measure. When houses are moved they are obstructious to public travel, and to all intents and purposes those who move them are trespassers and should pay for any damages that they may cause.

**Ten-Foot Ties** It is doubtless true that some street railway companies follow a penny-wise and pound-foolish policy in their tracklaying. The main thing with them appears to be to lay the rails as quickly and as cheaply as possible, and as a necessary sequence the cost of maintenance is high, so high in some instances that it plays havoc subsequently with the earnings of the road. Generally speaking, if more attention was paid to preparing the roadway for the rails, the extra cost would be a profitable investment. In a few places the use of concrete in making a bed for the ties, although very expensive, has proved a wise economy. The ties are as immovable as if laid on a solid rock foundation, and consequently the labor for keeping up the joints is reduced to a minimum. A writer in a steam railway paper suggests that the length of the ties be 10 feet, as a change that would tend to diminish materially their movement, and a part of the article is quoted elsewhere in this issue. The author suggests the use of such ties on steam roads only, but the same reasons which he advances for their employment in such service would seem to be equally good when applied to street railway track construction. The substitution of the 10-foot tie would undoubtedly improve street railway tracks. With a better bearing surface the ties would not be so likely to move under the pounding of the wheels. At the same time it seems to us that the cost would be prohibitive, although such is not the opinion of the writer in question. Ties 10 feet in length would, we think, cost decidedly more than 25 per cent. more than those of the standard length of eight feet. It would probably be not much less than double by the time the timber reached the point where it was to be used. This estimate, if correct, would be sufficient to deter companies from adopting the longer tie. But in the case of a street railway company another factor would add to the cost of track construction with longer ties. Two feet more pavement would have to be opened every time a tie were laid on a paved street, and the additional cost would be extremely heavy in the case, for example, of an asphalt pavement. It may be the fact, however, that in some places the use of longer ties would be advantageous where the traffic is so heavy that there is a constant tendency to pound down the construction. At the same time we think most managers before adding to the regulation cost would consider for a long time if it would not prove better economy to provide even more money for the track construction than the use of the longer tie would involve, and adopt instead standard ties with concrete foundation.



## NEW YORK & BROOKLYN BRIDGE CABLE RAILWAY.

The report of the trustees of the New York & Brooklyn Bridge for the year ending Dec. 1, 1894, has just been completed. The receipts from tolls amount to \$1,199,084.14, divided thus: Railroad, \$1,111,815.88; carriageway, \$87,268.26. This is \$53,823.90 less than the amount of the previous year. Passenger carried by the railroad numbered 41,714,235. During the previous year the number carried was 42,615,105. A part of the reduction in receipts is due to the fact that since July 1 last two tickets have been sold for five cents, when previously no reduction from three cents apiece was allowed except when purchased ten at a time.

Including rental and amounts received from the two cities on construction account, the total receipts for the year were \$1,476,593.85. From the telegraph and telephone companies whose wires are carried on the bridge, \$22,071.60 was received. The total expenditures aggregated \$1,521,660.94. The following extracts are taken from the report:

During the period the railway has been in service, a term of about 11 $\frac{3}{4}$  years, 346,589,521 passengers were carried. The greatest number transported so far, during any year, was 43,298,486 in the year ending July 31, 1893; and during any month was 4,033,920, in October, 1892, which included the week from the 8th to the 15th of the Columbian Festival. The next greatest number was 3,849,671, in December, 1892, an average of 124,183 per day.

During the current official year, in any month, the greatest number of passengers carried was 3,845,947, in October, an average of 124,063 per day, and the least number carried was 3,032,778, in July, an average of 97,831 per day; in any day of twenty-four hours, during the same year, the greatest number carried was 156,403, on Saturday, March 24, and the least number was 49,248, on Sunday, July 22.

During the year the trains have been run with the usual frequency and regularity. On nearly all week days, and except when from special causes a greater or less accommodation is required, the schedule of running is the same; under this, for illustration, during the 24 hours of Tuesday, Nov. 27 last, 135,549 passengers being carried, of two-car trains, were run 7 on 15 minutes' headway, 22 on 7 $\frac{1}{2}$  minutes' headway, 1 on 6 minutes' headway, 15 on 4 minutes' headway, and 8 on 2 minutes' headway; of three-car trains were run, 65 on 3 minutes' headway; and of four-car trains were run, 155 on 3 minutes' headway, 36 on 2 $\frac{1}{2}$  minutes' headway, and 220 on 1 $\frac{1}{2}$  minutes' headway; hence during this day 529 round train trips and 1,945 round car trips were made, with an average headway between trains slightly less than 2 $\frac{1}{2}$  minutes.

During the year the total time lost by delays, from all causes, was 2 hours and 47 minutes, an average of less than 27 $\frac{1}{2}$  seconds per day of 24 hours, or of 1 minute for each 250,000 passengers carried. Of the total time lost by these delays, only 30 $\frac{1}{2}$  per cent. was due to a failure of a defect in some of the several parts of the cable hauling machinery; the remaining 69 $\frac{1}{2}$  per cent. was due to accidents common in ordinary railroad transportation.

The grip mechanism remains reliable and trustworthy in every respect. During the period covered by this report, from failures of such altogether, there were but three delays, aggregating 18 minutes; of the total 19 delays from all causes whatever during the 7,300 hours, the cable was in active operation.

The railway continues to supply extraordinarily safe transit for its passengers. Referring to this, the following from a preceding report remains true: "Of the large number carried since its opening to public use, no one in transit has been fatally injured; a few minor accidents have occurred, causing a slight breakage of car platforms and other parts of the working machinery, but without seriously affecting any passenger."

Since the railway was first operated, 11 years and 67 days before Dec. 1, 8 hauling cables have been in use, of which 6 were worn out and removed before the past year. The terms of service of the six worn-out cables were as follows: No. 1, 1,440 days; No. 2, 607 days; No. 3, 393 days; No. 4, 356 days; No. 5, 520 days; No. 6, 509 days.

The total distances in miles hauled by the same cables were: No. 1, 228,329; No. 2, 120,232; No. 3, 81,099; No. 4, 74,111; No. 5, 111,116; No. 6, 149,475.

The total number of passengers hauled by the

cables were: No. 1, 49,002,442; No. 2, 47,840,261; No. 3, 36,941,881; No. 4, 34,134,409; No. 5, 56,237,452; No. 6, 58,071,052.

In regard to the new lighting system the report says:

Up to the present time the cars have been lighted with lamps of a superior design, burning mineral oil; this method seemed to be unsatisfactory to a great number of passengers. After that an exhaustive examination of various different systems it was determined to adopt that of electric lighting, in which the current would be generated at a station conveniently placed, and, by conductors suspended over the tracks and trolleys attached to the moving cars, be conveyed to the car lamps. A contract for the installation of such a system has been made, and the work under it has been commenced.

## DEATH OF EX-GOVERNOR ODEN BOWIE, OF BALTIMORE.

Ex-Governor Oden Bowie, president of the Baltimore City Passenger Railway, died at his home, "Fairview," Bowie Station, Prince George's County, Md., on Dec. 4. He had been stricken with a paralytic shock one week before and he gradually grew weaker until the end came.

In 1873 he was elected president of the street railway company with which his name has since been identified. It was due almost exclusively to his efforts that the property has been built up,



Ex-Governor Oden Bowie.

until it is now regarded as one of the most valuable street railway systems in the country.

Ex-Gov. Oden Bowie was born at Fairview, Prince Georges County, on Nov. 10, 1826. His parents were Hon. William D. and Eliza (Oden) Bowie, the former of Scotch and the latter of English descent. Both families were among the early settlers of the State. Mr. Bowie lost his mother when but nine years of age, and soon afterward was placed in the preparatory department of St. John's College, at Annapolis. He afterward entered St. Mary's College, Baltimore, from which he graduated in 1845. The following year he enlisted for the Mexican war as a private in the Battalion of Maryland and District of Columbia Volunteers, under Col. William H. Watson, who was killed at the battle of Monterey, dying in the arms of Lieutenant Bowie. He had been promoted, and was the only officer left with Colonel Watson at the time of his death. His gallantry in that battle secured for him the appointment as senior captain of the Voltigeurs Regiment—one of the 10 regiments added to the regular army and made a new branch of the service. Shortly after his promotion Captain Bowie had to resign his commission on account of ill health.

It was immediately following this that he entered the arena of politics. His political career is one of the most interesting in the State.

He was nominated for the legislature before he had attained his majority and was defeated. He was elected, however, the following year and took

his seat in the house before he was 22 years of age. In 1835 he was elected to the State Senate. In 1837 he was elected governor of Maryland by a majority of 42,000. After his term as governor expired he had little active connection with politics.

He was elected president of the Baltimore & Potomac Railroad in 1860. The road, which was built through his efforts, was chartered in the fifties and construction was begun, but interrupted by the war.

He was for nearly 20 years a prominent figure in the horse-racing world, and was one of the most successful breeders of racing horses in this country.

The *Baltimore American*, from which the information in regard to Mr. Bowie's life was obtained, pays this tribute to him:

Whatever Governor Bowie undertook he accomplished. There was no such word as fail in his lexicon. It mattered not in what profession or business he engaged, he always made it a point to give it his best efforts. He never did anything in a half-hearted way, nor would he relinquish an undertaking until he had brought it to a successful issue. Hence his remarkable success in life.

His versatility was wonderful. He was one of the few exceptions to the rule that a person applying himself to various trades could be master of none.

He was equally at home in the field, in the halls of legislation, in the office of the railroad manager and on the racecourse. As a soldier during the Mexican war he earned a reputation for skill and bravery that led to his advancement from a private in the ranks to a captain, and had he continued in the army, there is little doubt that there would have been greater honors in store for him. When he forsook the field and entered the political arena the party to which he allied himself was not slow to perceive his ability and usefulness, and here, again, his promotion was rapid. From the House of Delegates he went to the Senate, and thence to the Executive Mansion. Successful as he had been, however, politics had no charms for him. He was a square, open fighter, and hated duplicity. Besides, his ambition did not lie in this direction. He was a business man through and through. It did not take him long to master the details of railroading, and to him, more than to any one man, is the Pennsylvania system indebted for the Baltimore & Potomac road.

His administration of the affairs of the City Passenger Railway Company is too well known to every Baltimorean to require comment. It was entirely due to his efforts that this magnificent property improved in value, and, incidentally, brought a great revenue to the city.

## A RECEIVER FOR THE SUBURBAN TRACTION COMPANY, OF ORANGE, N. J.

Vice-Chancellor Van Fleet has appointed Watson Whittlesey, of Orange, N. J., receiver of the Suburban Traction Company, of that city. The court also granted an injunction restraining creditors from selling at sheriff's sale any portion of the company's assets in executing judgments secured by them. This action caused a stay of the proceedings and sale set down for last Saturday.

The application for a receiver was made for the American Loan & Trust Company, of Boston, which holds \$1,500,000 of 30-year bonds, executed in its favor by the traction company.

The receiver has qualified in \$30,000 bonds, and has already taken charge of the affairs of the company. It appears that the \$1,500,000 bonds were executed on June 1, 1893, and interest at 5 per cent. was to be paid in June and December each year. These payments have not been made until the arrears now are estimated at \$22,000. Taxes amounting to \$3,000 have not yet been paid, and the concern owes \$140,954.50 of floating debt. The company's commercial paper has been falling due almost daily, and there are no funds to meet these obligations.

The company's resources are estimated at \$500,000. This includes 10 miles of track, two-thirds of which is electrically equipped; 18 cars, 30 horses, 1 $\frac{1}{2}$  acres of land, known as Glenwood Park, a power house and other equipment of the street railway company. Frank W. Child is the company's president, and Albert W. Kissam its secretary.



**NEW YORK AND BROOKLYN BRIDGE TERMINAL IN BROOKLYN.**

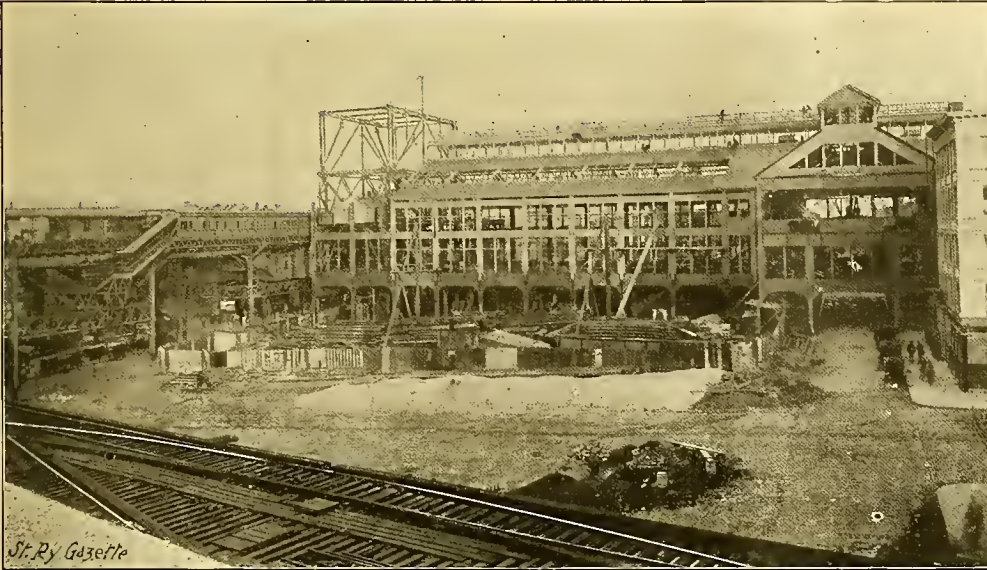
The work of improving the terminal facilities of the New York and Brooklyn Bridge is now well under way. When this improvement is substantially complete the cable service can be made to correspond more nearly to the demands of the public. At the present time the cable trains morning and evening are utterly inadequate to accommodate the regular patrons of the bridge. It is a familiar saying in Brooklyn that it is unsafe at the

engraving, and the traveler is now to be seen at the extreme left.

The ride across the bridge forms only a part of the journey of a very great proportion of those residents of Brooklyn who go to and from New York every day. Provision has therefore been made in the design of the station to facilitate as far as possible the passage to and from the elevated railways which radiate from this point.

The main station is rectangular, 355 feet 10 inches long, and 88 feet 10 inches wide, with two

way. From the transverse elevated railway platforms there will also be stairways inclosing an elevator and connecting with the bridge footway and the street. A loop undoubtedly will be built to accommodate the Brooklyn Elevated Railway. This will swing around from the left, the structure occupying the open ground shown in the foreground, and will enter the trainhouse shown at the extreme right of the station. This improvement will greatly facilitate the handling of trains. The present terminal of the Brooklyn Elevated is on Sands street, over the bridge structure, and is connected to the latter by stairways.



BROOKLYN TERMINAL STATION OF THE NEW YORK AND BROOKLYN BRIDGE.

present time for a lady to attempt to board a bridge train during rush hours, and this is not such a great exaggeration.

The crowding of platforms, both in New York and Brooklyn, becomes dangerous at times. The platforms leading to the trains are wholly unprotected, and should a panic occur while the army of Brooklynites is surging forward, the consequences might be disastrous. The platforms fit up so solidly and so quickly, even when the time intervals between trains are only 90 seconds, that if something happened to interfere for a moment or two with the trains there would be the greatest danger that the people on the front of the platforms might be forced thence on the tracks by the pressure of the on-coming crowds. Folding gates that could be instantly opened or shut should be provided along the edges of the platforms. Some such simple measure of safety might be the means of preventing a catastrophe.

At the New York terminal the roadways have now been widened. Much of the preliminary work for the new station has been finished and men are engaged in erecting the structural iron for the new terminal.

The contract for the Brooklyn terminal station was let to the Phoenix Bridge Company for \$225,127. The work is now well advanced and during the last few weeks rapid progress has been made. The structure is located on the west side of Washington street between Sands and High streets. The steel framework of the new station has been practically finished and it is now almost ready for building in. The outer walls, built in the steel framework, will be of brick or of cast or wrought metal. The floors will be of brick or terra cotta and the roofs will be of wood on iron or steel purlins, covered with sheet iron or slate and glass.

That part of the bridge approach on which the steel framework was erected has been used for a long time for switching purposes. The trains have been gradually housed in. The steel beams have been put in place by means of a huge traveler, which runs on trucks running on tracks and stretches from one side of the structure to the other, a distance of about 80 feet. Work commenced at the right, as the station appears in the

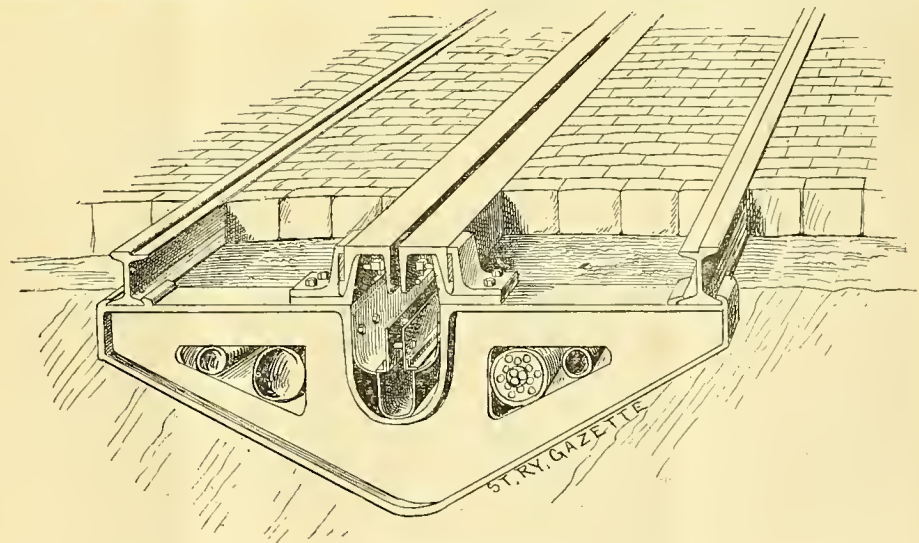
opposite projections or wings, each 59 feet wide. There will be three floors: the first, or ground, floor on which will be retiring rooms and two ticket booths; the second floor on which, placed longitudinally, will be two passenger platforms and four tracks over the bridge railway; the third floor on which, placed transversely in each opposite pair of wings, will be three passenger platforms and two tracks for the Brooklyn Elevated Railway; also an intermediate longitudinal gallery connecting these wings. From the third floor a

**ELECTRIC CONDUIT RAILWAY.**

The accompanying illustration shows an underground conduit for electric railways, recently patented by M. J. Martin, of Chicago, Ill. The yokes are similar in form to those ordinarily employed in cable railway construction, with a sheet metal conduit secured to the yokes in the usual manner.

Upon the top of each of the yokes are placed two angle irons, the horizontal flanges of which are secured to the yoke by means of bolts, and the vertical flanges of which extend upward and are so shaped that their outer surfaces converge upward to a slight degree so as to form complementary seats for the outer flanges of the slot rails. The slot rails are in the form of channel rail bars with downwardly depending angles, between which the conductors are located.

These slot rails are secured to the yokes by means of angle irons, the horizontal flanges of which rest upon the flanges of the angle irons and are secured to the yoke by the bolts before mentioned. The other flanges of these irons extend upward so that their upper edges are flush with the tops of the slot rails. Near its upper edge each of them is provided with a shoulder presented downward, so that between the flanges and their shoulders there is left a rectangular space into which is driven a key. The construction and arrangement of these parts are such that when the key is driven into place, bearing against the shoulders, it will force the tapering flange of the slot rail into the correspondingly shaped socket left for it between the flanges of the angle irons, and thereby securely hold



MARTIN CONDUIT

covered gallery will run west to an elevated platform, from which, by stairways, the platforms of the Kings County Elevated Railway station on Fulton street will be reached. Between the first and second floors will be two stairways, and between the second and third floors, or between the bridge railway platforms and the Brooklyn Elevated Railway platforms, will be nine stairways. At each end of the intermediate longitudinal gallery will be a stairway and gallery spanning the two elevated railway tracks, and connecting by three stairways with each platform of the elevated rail-

the slot rail in place. When it becomes necessary to remove the slot rail, it is simply necessary to remove the key, after which the slot rail may be lifted out of place without disturbing any part of the paving lying adjacent to it.

Between the angle irons of each yoke and the next, the sheet-metal conduit extends above the tops of the yokes and above the lower edges of the outer flanges of the slot rails, so as to prevent water, which may find its way to the bottom of said flanges, from entering the conduit. The bottom portion of the conduit is so shaped as to form a



drain, and to the conduit are secured sheet-metal plates, so located as to leave between them a space directly beneath the slot, through which water or dirt falling through the slot may pass into the drain. These plates extend upward such a distance as to leave, between their upper edges and the lower edges of the depending flanges of the slot rails, a sufficient space for the passage of the trolley arm. The plates are somewhat farther apart than the flanges of the slot rails, and their object is to make it difficult to reach the conductor with a wire or other device inserted through the slot. As shown in the drawings the drain is of U-shape in cross-section, and its upper edges join the adjacent portion of the conduit in an angle.

To the upper edge of the drain are secured angle irons, to the vertical flanges of which the plates are secured. The plates are in turn secured to each other so as to be incapable of relative movement either toward or from each other, by means of tie-bolts passing through them and sleeves or struts surrounding the tie-bolts and bearing at their extremities against the plates.

#### RIGHTS OF CONDUCTORS AND MOTORMEN.

During the last few weeks the matter of the organization of street railway employees in Philadelphia has received a great deal of attention at the hands of the local clergy, in view of the fact that the union of the conductors and motormen has been uncompromisingly opposed by the Philadelphia Traction Company. Some of the companies have not objected to their men joining the union, but the Philadelphia Traction Company has announced that if its employees became members they did so at the risk of immediate discharge. Last Sunday evening the Rev. William Swindells preached a sermon on the general subject. His theme was "The Rights of Car Conductors and Motormen." In the course of his remarks he said:

No right is more sacred than that of public assembly. It may be for the interchange of thought, intellectual improvement, co-operation in work, mutual protection, religious worship or political action. It may be assumed that such an organization will be dominated by a spirit of good will, and, therefore, its action will be in no wise a trespass on the rights of others. Where the claims of others are involved, it will not be summary in its designs or based upon a partial view of any question that involves the rights of others or the well-being of society. Admitting this definition to be true, it may be applied at this time to the rights of street-car conductors and motormen.

There are few vocations that are greater in their exactions or involve more serious responsibilities than these. Upon them depends the safe and rapid transportation of multitudes of people, especially in cities and towns, to and from their places of business or employment. Upon them depends in a larger measure than ever the safety of pedestrians, who must use the street crossings, especially the children whose only playgrounds are the highways of a city. They are required to have executive ability of no mean order. To accommodate and quickly dismiss the endless procession that goes in and out of a street car requires both mental activity and skill.

It must also be conceded that there are few positions in which there is a greater strain put upon personal courtesy. Few passengers consider it an obligation to extend to a car conductor any of the courtesies of life. What he does he must do with the utmost suavity, preserving, under frequent provocation, his self-control, and exercising, at times, the greatest forbearance, and it is all accepted as a matter of course. We therefore claim for him the right of peaceful assembly. It may be useful to him as an individual in establishing the feeling of brotherhood among men who are his associates in vocation and responsibility. It may be useful to others in the defense of the individual, who, left to stand alone, can do little, either to maintain whatever rights he may have, or secure those to which he is entitled. It may also be of much advantage to any corporation, whose franchise entitles it to take possession of a public highway for the public good.

In such association, for consultation, discussion and defined plan of action, it may well be that the car conductor and motorman are as much interested in the public good as the corporation that employs them. They are therefore entitled to the right of assembly. It is a violation of this right to attempt to prevent it or curtail it by threats of personal punishment in any form. It is unmanly to suspend over him the sword of a corporation, notice of dismissal if he asserts the simple right to declare his brotherhood with every man who is his fellow by occupation and needful sympathy. It is his right by nature, by legislation and in equity. It is as much so as the right of the members of a

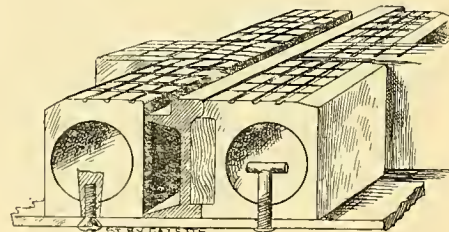
corporation to meet together for consultation and for the adoption of the plans of operation.

Furthermore, the men who are entrusted with the safety and comfort of the people while in transit, or, while occupying the street, are entitled to fewer hours of labor, and more for rest and individual profit. Many are compelled to work 12 hours a day, and in making up for time lost, for which they are not responsible, with insufficient time allotted for meals. No man can do his best, or even what should be required of him, if his time is abridged either to eat, to sleep, or for wholesome diversion.

#### METALLIC PAVEMENT.

A patent has just been issued to Esprit Perrody, of Geneva, Switzerland, for a metallic pavement which is designed to be used in connection with street railway lines. It will be seen from the accompanying illustration that the purpose of the inventor is to provide a durable form of paving along both sides of the rails and thus to prevent the formation of ruts. The cut illustrates the arrangement of the metallic blocks as well as the way in which rails are fastened.

The metallic pavement is formed of blocks cast of iron or steel, which are cored out either crosswise, lengthwise or chambered out with openings in the ends, and are filled with concrete. The upper and under surfaces of the blocks are formed with longitudinal and cross grooves, and are chamfered round the top and bottom edges, affording a sure hold to the horses' hoofs and preventing their slipping. The blocks have a seating or bedding surface equal to their upper surface and when worn off on the upper side can be reversed, the blocks thus being used twice. The blocks are preferably placed alternately with their long and short sides against the rail so as to be bound in with the wood or such other pavement as



Metallic Pavement.

may be used. In this way an iron roadway 12 to 15 inches wide is formed, which will not soon be indented with ruts to be found in ordinary pavements, caused by carts and carriages of different wheel gauge. To fasten the rails two blocks are fixed upon a bed plate of the necessary size, which may be done by means of a wood plug and screw or by a headed screw screwed into the bed plate and riveted over, the hollows in the blocks being filled in afterward with concrete. The rail is fixed by means of a wooden wedge driven in the recess in the side of the block, the plate with the blocks fixed thereto forming a chair for the rail, which is fixed without bolts. Fish plates also may be dispensed with. If the wedge shrinks through dryness, it can be tightened against the rail by means of thin iron wedges driven into the ends. If the top of the rail becomes worn to an appreciable extent, the rail can be easily raised by placing wood or metal packings under it on the bed plates.

This form of construction would probably not last many hours with electric motor cars running over the track.

#### TEN-FOOT TIES SUGGESTED.

In the current issue of the *Railway Review* Jerry Sullivan describes the advantages that would attend the use of 10-foot ties on steam roads. In this course of the article he says:

In anticipation of objections to 10-foot ties on account of increased cost the following may be added: A tie chopper can cut a tree in two at a 10-foot mark as easily as at an 8-foot mark, and as the hewing is only about one-half the total work of making a tie the extra two feet in length will make

little difference to him. To the owner of the timber perhaps some slight extra compensation would have to be made, but as contractors always figure their profits at so much per tie, their margin would be about the same as now. Taking all things into consideration, including extra cost of transportation, it is doubtful if the cost would be 25 per cent. more than for 8-foot ties. But suppose it was: 25 per cent. more tie is given, and that tie will furnish at least 50 per cent. more direct and reliable support to the rail than any wobbly 8-foot tie possibly could, and for this reason at least 25 per cent. less ties would be required to support a rail, so that the cost per mile would be no greater, if as much for 10-foot ties as at present, to say nothing of the greater stability of a 10-foot tie resting solidly on the ballast, making a more perfect track, and one that could be maintained by a less number of men.

A number of Southern railroads, after repeated failures to keep up track in the swamps and marshes, finally tried 10-foot ties with the result that they have become the standard tie for such sections. If they will keep track up in boggy land they will certainly do it on dry ground. One thing is certain, the 8-foot tie is not giving satisfaction at present, and on account of the increase of speed and weight of trains something must be provided in the near future that will fully meet these conditions. Such trains cannot always run safely on track balanced on a little ridge of dirt in the center with the ends of the ties playing up and down like a springboard; and so far as has been developed, the only way to economically overcome this trouble is to use 10-foot ties.

#### DEATH OF FRED E. DEGENHARDT.

Fred E. Degenhardt, western manager of the Standard Underground Cable Company, of Pittsburgh, died suddenly at his home in Chicago on Dec. 7. He was taken suddenly ill the previous Sunday, but serious results were not feared until Wednesday, when the physicians determined that a delicate operation was necessary. Although he was apparently strong he had not sufficient vitality to withstand the shock incident to the operation. The news of Mr. Degenhardt's death was received with feelings of genuine sorrow by the electrical fraternity generally. No man identified commercially with electrical interests was better known, and he was held in the highest esteem the country over. He was conceded to be one of the most successful salesmen in the electrical field and he has made a splendid record with the company with which he has been connected. Mr. Degenhardt will best be remembered in his personal relations. He was a marvelously brilliant entertainer, and at all electrical conventions he was always to be found surrounded by a group of interested friends. He was warm-hearted and loyal, and the place that he occupied in the esteem of his friends in Chicago can never be filled. Mr. Degenhardt was born in Chicago, and at the time of his death was 38 years of age. He was formerly in charge of the construction department of the Western Electric Company of Chicago, but since 1886 he has represented the Standard Underground Cable Company with rare fidelity and success. Mr. Degenhardt was greatly interested in the technical side of electricity, to which he devoted a great deal of study, and he made a considerable number of electrical inventions.

#### ELECTRIC RAILWAY PROJECT IN CONNECTICUT.

The New York *Herald*, under date of Dec. 10, prints the following dispatch from New Haven:

A meeting of the Connecticut Association of Electric Railroads was held in this city to-day that bids fair to be the starting point of a big fight between the steam and electric roads of the State.

The meeting took place behind closed doors, but to-night it was learned that the object of the meeting was to discuss the situation of the electric as compared to the steam roads, and take steps toward meeting amendments passed by the legislature, so as to put the electric on an equal footing with steam roads, to which the electric are fast becoming dangerous rivals.

The electric representatives frankly state that they are now able to take care of themselves and intend to do so. This will mean a fight in the legislature between the representatives of the great corporations.

The New York, New Haven & Hartford Road has obtained concession after concession from the legislature, and has at present the better of the electric in point of legislation. The consolidated



road has for years controlled the travel and freight of the State, but the electric roads have begun to cut into this monopoly and a long fight is now imminent.

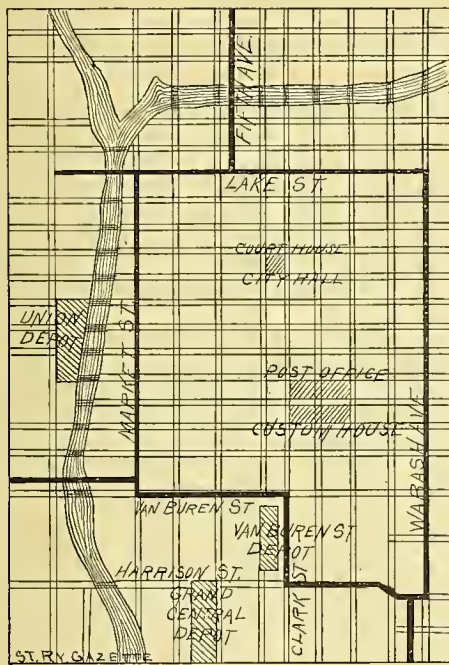
The consolidated line is already all but paralleled from Hartford to New York by electric roads, only a few short links needing to be put in to complete the chain. It finally will remain for some great syndicate to effect a consolidation of the electric roads, and then the crisis will come. There is now a big list of long electric lines in Connecticut that are taking thousands of dollars away from the Consolidated line. Among these electric roads are the following:

From Hartford to Ellington, and to Rockville; from Manchester to South Manchester; from Bristol to New Britain; from Meriden to Wallingford; from New Haven to Schutzen Park, which is to connect with Wallingford; from New Haven to Woodmont and Milford, and from Bridgeport to Stratford, leaving only a short link between this place and Milford.

From Bridgeport to Southport the Norwalk Tramway Company has a scheme to extend their line from Southport to Westport, and so on to New York city. The road from Meriden to Wallingford is already running freight trucks and carrying freight. The meeting of the electric representatives to-day was attended by representatives from all these and from other roads. There was also a number of the legal advisers of the roads.

**THE DOWNTOWN ELEVATED RAILWAY LOOP FOR CHICAGO.**

It is now considered almost certain that the elevated railroad companies of Chicago will be able to secure a loop in the downtown part of the city.



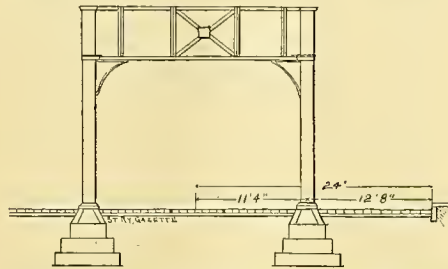
Route of the Joint Elevated Loop in Chicago.

The fact that no provision has thus far been made for their entering the heart of the business district has been the greatest kind of an obstacle to the success of the existing and proposed elevated roads. The termini of the Alley "L" road at Congress street, and of the Lake street road at Market street, are practically on the outskirts of the business district, and so inconvenient have the residents of Chicago found these termini that the patronage of the two roads has been materially affected. Neither road is doing half the business that could readily be done, and the earnings are very far below what the directors have expected. The earnings of the Alley "L" road have been so low that there has been talk of a receiver for many months, and recently the minority stockholders have taken action to devise means for the protection of their securities. It has been their belief that if the downtown loop could be secured the problem would be solved and the road would soon become a paying property.

When the operation of the elevated roads was commenced in the city, the owners of these properties evidently thought that public opinion in

favor of a loop would be so strong that the companies would find no difficulty in extending their structures, but as new elevated railway companies have been formed each had its own loop project and property owners have become decidedly antagonistic to the schemes, chiefly on the ground that if a loop was built for each road, the downtown district would soon be cut up badly by elevated structures.

It has been reported repeatedly that the several



Elevated Structure of the Proposed Loop in Chicago.

companies were endeavoring to agree upon a joint loop, and this result now seems to have been reached. At a meeting of the representatives of the several elevated roads, a project for a loop, which the trains of all the companies would follow in the business district, was agreed upon, and the route is shown in the accompanying diagram (Fig. 1). It will run from Market and Madison streets to Lake street, to Wabash avenue, to Harrison street, to Pacific avenue, to Van Buren street and back to Market street at the point of starting. It is stated that property owners along the line of the proposed route are favorable to its construction, and at a recent meeting they agreed to make no objections to the construction of the line if a definite agreement is made by the four elevated roads that they will all use it in common.

The plans for the loop structure have been completed, so that they may be submitted to property owners, and a cross section is given in Fig. 2. The structure is extremely light and will interfere but little, if any, with the light in the stores along the line. A supporting post will not be located at the curb line, but it will be 12 feet 8 inches in the street, coming just outside of the double street car tracks. The sectional view shows the relation of the structure to the curb line and sidewalk.

The representatives of the elevated lines state that the agreement for the common loop into which they have entered has had the result of add-

**NOTES ON ECONOMY TESTS OF ELECTRIC RAILWAY PLANTS.\***

BY GEO. H. DAVIS.

Assuming that a complete test is to be made, the parts that should receive particular consideration are the boilers, the furnace, the steam piping system, engines, condensers, pumps, water piping system, generators, line work from switchboard to terminus of road, motors and track bonding.

It is not intended in what is said here to mention details for the testing of each part of the system. All these things are explained in a most perfect manner in the reports of the American Society of Mechanical Engineers, in "Engine and Boiler Trials," by Dr. R. H. Schuster, and in "Experimental Engineering," by Thurston, R. C. Carpenter. In these publications may be found all the blank forms necessary for the taking of data, and the results of the complete test calculations, all equations and formulas, and a thorough description of all instruments and their uses.

A few notes with particular reference to railway plants may be of interest.

The tests of different parts must be made simultaneously in order to locate defects in the system of power generation, conversion and transmission, since the conditions are constantly changing. Two tests, one on a constant load and one on a variable load, are always necessary. The variable load trial proves the efficiency of the parts under actual conditions, and for the particular kind of work they are doing. An engine may be so designed and proportioned as to do perfect work in a flouring mill, and also be a total failure in a railway plant. This, in a less degree, is true of boilers and steam fitting. It is plain also that a variable load test is the only one that is at all valuable to the railway company since they have no interest in the economy of the parts outside of the particular duties assigned to them; however, as a check on the work, a constant load test should always be made, because in it greater accuracy can be maintained.

It is always difficult to take readings on variable loads, and the first consideration should be to take them exactly on the second. Boiler-room readings may be taken at intervals of five minutes, cards should be taken from the engine at intervals of two and a half minutes, with about two tracings on each card, generator readings being taken at the same time, while motor readings may be taken as frequently as each fifteen seconds.

Definite plans for a test must always be made and strictly adhered to; no details can be overlooked without causing serious inaccuracies in the results obtained. The changes in pipe fittings and all preparations for a test must be carefully studied and a sufficient number of reliable men employed, because if one man fails to do the work assigned him the entire results may be wholly without value. One competent man should be assigned to the duty of doing nothing except to see everything and remember all that he sees. His information will be valuable in working up the test.

In the preliminary work engine valves should be



ELEVATED RAILWAYS OF CHICAGO.

ing millions of dollars to the aggregate value of the elevated railway securities. Such evidently is the belief of the Chicago Stock Exchange, as upon the announcement that the agreement had been made, securities took a sharp advance.

carefully adjusted and the interior and exterior of the boilers personally inspected, as the least coating of soot or scale makes a large difference in the evaporation. All piping valves must be carefully

\* *Electrical World.*



tested, and if any faults are found the valves should have blanks inserted.

The three most accurate men should be assigned to the duty of weighing water and coal and reading voltage and amperage at the switchboard, because these three items form the foundation for the test.

A set of friction cards should be taken at the beginning and another at the end of the test, the final set forming the basis for friction calculations.

The instruments and appliances needed are at least two pyrometers, a barometer, scales and tanks for weighing water and coal, apparatus for flue gas analysis, case of thermometers and thermometer cups, two or three calorimeters, with taps for steam pipes, draft gauge, condensing coils and tanks for the measurement of hot drips, speed indicators, engine indicators and attachments, standard steam and vacuum gauges, Weston voltmeters and ammeters, a rheostat or tank of water large enough to consume the maximum current, a portable Wheatstone bridge (or the fall of potential method may be used in measuring resistances, since they are usually small), a spring balance and some form of dynamometer and tachometer for car tests. All these instruments must be carefully calibrated and a preliminary run made previous to the first day's test.

The constant load test should be made first, because in this readings would be nearly uniform and taken at much longer intervals, thus giving greater opportunities for accuracy. It will also serve to initiate the men, who, perhaps, are not accustomed to reading instruments accurately and quickly.

The object of the whole railway design is to convert the heat energy of coal into mechanical energy at the car trucks, and for this reason, in making an economy test, every possible loss of heat should be traced to its source. Thermometers should be placed everywhere, as a steam plant test is practically a heat test. If power house windows have to be open in the winter to keep the building cool it is certainly profitable to know the source of the loss. Heat losses in a plant of this kind are: (1) Heat discharged from the flue. (2) Heat discharged in condensing water; and (3) Radiation and convection from the entire system. For example, in a large station there are 1,200 square feet of superficial area in the high pressure piping and reservoirs containing high pressure steam. Aside from this area there are those of the heaters, hot water system, and drip system. The steam pressure usually carried is 125 pounds gauge, average temperature of surrounding air about 75 degrees F., difference in temperature between steam and air being about 277 degrees F. In experiments on bare wrought iron pipe conducted at Cornell University, under the direction of Professor R. C. Carpenter, it was found that the loss due to convection per square foot per hour in a four-inch pipe at the given difference of temperature to be 425 B. T. U. The losses due to radiation 340 B. T. U., making a total of 765 B. T. U. This would make a total loss in the entire system of high pressure pipe of 913,000 B. T. U. per hour, equivalent to about 65 pounds of coal, equivalent to about 30 H. P. at the switchboard per hour.

With a covering on this system of one inch of magnesia and one inch of hair felt, the losses as shown by calorimeter tests were only ten per cent. of the above, making a difference for annual operating expenses for the high pressure pipe alone of \$480.

In the summer season the power house should be as cool as a machine shop. The extra coverings necessary to make it so will save enough fuel to pay many times the interest on their cost. It is a mistake to allow 20 or 30 H. P. of heat, at from \$30 to \$30 per annum to pass out of monitor windows. In fact, monitor windows should not be necessary. Enough heat is wasted in some large plants by radiation and convection losses to pay for an additional inch of hair felt over every square foot of exposed high pressure area.

Therefore, in making an economy test, it should not be neglected to place thermometers outside the building and in the engine and boiler rooms. They should be placed on the outside of pipe coverings, engine cylinder jackets and outside of coverings for boiler drums and fronts, besides in the usual places required in a test.

By knowing the temperatures and the superficial area of pipes we have a check on losses due to radiation indicated by calorimeter tests. Calorimeters, as instruments, tell most accurately the quality of steam passing through them, but this steam may not be of the same average quality as that passing through the main. It entirely depends on the form and position of the top pipe used. A spiral pipe used inside the main, being perforated to correspond with the amount of steam passing each point, should give the best sample of steam. But since its form is very inconvenient in placing, the standard form is practically best.

If a careful calorimeter determination is made at the nozzle of the boilers as to the amount of priming water carried over, then it becomes easy

from the measurement of drips to determine the loss due to radiation.

The drips can be measured by drawing the water off at a point under the surface of the condensed water in the separator and passing this mixture of water and steam through a condensing coil. The steam appearing in the drips being re-evaporated water due to the change of pressure from that of the separator to that of the atmosphere.

If the unit to be tested is direct belted, speeds of both engine and generator should be taken if possible with a continuous counter, so that belt slippage can be accurately determined. Tests of both direct connected and direct belted units show that there is a loss in large belts of this class not usually accounted for. It probably results from the great and sudden variation of loads in the generator, the thickness of the belt and the wave motions which are not found in steady loads. Certainly the loss is much greater than that found in woolen mills and flouring mills.

In the generator tests temperatures should again be taken of armature fields and bearings, and a voltmeter and ammeter used on the field circuit both shunt and series, and at the end of the constant load test a characteristic curve of the generator may be taken.

The water rheostat commonly used, consisting of a large tank with copper plates for positive and negative terminals, is practically best. This should be exceedingly well built since the water in it rises to a temperature of 212 degrees, and a flimsy structure will surely burst, interrupting it not spoiling the test.

With reference to motor tests, a voltmeter should be placed across the terminals, and another from trolley to tracks, and an ammeter inserted in the main circuit. A tachometer should be attached directly, if possible, to the armature shaft; a straight edge 10 feet in length, with a level inserted, and pivoted at one end, will serve to give the approximate grades. Readings each 15 seconds of ammeter voltmeters, tachometer, level, with times of each, with street and street crossings noted, and such extra notes as should be frequently taken give us all that is of immediate practical value.

If a test of efficiency of gearing is required, the car may be blocked up and a Prony brake applied, first to a pulley on the car axle and next to a pulley on the armature shaft, voltage and amperage being read with those of the brake; from these readings the losses can be deduced.

In the measurement of resistances, such as joints in feeder wires, contacts between trucks and rails through a sand or dirt coating, sections of track bonding, etc., the fall of potential method, using high resistance Weston voltmeters and ammeters, is the most satisfactory. The same method may be employed in the measurement of total overhead line resistance.

The losses due to sand on rails are great as is plainly shown by placing one terminal of a voltmeter in contact with the car truck and the other on a clean portion of the rail. This drop in potential between truck and rail varies greatly, and is often in dry weather a source of greater loss than poor track bonding. An easy way to determine this fall of potential when the car is running is to attach one terminal of the voltmeter to the trucks and the other to a small wheel with a sharp flange, having a handle sufficiently long so that from the rear of the car this wheel can be held on the rail. The knife edge flange will push aside and penetrate any coating of sand, besides cutting through a coating of dirt which is always found clinging closely to the rail surface. This coating, which is found in filthy streets, does not form so great a resistance as sand, but at the same time is a source of loss, and also very hard to remove from the rails.

From the more or less complete tests which have been made during the past four years, it is quite clearly indicated that the following standards of economy are not too high in the best condensing plants:

Equivalent water evaporated per pound of combustible from and at 212 degrees F.....	11.50 to 11.75 lbs.
Loss in high pressure piping system, due to convection, radiation, etc.....	1 to 1.25 per cent.
All heat losses aside from heat discharged from furnace flues and from condensers.....	1.5 to 2 per cent.
Pounds of combustible per indicated horse power per hour, constant load..	1.5 to 1.7
Total friction of engine, belt and generator.....	.15 to .20 per cent.
Electrical resistance of double track return circuit, per mile....	.02 to .03 ohms

The complete test should be made on an "average day" in the operation of the road. Complete records of the operations of all cars, their weight, etc., all generators, engines and boilers, aside from those under test, should be kept. This data, with the regular test readings, will furnish all that may be required in giving a more satisfactory knowledge of the equipment and a basis for the recommendations of all changes in operation, which the test should indicate.

CONDUIT ELECTRIC RAILWAYS; IS THERE A SOLUTION OF THE PROBLEM?

PART V.

DISCUSSION.

Mr. SACHS: Don't you think, Mr. Fairchild, that the construction adopted by the Metropolitan Traction Company and also by the Third Avenue Railroad Company is sufficiently strong to support any electrical car we have to-day?

Mr. FAIRCHILD: I omitted to say that; I meant to say, excepting the Third Avenue and Broadway construction, they would seem to be strong enough for the electrical cars. But as you know, the electric traction is very much harder on the rails than cable traction, where the headway is under three minutes. I know of but one road in this entire country, one that was equipped two years ago with electric traction, that has stood for two years any way decently. There is one road in Cleveland, built two years ago this month. I heard from the superintendent, in a very flattering letter, that it stood up very well; it has an 11-inch rail. I think the road in Cincinnati also has been standing well after completion of four years. It is in Cleveland, O., that I considered the construction at the time the best in the country with the exception of Cincinnati; they are two of the best in this country. But you would be surprised to know the cost of keeping up electric traction, even where the rail is from 75 to 80 pounds, and where cars are not run very close together.

Now, I have got off from the electric conduit system. The serious point is the insulation, and to provide for the expansion and contraction of the conductor. I think there is nothing gained by the closed conduit or switching in and out. It is a question now whether the electric conduit is demanded, and if demanded, the point is the cost. I can only qualify it by saying that from my experience and observation I cannot see that the demand is very great for it.

THE PRESIDENT: What is the cost of a cable road as compared with that of an electric road? Every one knows that an electric car costs more than a cable car. What would be the difference in a mile of track, assuming the same headway in both cases?

Mr. FAIRCHILD: I could give you figures later on; the cars in both cases will cost about the same; the grips cost all the way from \$100 to \$300; I think the Third Avenue grips cost \$300. I don't know exactly what the motors cost; I should say at least ten or twelve times as much as the grips.

THE PRESIDENT: A difference of about \$1,000 per car?

Mr. FAIRCHILD: Yes.  
ROBERT R. LUNDELL.—It is a good scheme, as Mr. Sachs suggested, to operate by the three-wire system. But why cannot that be applied to an ordinary trolley road in this way between two trolley wires and use the ground as a neutral, thereby getting 500 volts between each wire and the track; that would save enormously in the cost of copper. We would use the same dynamos in our power station, simply coupling them as they are coupled in the three-wire system.

THE PRESIDENT.—I want to state for Mr. Lundell's information that that system has been in operation in several places.

Mr. SACHS: I would also like to say that that particular system is being installed now by the General Electric Company, or will be hereafter, so I understand.

Mr. LUNDELL: Some reference was made to the system which we have been trying at Fifty-ninth street, and Mr. Sachs stated it has been running. I want to state that it is running. We are running it to find out whether it develops any weaknesses, but we have not found any yet. We are ready to show it to anybody. As to the storage battery there, I do not believe everybody understands what service it is performing. With us we must have something to start those relays. We can do that in two ways, either with a small battery, or we can start it mechanically. Of course, as soon as we have once got the current, if we not accidentally miss it, we ought to go along all right. But the trouble is to make good contact on the contact rails, and therefore where you have a sectional rail we have found that it is exceedingly difficult to make a good contact. We may ride over a switch and lose the contact, and cannot go along in that case. Therefore it is necessary to carry a small battery to pick up after losing contact. To pick up you do not want amperes, but you need volts. We cannot pick it up unless we have volts. It won't go through the car wheels—it won't go between the car wheel and the track unless the rails are very bright indeed. The resistance otherwise will be so great that the electro-magnet does not respond. With the local source of electricity we can do away with a great deal of electric track construction which would make a complex system. We do away with the complications at switches and cross-overs. The



storage battery is a very small one, but it carries the car through emergencies, and will even bring a car back to the station in case of breakdown. Now, that battery is not used as an ordinary battery is used on storage battery roads. I want to call attention to the difference in this way. On the storage battery roads we expect one set of batteries to carry our car about 20 miles before it is recharged again, and experience has shown that this is too much. There has not yet been any battery that could stand such a long run continuously. Now, we do not expect this battery to do any such great feats. We only expect it to carry us at the maximum one-quarter, one-eighth or one-tenth of a mile. So we are using a very small battery. Only one thing is necessary, and that is to get back again or pick up the magnet after losing contact. Fortunately we found such a battery, and the battery we are using does not weigh anything at all like the batteries such as storage battery cars usually have; consequently we do not call that any objection. The reason why Mr. Johnson and myself adopted this particular kind of system is this: the slotted conduit is all right provided it is built deep enough to suit the climate. In Europe we can get along with a fairly shallow conduit because the conditions are not so severe and the streets are in better condition. In Washington we ought to be able to get along with almost the same as they do in Europe, but in New York we need something extremely substantial, and we need the conduits very deep and well drained. There is no question in my mind, if we take the conduit in 125th street, which I understand is very deep, that we can put the trolley wire in there and make a success of it. But the problem is to get a system for a city that is cheap enough, and that is the reason we abandoned the open-slot, because we thought the cost would necessarily be great, due to the enormous size of the conduit. We adopted the switching device which we have—I mean the electro-magnet—for the simple reason that the electro-magnet has shown itself to be positive. We have seen this in our telegraph instruments. We are ready now to put the system in for \$30,000 per mile, double track, which is cheap enough.

Mr. SACHS: I would like to ask Mr. Lundell what is the voltage between the contact rail and the track, which I understand is the return.

Mr. LUNDELL: We average 300 volts. On the first experimental road we used 300 volts. If we increase the voltage we have necessarily got to have better insulation. And I think that between 300 and 400 volts is all we ought to use in conduit insulation.

Mr. SACHS: Does that \$30,000 mean double track, ties, rails and everything complete?

Mr. LUNDELL: No. That means what we put in—the electric part; I failed to explain that. The cost of \$30,000 simply includes the electric equipments, without rails or ties.

Mr. SACHS: In figuring the cost of a road and comparing it with cable or open conduit, it is necessary to go from the bottom up, for the reason that in the open-slot conduit when you figure the cost there you start right from the bottom and go up, and when you say \$50,000 or \$60,000 or more per mile, it means from the beginning to the end. I think, therefore, that the surface contact system, or any system, or even the trolley, should be compared with the open-slot conduit in that way—we should start with the beginning, and consider rails, ties, and so forth, in the entire cost. But, in my mind, you cannot put down a good track for less than \$10,000 per mile. Perhaps Mr. Fairchild can give us a better figure on that. Now, then, simply add \$10,000 for single tracks, or \$20,000 for double tracks—add \$20,000 to the \$30,000 and you get \$50,000 a mile. Then add the increased cost of each car equipment in the way of storage batteries, because the motor equipment is the same whether you see a single motor or a double motor. But there is another point there which I want to bring out and that is this: That the system I showed this evening, which was tried at Coney Island, gave me quite an experience with surface contact roads. Whether they have storage batteries or not does not enter in the problem. The point about it is this: It is a question of dollars and cents and how much current is lost by leakage. You find that on a line like the Broadway road or the Third Avenue road, where the cars run on very slight headway, your current would be going and you would not know where it went. The next question, and an important one, is simplicity and positive action. You can never get actual positive action and safety in any system in which there exists a large number of moving mechanisms located in the roadbed. No matter how positive they are, there is always the chance of uncertainty. It may be one in ten thousand or one in a million, but that one in the million may block your whole system.

Mr. STETSON: I would like to ask Mr. Lundell whether as a business matter he considers it good policy to carry around in his cars, at five cents for every 150 pounds, a large storage battery to provide for the connection and picking up, when possibly that storage battery can be done

away with? I think it would be very much cheaper to have a pair of horses to draw the car back than carry the batteries in cases where it is not necessary.

Mr. LUNDELL: We never call upon a storage battery except at the time we wish to use it. I find that by actual measurement with ten passengers in the car it makes but very little difference as far as the storage battery is concerned. The battery weighs but 1,500 pounds and takes care of itself. It is always sealed up and being charged continuously, and we never look at it.

C. J. FIELD: It has been my experience with street railway people that it is not a question of investment with them, but it is rather a question of where they are going to stand when they have spent their money. I find street railway people the most liberal I have had to do with in the electric business. You are meeting men who are spending millions, and who are ready to spend it liberally provided they are getting a fair showing, that they are getting something for their money, and can see where the dollars and cents will come in on their return. I would like to make a few suggestions on the comparative operation of cable and electric roads. I have been gratified to find that in the operation of street railroads in this country the electric shows a lower operation rate per car-mile. In a good cable road the cost is in the neighborhood of two cents per car-mile. We started a few years ago with electric roads at a cost of five or six cents per car-mile, which, compared with our horse roads at ten and eleven, we thought very good. We have got down now to power stations furnishing power and charging in ordinary repairs in the vicinity of one cent per car-mile. It is not generally known for the reason that so many street railway companies want to keep matters for the public. It has come down to even under one cent per car-mile. But the fact remains that as we go along and see the difficulties we have to contend with, and as time goes on, I think where we have heavy traffic in certain conditions we have got to have a conduit. It is not going to compel the trolley to get out of the way any more than the trolley compels the horse-car roads to apply for electric franchises. It is going to raise difficulties with some of the companies that have a clause in their franchise compelling them to put in an electric conduit when a success. But treating it fairly and squarely, there are two cities in the country where it is going to put out the overhead trolley. I believe in overhead trolley; well built and well equipped, in certain cases, it is a thing of beauty and a joy forever. And such a road put in as it has been put in in some cities has cost a good many thousands of dollars per mile. Some of you might be surprised if I should say that in one city where I had the pleasure of establishing a system the cost of our system was up to \$70,000 per mile for a single track. We had the pleasure there of paving the street from curb to curb. That was about \$20,000, but that is of course an exceptional case. In regard to the different points of the conduit: The Siemens-Halske conduit which was used at Budapest has been modified by the American managers in this country in some radical form which has not been spoken of to-night, and I know they have got their conduit in shape which would fill all the requirements of the American conditions. The conduit is a double one and lies between the two tracks, but each track is really a separate conduit, both of which, however, have a common yoke and manholes. I think the conduit which is going into New York here may be said to be a modification of the Siemens-Halske conduit. I understand the Siemens-Halske Company had the contract partly agreed upon and it came to the question of patents and they could not agree. On the question of closed conduits I think that of Messrs. Johnson and Lundell a good system. It has strong points of merit about it, and I think I can say it will perhaps be adopted for trial on some roads. The strong argument in favor of that form of conduit is that you have no uncertain element as you have with the open-slot conduit. It is not a question of direct cost of the open conduit, but the question of clearing the right of way for the conduit structure, which can vary from 100 to 300 per cent. of the cost of the conduit itself. A closed conduit gets rid of this item of uncertainty. That uncertain item is one that is going to make a company hesitate in going ahead with any open-slot conduit system. Too many pipes buried below the depth of the ties make this item very large sometimes. The voltage is also an important question. I believe in putting in enough copper, because a little more copper does not cost so very much and we save in operation. On the question of the three-wire system that is being tried in some cases overhead, I think that on a heavy system there is going to be a strong objection to it. Those of us who have had any experience with the Edison three-wire system and keeping it in balance, I think will appreciate in a measure the difficulties of balancing a three-wire railway system. And particularly if we divide it up between the two tracks as has been shown. I do not think any open conduit is going to be a suc-

cess except with the double trolley wire. If we have a single trolley conduit we can easily get a short circuit between the wire and the structure. The saving in copper would not be so material in using a single wire when we consider the disadvantages.

E. A. MERRILL: I have seen the three-wire system in operation, and I think the balancing is a great difficulty. Now, on the Bangor road they have a three-wire system of distribution, and frequently in going up steep hills on one side of their system they would have to take off the trolley and put it on the other wire. How much it is out of balance nobody knows. The same thing, I believe, was tried in Milwaukee. There they found the same question of balance. There they have water power and plenty of reserve, and they did not notice it so much. I know a road, however, where they did notice it and had to abandon it. They also found a great deal of trouble with leakage. I would like to ask Mr. Lundell a question about his system—if the contact sections that were insulated were very far from each other. Now, I should think that under certain conditions of weather the insulation between two pieces of contact rails would be so low that there would be sufficient leakage to make the section connect with the rail under the car and in that way leave exposed a live section in a position to shock horses and people, and make a very considerable amount of trouble. The question of copper, it seems to me, is another controlling item. The difference between 300 volts and 600 volts is in the ratio of 9 to 36, or four times. And it is not a very large road that puts in an investment of \$100,000 to \$150,000 in copper; and when you come to multiply that by four you are getting up very high, and the question of the amount of copper that is found necessary to give any results to-day is a very serious question.

Again, the storage batteries in the Johnson and Lundell systems are another one that presents many serious features. The question of weight itself does not seem to be a serious one, when you take it as to passengers, but when you come to add 1,500 to 2,000 pounds to the weight of the car you have added a considerable item. Another thing is that the batteries are used a very short part of the time. Current must be passing through them and they must be effected by the variation of the voltage which would occur along the road. This fluctuation of the voltage may at times give your batteries too much, while at others the batteries may be feeding into the line. In either case the operation of the batteries under such conditions would perhaps be affected.

Mr. LUNDELL: The first question is about the leakage between rail and rail. That is a question which we thought of before, and we not only cut out the sectional rail from the line, but we connect it to the ground. The distance is very short between rails. We are, however, going to use four feet space between for the reason that we will put a long brush underneath the car. We may just as well throw away that much sectional rail. As to the voltage, we run at 300 and sometimes it falls to 275, while the batteries practically are about 280. If we had an enormous battery then it would be true that the battery would actually feed into the line, but where we have a small battery it is not the case; the battery and line act together.

Mr. FAIRCHILD: The statement made by Mr. Field, as I understood him, does not agree with my observations, and perhaps others understood him as I did. I understood him to say that electric and cable roads in certain conditions in some cases were operating at about the same cost per car-mile. He referred only to power. As far as my observation goes cable roads, as a general thing, under the same conditions, operate cheaper than electric roads as a whole. This is referring only to power.

Mr. FIELD: I think I know of one road that has cable and electric cars both, and the electric cars are showing on total expense almost the same as the cable, and the expenditures are such that they are going to abandon their cable lines.

The PRESIDENT: I want to state with reference to the use of storage batteries, it being a subject with which I am somewhat familiar, that there might not be so much fear and trembling concerning the battery used in the Johnson and Lundell system as has been asserted this evening. I am familiar with most of the storage batteries. The storage battery as employed here may help you out under various conditions. But I do not wish to pronounce myself either in favor or against the surface contact system, because it is a matter I do not know enough about.

Mr. SACHS: Mr. Stetson and Mr. Fairchild also have both compared the conduit construction to the cable. Mr. Field, on the other hand, has shown us that he, by actual experience, knows of roads, and has installed roads and operated roads in which the operating expenses are—that is, as far as power goes—less than the cable, and that the total expenses, including interest on capital invested and everything, are the same. Now, then, if the operation as regards



the cost of power is the same the total operating expenses would certainly seem to me not to come above that of cable in an electric conduit system. Although our track equipment includes car equipment and would perhaps be higher with the electric system, still we must consider the power-house, which is really the heart of the whole system; and as we well know, the power-houses of the Metropolitan Traction Company and the Third Avenue road have not been inexpensive toys, mainly on account of their location and the immense cost of the machinery necessary; whereas with the electric system we might have gone up into the woods and burned anything we could find and get the same results.

I do not believe that the electric conduit railway will at all hurt the interests of the electric traction companies, and believe that both it and the trolleys have their own respective fields, separate and distinct from one another.

But the point I wanted to bring out, and I thought I did bring out, is that the conduit will be an expensive affair, and being expensive will be only used in the larger cities and by large corporations.

Now, in regard to the location of the insulator and wire, I believe it is much better to hang the insulator high and dry in the conduit than to support it from the sides or bottom. As regards underbearing contact and the expansion and contraction of the contact wire, I would say that if we used ordinary copper wire supported at intervals, even though it may sag between the insulators at one time of the year or be taut at another, the underbearing trolley will always push up against it and conform to the irregularities.

As regards surface leakage in the insulators, that can be done away with by having a long surface and also by having as few insulators as possible. The longer the surface the less leakage.

In regard to the gas in the conduit, I cannot say very much, because I have never seen the phenomenon in the way that Mr. Fairchild speaks of it.

Now, I would say in regard to the alternating system, I think that it is coming to the front, and I think that we can produce an alternating system of traction, and at a low cost of copper, by putting in the alternating current and using some form of gear, or by directly connecting the alternating current motor to the car axle in some way.

As regards the surface contact system, I want to answer Mr. Lundell that there is just this one point: In my operations with the system which I have described I have found something which is more important than the leakage, and that is the uncertainty of the cutting in and out of the sections and the action of the switching devices. There is always the liability of leaving one of the sections alive. If it is not caused through leakage from that section which may be alive under the car, it can be caused in several other ways, and it is a matter of possibility, in fact probability, that a section may be left in connection with the feeder, caused by the failure of a magnetic switch or relay to act. I think that even though this may be but a very slight possibility, it becomes an element of the greatest danger on any road over which there is considerable traffic and which passes through a crowded thoroughfare.

Mr. Field brought out an excellent point, that where the conduit system is wanted it is not a question of cost. Something is wanted that is sure to operate after it is put in. We have not got an operative cheap conduit system, although the various surface contact systems are comparatively cheaper than the open-slot conduit, but I believe we can install an open-slot continuous wire conduit which, although quite expensive, will be operative.

As regards the uncertain element which Mr. Field spoke of, that is true in a great many cases, but in the construction which is being put down in Lenox Avenue by the Metropolitan Traction Company they have practically a clear road. In either case it would be exactly the same with the cable or the electric conduit, between which, I think, we must make comparison.

In regard to the two wires, I believe that is unnecessary. I think we can use a single wire and structure by adopting the three wire distribution. I think in the form I have shown it, while it may not be perfectly balanced, still various devices can be arranged to keep the system in balance. I again want to make mention of the alternating current. Here we can get an extremely low voltage on the supply wires, from which the leakage occurs, while we can distribute the current economically at a very high tension; that in such a system where we can use 100 volts or so on supply wires we can certainly very readily use a single wire and the structure.

The storage battery, as spoken of in the surface contact system, I think is simply adding another item of uncertainty and additional complication. The storage battery strong enough to pick up the magnet is used and has been used by myself and by many before me. I do not see where the necessity comes in of putting in a large storage battery, weighing 1,500 pounds or over, for the purpose

spoken of. I think if we want to use a storage battery we should simply have it strong enough to pick up the magnet after the contact is lost.

I do not mean to say that the surface contact system cannot and will not work, because I believe with an exceedingly low voltage a system may, perhaps, be devised which would be operative under certain conditions, but I believe that that system must be absolutely simple and be free from the many small mechanisms which are inherent in the electro-magnetic class to which Messrs. Johnson and Lundell's systems belong. I think that a much simpler cutting-out mechanism can be devised, and as an example of a simple system of cutting in and out the sectional contact, I would again like to make reference to the Linff and similar systems which I have shown this evening.

The alternating system here also presents various features. I believe that success may possibly be attained by the use of an alternating current reduced to a very low voltage at the surface contact and by the adoption of some exceedingly simple and absolutely positive method of cutting in and out the sections. But even then such systems would not be generally applicable, and I believe that a perfect and operative system of this kind will be but very little cheaper than an open-slot conduit under the same conditions.

In closing, I would like to say, and I think there are many who will agree with me in saying, that an open-slot conduit system can be designed and operated, but that it is simply a question with those who are to put up the money. From what I can see I think this item is the principal one which has prevented and still prevents the installation of a conduit system.

(Concluded.)

#### CANADIAN NOTES.

(From our Special Ottawa Correspondent.)

**Toronto, Ont.**—The city engineer is investigating the charge of the overcrowding of the street cars.

**Hull, Que.**—The Railway Committee of the Quebec Legislature has passed the bill granting a charter to the Hull & Aylmer Electric Railway.

**Ottawa, Ont.**—The Postmaster-General, who recently visited the United States to study, he says, the conveyance of mails from the different railway stations to the postoffice in the different cities by electric cars, says he finds the system in Brooklyn the best, and will recommend its adoption in Canada.

**Montreal, Que.**—The road department has taken nine actions against the electric street railway company for overcrowding their cars.

The Citizens' Light and Power Company are putting in a 1,200-h. p. plant and will supply power to the electric road it is proposed to construct between this city and Lachine.

**St. John, N. B.**—The solicitor on behalf of the New York bondholders in the Consolidated Electric and Street Railway has applied for a part of the allowance from the recent sale of property to the company now operating the street railway on the ground of a collusive combination between the solicitors interested in the allowance made for costs.

**Hamilton, Ont.**—The City Council is now considering an amended offer from the Hamilton Radical Railway asking a bonus of \$300, to be divided as follows: \$100,000 for the line from Hamilton to Woodstock; \$75,000 for the line from Hamilton to Shaw Station; \$50,000 for the line to Guelph, and \$75,000 for the line to Berlin. With the exception of the Woodstock line it is proposed to operate the several roads with electricity.

#### COMMENTS AND VIEWS OF CONTEMPORARIES.

**FRESH AIR.**—Don't let the motorman monopolize all the fresh air on street cars. Give some to the suffering passengers within.—*St. Louis Star Sayings.*

**WHAT THE TROLLEY HAS DONE IN DETROIT.**—Detroit has thus far been peculiarly fortunate in the use of the trolley. The only accidents which have resulted have been mainly due to carelessness on the part of those walking the streets, and not of a kind which could be prevented by foresight on the part of those operating the lines.—*Detroit Free Press.*

**CONTROL OF CARS.**—The railway companies owe it to themselves to impress upon their motormen the importance of keeping their cars under control. With the horse cars many accidents were averted by the instinct of the horses, which often drew back when collisions seemed imminent or when pedestrians were in danger of being run over. Electric cars have no such sense, however, and the safety of the passengers and persons crossing the tracks or in the way of the cars rests with the intelligence, capability and discretion of the motormen.—*Philadelphia Public Ledger.*

**THE SMOKING CAR.**—The interior of a smoking car on the elevated road in Brooklyn during the rush hours is a sight that would cause John Burns to sink his head in deep and meditative study. Though the other cars may be only half filled, the smoking car is jammed to suffocation. Among its passengers are workmen in blouses, stevedores and truckmen in heavy coats, and Italian street laborers, reeking with dirt and indescribably offensive to the olfactory organs of the respectable people in the car. Every man who is at all intoxicated, particularly ragged, or in any other way objectionable is promptly directed toward the smoking car by the train hands. Mixed in with this heterogeneous and repulsive crowd of passengers are a few cigarette-smoking dudes, pipe-smoking Anglomaniacs, and a few well-dressed men who puff their cigars rapidly, and escape into one of the other cars as early as possible.—*New York Sun.*

**DR. CONAN DOYLE ON AMERICAN STREET RAILWAYS.**—In Chicago the cars are run with scarcely any regard for the rights of passengers. They are crowded into the cars, and a seat is out of the question. I understand the company pays 24 per cent. dividends, and when this is considered it is simply outrageous that the road should not be run for the comfort and convenience of the passengers. Another thing that would not be allowed in England is the manner in which the railroad companies tear up the streets here whenever they choose. Why, this morning I was jolted over hills and obstructions while driving through the streets, and received such a shaking up that I thought I was a die in a box. Such a thing would not be tolerated for one hour in England, in these days when it is possible to build street railroads without doing that sort of thing. Your elevated road is a marvellous improvement on our underground roads, and it is a real pleasure to ride on it. The cars are airy, and there is plenty of light and fresh air to be had.—*New York Sun.*

#### FINANCIAL NOTES.

**Newton & Waltham (Mass.) Annual Report.**—The annual report of the Newton & Waltham Street Railway line shows the following figures: Gross income, \$3,478.28; operating expenses, \$25,262.03; net income, \$8,216.35; net income after all deductions are made, \$539.35; total number of passengers carried, 491,718.

**New York, N. Y.**—It is stated that German capitalists are endeavoring to secure control of the Second Avenue Railroad Company. An offer to purchase the company's stock at 200, which is above the market price, has been made, according to report. The company operates 28 miles of track and last year it carried over 19,000,000 passengers.

**Elgin, Ill., Company Assigns.**—The Dundee Rapid Transit Company has made an assignment to W. H. Thompson. The schedule shows assets of \$31,800 and liabilities of \$15,583. The personal assignment of the president, E. C. Hawley, last month affected the credit of the company. It is capitalized for \$50,000, but only about one-third has been paid in.

**Proposed Consolidation in Taunton, Mass.**—It is reported that the owners of the Taunton Electric Railway Company held a meeting in New York recently, where some of the heaviest owners in the Taunton, Fall River and New Bedford roads live, and the result is a petition to the Legislature to allow the Taunton company to change its name to the Bristol County Electric Railway Company, to allow it to increase its capital, mortgage its property and to absorb the Globe Street Railway Company of Fall River and any others in the same section which it may desire to secure possession of.

**Earnings of the Columbus (O.) Railway.**—The gross earnings of the Columbus Street Railway Company for November aggregate \$46,472, an increase of \$5,322 compared with the same month last year, while operating expenses decreased \$1,279 to a total of \$22,903, or less than one-half the gross. Net earnings were, therefore, \$23,568, an increase of \$6,601. As fixed charges were \$14,700, a surplus of \$8,867 remained, which was \$5,699 larger than in November, 1893. For 11 months net profits amounted to \$110,368, an increase of \$62,351. In 1893 the proportion of operating expenses to gross earnings were 61.4 per cent.; for 11 months this year the proportion has been 47.6 per cent.

**Third Avenue (New York) Stock Issue.**—President A. J. Elias, of the Third Avenue Railroad Company, has issued a circular calling for a special meeting of the stockholders for Dec. 26, for the purpose of authorizing an issue of new stock to the extent of \$2,000,000, making the total \$9,000,000. The stockholders will be allowed the privilege of subscribing for the new stock at par, in proportion to the amount of their holdings. The proceeds of the new issue will be devoted to the payment of the floating debt of the company, which was



created by the construction of the cable road and its equipment, and to such further expenditure as may be entailed in the completion and construction for kindred purposes.

**Consolidation in Pittsburgh.**—The following dispatch from Pittsburgh, under date of Dec. 11, appeared in the daily papers: The details of the biggest street railway consolidation ever effected in Pittsburgh were arranged to-day. The new system, under the name of the Second Avenue Traction Company, will be in operation by Jan. 1, and has a paid-in capital of \$5,000,000. There are four branches, with a total of 60 miles of track. The main line extends from Market street, Pittsburgh, to McKeesport, a distance of 10½ miles. This distance will be traveled in 45 minutes and the fare will be 20 cents. A power-house of 22,000 H. P. is now nearing completion at Glenwood. On the line the company has purchased is a large farm, which will at once be changed to a park. James D. Gallery is president of the new company.

**Lynn & Boston Earnings.**—It is understood that gross earnings of the Lynn & Boston Railroad Company for November have increased about \$10,000 over last year. October earnings likewise showed an increase of \$10,000. Since last April the company has had 100 men at work on repairs at an expense of \$10,000 a month, all which has been charged to operating expenses. President Breed estimates that the road will be operated this fiscal year for 58 per cent., and that the company can easily earn \$1,250,000 gross, and possibly \$1,350,000, if earnings continue to increase. C. W. Wickes, president of the North Shore Traction Company, says that his company paid \$90 cash per share for the Lynn & Boston stock, and \$115 to \$130 for the others (Essex Electric, Lynn Belt and the Naunikeag) which form the traction company, and that the cost of electrically equipping these properties was \$3,000,000.—*Philadelphia Stockholder.*

**Disposition of Bonds Enjoined.**—Judge Morton on December 7 granted a temporary injunction restraining the American Loan and Trust Company from disposing of bonds or proceeds of bonds sold, and at present held under an agreement relative to the Great Western Manufacturing Company, of Duluth, Minn., which recently passed into a receiver's hands. It was stated in court by S. L. Whipple, counsel for the Eastern Electric Cable Company, a creditor of the Great Western Company, that there has been an issue of \$100,000 in bonds secured by the plant of the company in Duluth. These bonds were held by the trust company, and \$80,000 have been sold. There are \$20,000 remaining, and Mr. Whipple did not wish to run any chance of the bonds or their proceeds being turned over to the receiver of the Great Western Company or to any one else. It appearing that notice of the suit had been given the trust company, which did not appear, Judge Morton issued the temporary injunction. Mr. Whipple's bill further asks that the trust company sell the bonds later and devote the proceeds to the payment of plaintiff's claim.

## NEW INCORPORATIONS.

**Model City, N. Y.**—Niagara Engineering Company has been incorporated with a capital stock of \$10,000. The promoters are, L. B. Dorr, C. C. W. Nobles, L. E. Squier, of Buffalo, N. Y.

**Wymore, Neb.**—Wymore & Blue Springs Transit Company has been incorporated with capital stock of \$25,000. The incorporators are A. Stewart, H. C. Van Buskirk, S. T. G. Moore and S. D. Ringler.

**Terre Haute, Ind.**—The People's Electric Railway Company has been incorporated. The capital stock is \$100,000. The promoters are Andrew I. Crawford, Jas. P. Crawford, Geo. I. Hammerstein, Edwin Ellis, Herman Hulman, Sr.

**Bucyrus, O.**—The Yawger Construction Company has been incorporated with a capital stock of \$40,000, to undertake railway, street and municipal construction. The promoters are J. L. Leonard, Bucyrus, O.; A. J. Yawger and Geo. C. Terry.

**Sidney, O.**—The Sidney Electric Railway Company has been incorporated with a capital stock of \$100,000 to construct and operate an electric road in Sidney, thence to Loramies and thence to Minster, O. The promoters are: Charles Timeus, Jno. Loighlin, I. H. Thedieck, William Piper, Jno. H. Wagner.

**Niles, O.**—The Mahoning Valley Electric Railway Company has been incorporated with a capital stock of \$150,000 to operate street railways (electric or other motive power, except steam or animal) in Niles, Girard and Youngstown, and on highways connecting these places. The promoters are C. P. Clapp, R. G. Sykes, Arthur A. Anderson, G. E. Herrick, Andrew Squire, John E. McVey.

**Albion, N. Y.**—The International & Oak Harbor Railroad Company has been incorporated to construct a surface road to be operated by steam, elec-

tricity or other power, from Albion, Orleans County, along Old Orchard Creek to Lake Ontario; distance, ten miles. Capital, \$175,000. The directors are: George A. Wingate, Jacob Cole, William H. Hazzard, of Brooklyn; Robert Avery, James H. Cox, of New York; Dwight S. Beckwith, Charles E. Hart, William Hallock, George W. Barrell, of Albion.

**New Brighton, Staten Island, N. Y.**—The Staten Island Electric Railroad Company has been incorporated for the construction of an electric road, 22 miles in length, in the villages of New Brighton and Edgewater, Richmond County. The capital stock is \$1,250,000; directors, George B. Harvey, Milton L. Bauden, J. J. Wals, William H. Hurst, J. T. Mills, Eugene Leland, A. G. Hummel, J. Henry Haggerty, of New York City; John A. Hilton, Jersey City. The principal office of the company will be in New Brighton.

**Traverse City, Mich.**—Traverse City, Peninsula & Old Mission Electric Railway Company has been incorporated. The capital stock is \$160,000. The road will be 20 miles long and will run from Traverse City to Old Mission via Bower's Harbor, along the east shore of the west arm of Traverse Bay. Both freight and passengers will be transported, and an outlet will be furnished for the entire fruit belt of that region. The incorporators are: J. G. Ramsdell, L. K. Gibbs, J. O. Crotser, Ralph Case, J. G. Ramsdell, Anton W. Bartak, W. P. Croster, Charles Wilhelm, W. H. Foster, Elsworth Clark, Frank Vortruba and Harry L. Gibbs, all of Grand Traverse County.

**Trenton, N. J.**—The Trenton Traction Company has been incorporated. The capital is to be \$500,000, consisting of 10,000 shares, of which Thomas C. Barr, of East Orange, holds 4,000 shares, Edward J. Moore, of Philadelphia, 4,000; George B. Jenkinson, of Newark, 200; Ferd. W. Roebing, of Trenton, 200; John L. Kuser, Trenton, 800; Hugh H. Hamill, Trenton, 200; and Francis M. Eppley, West Orange, 200. The company is organized to control the Trenton Electric Railway lines and form a connecting link in the line between New York and Philadelphia. At recent meetings of the stockholders and directors of the Trenton company all the stockholders and directors favored leasing their lines to the new company except Samuel K. Wilson, who owns one-third of its stock, and is a heavy indorser. He insists that the new organization assume \$80,000 of notes given, on which he is an indorser, and also assume \$80,000 of floating indebtedness. Because of Mr. Wilson's stand further negotiations will be necessary. If his objections can be overcome the injunction proceedings before the Chancellor will be discontinued and the lease effected.

## NEWS OF THE WEEK.

**Freeport, Ill.**—The operation of the electric street railway has been begun.

**Mt. Vernon, N. Y.**—The North Mt. Vernon & Chester Hill Horse Railway has been purchased by a syndicate of New York men.

**Jersey City, N. J.**—The Consolidated Traction Company has been indicted for running its cars at a speed higher than is allowed by law.

**Waukesha, Wis.**—The contract for constructing the Waukesha Beach Electric Railway has been awarded to C. E. Loss & Co., of Chicago.

**Chicago, Ill.**—A permit has been issued to the Metropolitan Elevated Railway Company for an extension of its line on the Humboldt Park branch.

**Greensburg, Pa.**—The borough council has granted a franchise to the Greensburg, Jeannette, Turtle Creek and Pittsburg electric street railway company for right of way through Greensburg.

**Hot Springs, S. D.**—A franchise has been granted by the city council to Pennsylvania capitalists for an electric street railway through the city. It is to be completed and in running order by July 1, 1895.

**Niles, O.**—The Trumbull Electric Railroad Company, which comprises in part Cleveland capitalists, has made application to the County Commissioners for a franchise to connect Girard with its present terminal at Niles.

**Media, Pa.**—The line of the Delaware County & Philadelphia Electric Railway that follows the old Baltimore Pike and is parallel for many miles with the Media & West Chester Street Railway, has been opened for travel.

**Chicago, Ill.**—Two West Side cable trains came into collision in the Washington street tunnel on Dec. 11. A dozen passengers among the hundreds who crowded the two trains were seriously and, at least two of them, fatally injured.

**Mantua, N. J.**—The Camden, Gloucester & Woodbury electric road has put a large force of men at work on the extension of the line to Mantua, and should the weather remain favorable cars will be in operation by the first of next month.

**Kingston, N. Y.**—The Colonial City Electric Railway Company has asked for consent of the Common Council of the city of Kingston to build, maintain and operate a trolley system on its railway in certain streets of the town. David Kennedy is mayor.

**Dubois, Pa.**—Adjutant-General W. W. Greenland is interested in having the Beech Creek road extended from Dubois to Franklin, where it would connect with the Lake Shore, and form a trunk line to include Clarion. The general says the extension will undoubtedly be made.

**South Williamsport, Pa.**—The South Williamsport Railway Company has secured a charter permitting it to extend its line from the present western terminus at Maynard street on through to Du Bois. The company have decided to begin the work of construction next spring.

**Oregon, Ill.**—The directors of the Rock River Electric Railway Company have decided to complete the survey from Oregon to Rockford, and secure the balance of the right of way between Rockford and Dixon. It was also decided to commence interesting capital in the enterprise so as to commence work by next spring.

**St. Louis, Mo.**—The City Council of Brooklyn has under consideration a franchise for the construction of an electric railway in Brooklyn, from the city limits of East St. Louis to and through Brooklyn. L. M. Jenks, S. Meyers, John Schroeder, of East St. Louis, and Henry Robinson, of Venice, are interested in the project.

**Albany, N. Y.**—It is rumored that should the proposed new bridges across the Hudson at Bath and between Green Island and Troy be erected, an electric railroad belt line will be constructed between Troy and Albany. When the new bridge from Troy to Green Island is built the tracks of the Troy City road will be laid across it.

**Bridgeport, Conn.**—Employees of the New York, New Haven & Hartford Railroad last week cut the wires of the Traction Company, which ran under the tracks of the Fairfield avenue crossing. It is stated that the trouble will be in all probability avoided by the Traction Company taking its wires from the bridge, and stringing them on its own poles.

**New York, N. Y.**—At the last meeting of the Rapid Transit Commission it was agreed that the best plan for the board to pursue at present was to arrange a conference between its engineer and the chief engineer of the New York Central, in order to determine to what extent the proposed road will interfere with the structure of the railroad company.

**Rensselaerville, N. Y.**—It is reported that a company has agreed to build and operate an electric railroad from Rensselaerville to Ravena, to connect with the West Shore railroad at the latter place. All the company asks is that the people along the route will pay the costs of survey and give the right of way. The proposed line will run through the towns of Coeymans, Westerlo and Rensselaerville, a distance of 20 miles.

**Baltimore, Md.**—The Baltimore Traction Company has secured control of the Walbrook, Gwynn Oak & Powhatan Railway, which runs from Walbrook to Gwynn Oak. It is stated that the extension which connects the Gwynn Oak road with the Pimlico road will soon be completed and connections will be made so as to give the residents of that vicinity the advantage of either the Pimlico or Pike road or the Edmondson avenue line direct to the center of the city.

**Philadelphia, Pa.**—It is reported that a plan is being considered by the officials of the Pennsylvania Railroad for the construction of a trolley line between Camden and Atlantic City. As yet the matter is simply contemplated, and no details have been decided upon, although the feasibility of the scheme has been the subject of a lengthy consultation. Should the road be built, it will probably run parallel with the Camden & Atlantic Railroad. The line, it is said, has been gone over and electrical experts have been consulted.

## PERSONALS

**Mr. M. F. Burke**, superintendent of the Terre Haute Street Railroad Company, was in New York this week.

**Mr. William E. Kelly**, president of the National Water Tube Boiler Company, of New Brunswick, N. J., died last Tuesday.

**Mr. J. W. Godfrey**, general manager of the New York Insulated Wire Company, has resigned his position with that company.

**Mr. G. Blagden Hazlehurst**, general superintendent of the motive power of the Baltimore & Ohio Railroad Company, is spoken of as the probable successor of ex-Governor Bowie in the presidency of the Baltimore City Passenger Railway Company.



Mr. George B. Lindsay, a lawyer of the Delaware County bar, has been elected president of the Chester Traction Company, of Chester, Pa., to fill the vacancy caused by the death of Col. Samuel A. Dyer.

Mr. George H. Roe, president and general manager of the Edison Illuminating and Power Company, of San Francisco, died last Monday in Brooklyn. He had been ill of Bright's disease for some years and came to New York to consult a specialist. Mr. Roe leaves an estate valued at nearly \$500,000.

TRADE NOTES.

The Metropolitan Electric Company, of 186 and 188 Fifth avenue, Chicago, has recently been selling very large quantities of the P. & B. type.

The Niles Tool Works, of Hamilton, O., have just issued a pamphlet in which several of their machine tools suitable for use in street railway repair shops are described and illustrated. The company is prepared to furnish any of these machines ready for operation with electric motors if desired.

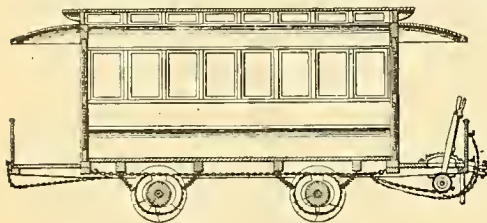
The company furnishes complete equipments for street railway repair shops.

The Composite Brakeshoe Company, of Boston, reports a constantly increasing business, November showing the largest sales by 50 per cent. that it has ever had, including orders from several large metropolitan railways. The wooden plugs used in this shoe are made from kiln-dried spruce, cut diagonally across the grain. There are advantages in using a soft wood, it being fibrous and tough. It has better frictional features, as it will not glaze over like hard woods.

RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Dec. 4, 1894.

530,088. **Brush for Dynamo-Electric Machines;** Pierre J. C. Cairon, Pont-de-Claix-Isere, France. Filed Feb. 10, 1891. Patented in France, April 22, 1893, No. 2,954, and in England Jan. 16, 1891, No. 993. The brush comprises a sheet of wire gauze, coated and impregnated with paint composed of plumbago and an adhesive substance, the coated sheet having its



No. 530,181.

main portion arranged in zig-zag folds and its outer portion wrapped about the folded portion and its free end secured.

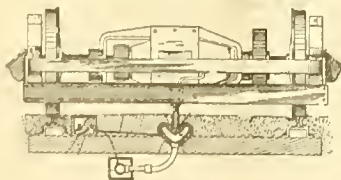
530,140. **Car-Fender;** Edgar B. Towee and Franklin S. Towne, Kingston, N. Y. Filed June 13, 1891. The main frame is provided at each side with depending rearwardly swinging bars arranged in pairs. Rods are movably mounted on the main frame and connected with the depending bars, springs being disposed on the rods and cushioning the rearward swinging of the bars. A forwardly extending hinged frame is connected with the main frame, and a hinged extension of the last-mentioned frame is connected with the rearwardly swinging bars.

530,150. **Car Starter;** Thomas C. Wright, Chicago, Ill. Filed March 19, 1891. There is a loose inner collar upon one of the axles, and two loose outer collars upon the opposite ends of the inner collar, being spaced apart slightly less than the distance between the wheels. There is a frame in which the outer collars turn, and means for sliding the frame back and forth longitudinally of the axle. A coiled spring is located between the outer collars, and attached thereto at its opposite ends there are ratchet teeth upon the outer collars, and pawls pivoted upon the frame in position to engage with these teeth. There are means for releasing pawls, and cam-shaped clutch teeth upon the outer ends of the outer collars, oppositely arranged teeth upon the axle being adapted to engage with the cam-shaped teeth. The meeting surfaces of such teeth are sufficiently inclined to enable the turning of the axle to force the said teeth out of engagement when the tension of the spring offers a predetermined resistance.

530,171. **Brake for Railway Cars;** Andrew Fahrney, Milledgeville, Ill. Filed May 21, 1891. Bars are movably secured to the under side of the car body; levers pivotally secured to the car substantially parallel with each other. The pivotal point of the levers is each nearer one end than the other, and the short end of the lever is connected with the longer end of the lever by means of a link, a shaft seated at one end of the car and adapted to be rotated. Two arms are secured to the lever, one upon each side of its pivotal point, each being connected at its opposite end with its respective bar, and a chain connecting the longer end of the lever with the brake shaft.

530,174. **Safety Guard for Street Cars;** Daniel A. Freeman, Boston, Mass. Filed Nov. 23, 1893. The guard net has its upper part mounted under the body for swinging movements, and here are the following instrumentalities: The rock shaft with the spring and the arms, which are connected to the free end of the guard, and which have lugs, the pivotally hung fender, in advance of the guard and longitudinally supported rods connected to the fender and having lateral lugs for the supporting engagements therewith of the lugs, and forwardly pressing springs applied to the rods.

530,185. **Brake for Railway Cars;** George H. Ketter and George D. Teller, Buffalo, N. Y. Assignors of one-third to George Tait, same place. Filed Mar. 2, 1891. Contractile brake shoes are suspended from the car frame and are arranged round the drum, a chain or



No. 530,192.

cable independent of the brake shoes, extending lengthwise of the car and having a loop or convolution surrounding the brake shoes. (See illustration.)

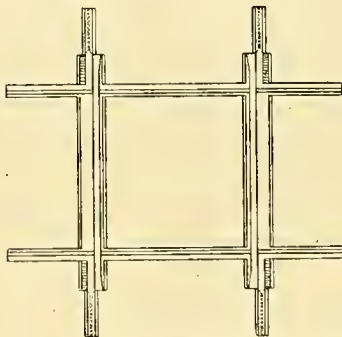
530,192. **Electric Railway System;** David Mason, New York, N. Y. Filed Feb. 16, 1890. The conductor for electricity is composed of a series of independent sections arranged end to end, each section constructed with a tubular body that is closed at its ends, and pro-

vided with a longitudinal groove extending throughout its length in which is arranged a rib or bar. (See illustration.)

530,197. **Railway Crossing;** Arthur J. Moxham, Johnstown, Pa. Filed March 30, 1891. One portion of the crossing rail is provided with a guard and a head widened on the outside, while the end portions are adapted to mate with the abutting track rails. (See illustration.)

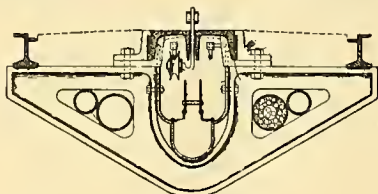
530,201. **Tongue Switch;** Henry O'Shea, Johnstown, Pa. Assignor to the Johnson Company, same place. Filed May 11, 1893. A track surface is formed on the frame of the switch and abutting the pivoted end of the tongue, forming a continuation of the surface thereupon. A holding-down plate engages the pivoted end of the tongue and lies in a pocket adjacent to the aforesaid track surface upon the switch frame, the plate being secured to the frame of the switch.

530,223. **Fender for Trolley Cars;** Charles F. Hang, Brooklyn, N. Y. Filed April 5, 1891. The hangers are below the car platform supporting sockets which open toward the ends of the car. Rectangular bracket arms are rigidly connected at their apices, rods projecting from the apices and adapted to be inserted into the sockets. Means are provided for connecting the upper ends of the bracket arms to the dashboard, fender-supporting arms connecting the upper and lower ends of the bracket arms. A transverse brace connects the lower ends of the bracket arms, and a fender-net is stretched between the supporting arms.



No. 530,197.

530,276. **Trolley Catcher;** William F. Kendt, Buffalo, N. Y. Assignor of two-thirds to George M. Mitchell and Rod McLeod, same place. Filed May 26, 1891. A stationary frame or casing has a stop or shoulder, a rotary spring drum being journaled thereon, and a detent pawl being carried by the drum, adapted to be connected with the trolley rope and engaging with the stop or shoulder of the casing.



No. 530,283.

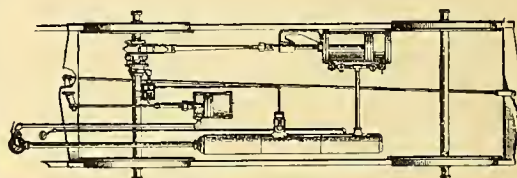
530,283. **Conduit for Electric Railways;** Michael I. Martin, Chicago Ill. Filed Feb. 7, 1891. The slot rail has a down-turned flange, a substructure therefor having two upturned flanges forming a socket adapted to receive the flange of the rail and provided with a shoulder presented downward. A key inserted in the socket engages the flange and shoulder. (See illustration.)

530,286. **Electric Tramway;** Heinrich Schwiager, Berlin, Germany, Assignor to Siemens & Halske, same place. Filed Dec. 22, 1891. Patented in Germany Dec. 30, 1885, No. 37,255; in Austria-Hungary Aug. 7, 1886; No. 31,294-35, and No. 2,750, and No. 63,587 XX, 2,733, and in England Aug. 20, 1886, No. 11,003. Claim I. reads: "In an electrical railway, the combination with a channel or conduit, and means for conveying current from a source of electricity; of contacts arranged within the conduit and in electrical relation with said means; and a series of oppositely arranged yielding guards or protectors within the conduit, between which a traveling device from the car is arranged to pass."

530,302. **Switch-Operating Device for Tram-Cars;** Augustin C. L. Engstfeld, Cleveland, O. Assignor of one-half to Lawrence Lamb, Memphis, Tenn. Filed Jan. 22, 1891. The device comprises a vertically movable casing, a rotatable switch-shifting blade supported in the casing, a dog or guide pivoted to the casing and adapted to engage the lead groove of the switch frog when the casing is lowered so as to guide the blade into engagement with the switch tongue, and means for rotating the switching blade.

530,359. **Car Attachment;** Charles K. Sherwood, Brooklyn, N. Y. Filed Aug. 18, 1891. There is a depending apron, with the dust collecting and conveying conduit carried thereby.

530,361. **Tool for L'emen's Use;** Solomon Smith and Milton B. Mishler, Ravenna, O. Filed Sept. 17, 1891. The tool comprises a lever slotted at one end and cut away on one face and notched on the other, a double hook being pivoted within the slot and a spring bearing upon the hook.



No. 530,422.

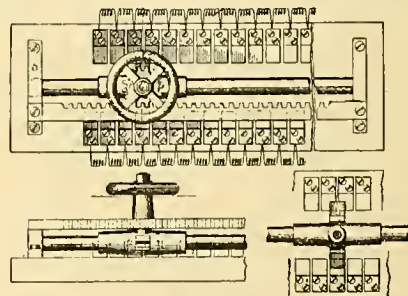
530,378. **Brake for Railway Cars;** William S. G. Baker, Baltimore, Md. Filed April 11, 1893. A truck frame is supported on the axle boxes, brake beams above the plane of the axles being arranged to slide in guides in the truck frame. Rods extend over the axles and connect the brake beams, being also arranged horizontally in the same plane with the brake beams.

530,399. **Insulator for Electric Conductors;** John H. Creskey and Joseph Locke, Pittsburg, Pa. Filed Sept. 28, 1891. This is an electrical conductor consisting of lengths of glass having asbestos-coated wires imbedded therein, the adjacent ends of the wires being welded together and covered with a plastic non-conductor.

530,416. **Self-Lubricating Contact-Bar for Electric Railways;** Friedrich W. N. E. Hayn, Berlin, Germany, Assignor to Siemens & Halske, same place. Filed May 12, 1894. This is a transversely extending contact-bar for transmitting the working current from the stationary working conductor to the motor carried on an electro-motor vehicle of an electric railway. The bar has a hollow or tubular space along its whole length or a suitable part of its length, strips or layers of wick or felt or any other suitable spongy material connecting the tubular space with the outer air. A tube connects the tubular space with a vessel carried on the car containing a suitable lubricant subjected by any suitable known means to a suitable pressure.

530,422. **Air-Brake for Street Railway Cars;** Roswell S. Judson and Gilman D. Holmes, Matawan, N. Y. Filed Dec. 20, 1893. This covers a system for street railway cars, consisting of a storage cylinder, a pump for charging the storage cylinder, an eccentric for operating the pump loosely mounted on an axle and having a half clutch, a corresponding half clutch mounted on the said axle and held thereon by feather and spline connection, a clutch operating cylinder having its piston-rod in connection with the movable half clutch, a spring to cause the parts of the clutch to mesh, a pipe connecting the said clutch cylinder with the storage cylinder, whereby a superior air pressure in the said storage cylinder will move the clutch cylinder piston against the tension of the spring and unseat the clutch, a check valve in the said pipe, a brake cylinder for setting the brakes having communication with the said storage cylinder, and a three way cock to establish communication between the brake and storage cylinders and relieve the said brake cylinder when required. (See illustration.)

530,465. **Dynamo Regulator;** John Van Vleck, New York, N. Y. Filed Oct. 8, 1891. This is the combination, in an electrical regulating apparatus, of two series of contact plates, each series being disposed in a



No. 530,465.

straight line, the plates of one series being opposite the intervals of the other, resistances interposed between the successive plates of each series, and a contact piece movable over both of said series and constructed to bridge two of said plates of one series while bearing upon one of said plates of the other series. (See illustration.)



# Street Railway Gazette.

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**Sliding Contact Frame.** Few persons, we fancy, will agree with Mr. Preller in his belief in the æsthetic appearance of the contact frame used instead of the trolley wheel on foreign electric cars. This device may be useful, but it is hideous enough to be an invention of the adversary. Mr. Preller's paper, which we publish in this issue, contains a number of good points, but his commendation of the "lighter and more pleasing" sliding frame is not one of them.

**Competition of Trolley and Steam Roads.** A steam railway opinion of country electric roads is presented elsewhere in this issue. The prediction is hazarded

that these lines, especially if they are designed to transport freight as well as passengers, are likely to prove disappointing to the public which they are designed to serve when the attempt to compete with steam roads with their "spacious cars, high speed and regularity of service." For some reason or other these do not appear to us to be characteristics of the ordinary local steam railway service in country districts. If they were actual features these rural electric railway projects would not be springing up on every hand; capitalists would not put money into them, and franchises with privileges to cross tracks at grade would not be secured with so little difficulty. The fact is that country electric lines as a rule have not up to the present time proved disappointing to the public; very far from it, though it is true that they have not been in all cases remunerative to their owners. It may also be stated as the fact that when trolley lines and steam roads have, up to the present time, come into competition the former have not been the sufferers.

**Electric Braking of Motor Cars.** The energy of a moving car if it is properly applied is much more than sufficient for braking purposes. This power is effectively used in the familiar momentum brake as well as in most forms of electric brakes. When the electric car was introduced it was persistently remarked that the act of bringing it to a standstill would not be the wasteful operation that attended the use of brakes on all other forms of cars, as, it was pointed out in so many papers, the motors could be converted into generators and theoretically give back power to the line while bringing the car to a stop. Just why this principle, so attractive and feasible in theory, has not come into practice is explained by W. Nelson Smith in his article on electric braking which appears elsewhere in this issue. Mr. Smith discusses and explains the method of electric braking that consists of converting the motors into generators, and then providing a local circuit in the car to dissipate the energy of stopping instead of attempting to transmit the energy away from the car. This braking action which may be considered inherent in the double motor equipment, although with proper arrangements the single motor equipment may be used in the same way, has never before, so far as we know, been so satisfactorily and adequately explained. The matter of electric braking, in fact, is one that has not received a liberal amount of attention from those that have develop-

ed electric railway equipments, though it affords a wide and promising field for inventors. The moving car furnishes the power; there is no doubt this can be converted into electricity easily; the only question is the best way of utilizing it to check car speed. The electric brake has many decided advantages; first of all its use throws no additional load on the power station, and it can be applied in such a way as to produce the greatest braking effect for the amount of power used. At the same time the electric brake cannot be considered so reliable as the friction brake under all circumstances. The brake that depends for its action on the energy of the moving car cannot, for example, lock the wheels and hold a car if, when it is descending a grade, the trolley current should be cut off.

**Rooms for Street Railway Employees.** All enterprising street railway companies are now making provision for the

comfort and convenience of their employees during the hours when the latter are not engaged in their work. A car barn that does not contain rooms set apart for the especial use of the men would be considered incomplete and very much out of date at the present time. The substitution of mechanical traction for animal power has, without a doubt, led to the more considerate and liberal treatment of employees. A driver of a horse car was on a very low plane as a workman; he needed no large equipment of brain or skill; but the man who is in charge of a cable or an electric car occupies a very different position. He must be a man of intelligence, and must possess no small degree of manual skill, especially if he happens to be employed in a large city. As a trained and skillful workman he can demand, in fact he will be granted voluntarily, considerate treatment by his employers, that his predecessor on the platform would not have dreamed of receiving a decade ago. A great many cities could be named at random where companies have expended considerable sums of money to promote the comfort of the men in the arrangement of large, airy, well-furnished reading-rooms and lounging-rooms, such, for example, as those that may be found in Pittsburgh, New Orleans, Milwaukee, New York and St. Louis. The Metropolitan Traction Company proposes to go even further in its efforts to promote the interests of its employees. A floor has been set apart in one of its power stations for the use of the Cable Club, which is to be organized by the company among its gripmen and conductors. The association will be similar to that formed by Cornelius Vanderbilt among the employees of the New York Central Railroad Company, but it will differ from that organization in that it will have no religious features. The clubroom will contain a library, smoking-rooms, sleeping-rooms and a restaurant, at which the men can secure food at cost price. Beyond a doubt this sort of a club should well repay the company for all the time and money that will be expended in developing the plan. It should lead to the employment of a better and a more loyal class of employees. They will be much less likely to patronize the saloons that spring up wherever the car men congregate, and they should be much less susceptible to influences proceeding from professional labor agitators.



### VETO OF THE FENDER RESOLUTION IN BROOKLYN.

Mayor Charles A. Schieren, of Brooklyn, has vetoed the fender resolution passed by the Common Council. His reasons for his disapproval of the measure are contained in the following abstract from the veto message:

The resolution is as follows: "Resolved, That all surface railroad companies in this city operating cars under the trolley system must attach to each car such safety fenders as shall be satisfactory to a commission of seven, that commission to consist of three members of this board, whom the President of this board shall name, three representatives of the said railroad companies, and one other man, to be appointed by the six members of the commission herein provided for, under a penalty of \$50 fine for each offense and the forfeiture of the license of each car unprovided with fenders after Jan. 1, 1895, and that in case the railroad companies aforesaid shall refuse to co-operate with the committee of this board to be appointed under this resolution, that committee shall determine the style of fenders with which the railroad companies must provide their cars."

The following is a statement of my objections to the resolution so returned and disapproved: The resolution attempts to delegate to a commission of seven, a majority of whom are not even members of the Common Council, the absolute power to determine, in a manner satisfactory to themselves only, what kind of safety fenders must be attached to each of the cars of all surface railroad companies in this city operating cars under the trolley system. Assuming, for argument's sake merely, that the Common Council has power to designate a particular kind of fender to be used by the railroad companies, I am advised that it would have no power to leave the determination to a commission constituted as proposed in the resolution in question. I understand it to be settled law that the public powers of trusts devolved by law or charter upon the council or governing body to be exercised by it, when and in such manner as it shall judge best, cannot be delegated to others. That is to say, the exercise of the power or the responsibility of the trust requires the judgment of the body upon whom, by law, the power of the trust is devolved, and that body cannot leave it to a commission to say how the power or trust shall be exercised.

This does not at all prevent a reference of a matter to a committee for examination and report in order that the body having the power of action may be the better informed upon the subject before them.

It seems to me also to be doubtful whether the Common Council has the power to prescribe as a penalty the forfeiture of the license of each car unprovided with fenders after Jan. 1, 1895.

Inasmuch as the objections stated above, if well taken, show the resolution to be illegal and void, I have not thought it either necessary or appropriate to discuss the merits or the matter of the provision of safety fenders for the cars. I am now actively giving my attention to the whole subject of the practical regulation of the trolley cars for the public safety.

### STRIKE ON THE METROPOLITAN, WASHINGTON.

The conductors and drivers of the Metropolitan Street Railway Company, of Washington, struck for higher pay on Friday, December 14. Their pay had been reduced, and they decided to leave their cars at the hour when most of the department clerks start homeward. The strike lasted but a short time. A committee appointed by the men consulted with the president, Samuel L. Phillips, who made the statement that the financial condition of the company had made the reduction in wages necessary. The men finally submitted the following proposition, which Mr. Phillips accepted on behalf of the company:

1. That the men should all be put as nearly as possible on the same footing, with a 12 hour schedule, as near as could be practically arranged.

2. That the 12-hour schedule should call for \$1.75 a day, Sunday and week days equal.

3. That no men should be discharged on account of the strike, and those who had already been discharged should be taken back.

4. That the men should again be given awnings on their cars.

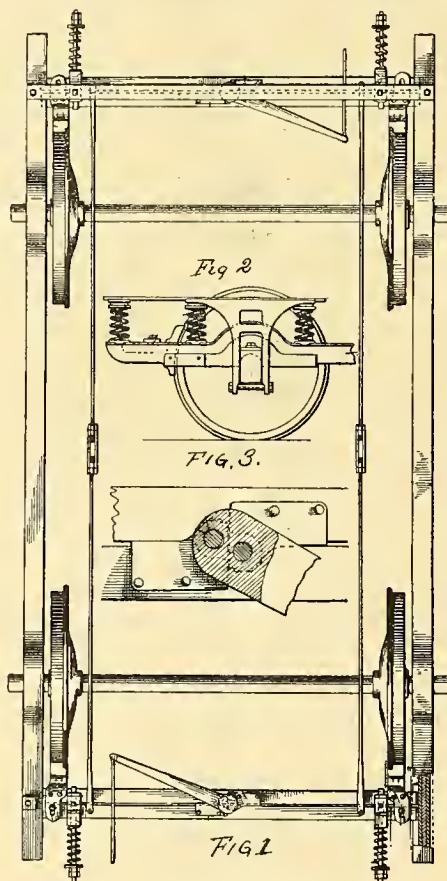
### A NEW BRAKE GEAR.

A new brake gear, recently patented by W. S. G. Baker, of Baltimore, Md., is shown in the accompanying illustration. The device is strong and simple, and the mechanism is so arranged that the wheels and axles may be removed from the truck without detaching any part of the brake mechanism or moving the shoes away from the wheels.

The beams to which the brake shoes are attached extend beyond the line of the wheels, and move to and from the wheels in yokes or saddles fastened to the ends of the side frame of the truck. By this means twisting, vertical movement or distortion of the beams is avoided.

Parallel with each brake beam there is another beam, which is connected with the frames of the brake shoes by means of bolts passing through slots in castings mounted on the beams. Each beam is provided with a casting, having a stud arranged diagonally opposite each other. These studs enter sockets in an operating lever. When this lever is turned it affects the separation of the beams, and causes the brake shoes to be applied to the wheels. The mechanisms on opposite ends of the truck are the same.

Each of the levers is provided with a rod, which may be connected to any suitable operating



mechanism. The two beams are connected by rods having adjusting or tightening devices. It will be seen that when either of the levers is operated, the beams will be moved toward the wheels, and will carry the brake shoes into engagement with the wheels.

Arms are secured to the cross beams, and are provided with downwardly projecting lugs or flanges, to which extend bars connected with the brake beams. The outer ends of the bars are provided with adjusting nuts and washers, between which and the flanges are interposed springs. These springs tend to withdraw the shoes and the beams from the wheels. The nuts are adjustable in order that the tension of the springs may be varied to accommodate wear on the wheels and the brakeshoes.

It will be observed that the connecting rods, and, in fact, all the brake mechanism, is located

above the axles, so that the wheels and axles may be readily removed without disturbing any parts of the truck frame or the brake mechanism.

### NEW DANGERS ON THE HIGHWAYS FROM A STEAM RAILWAY POINT OF VIEW.\*

Electric railway enterprises for connecting adjacent villages and cities continue to multiply, and some of them are intended to carry freight as well as passengers; for example, one which there is talk of building from Baltimore to Annapolis, Md., 28 miles, and another suggested to run from Traverso City to Old Mission, Mich., 20 miles. The cheapness at which such roads can be built and equipped (\$9,000 and \$8,000 respectively is the total capitalization in the two instances named), the fact that thus far they have been given free right of way on the public roads, and the accommodating character of the service which they are expected to give, stopping at every street crossing and farmhouse, have made the theory of electric roads very popular, and the movement for their construction has become a sort of craze. For localities not reached by steam roads these light lines may be useful, though their service will be found irregular and unsatisfactory at the best; but where they undertake to compete with steam railways with their solid tracks, spacious cars, high speed and regularity of service they will show to great disadvantage for runs of more than a very few miles, and the expectations which are now popularly entertained of them will be disappointed. The idea of adding the gathering and carrying of way freight to the transportation of passengers on such roads is incongruous. If freight and passengers were carried in the same train the delays and slow speed would be intolerable; if it is proposed to run freight trains separately they would interfere with the moving of passenger cars at frequent intervals, without timetable restrictions, which constitute the only advantage of street cars over railways proper.

But most serious of all objections is the peril to the public from the occupancy and crossing at grade of highways by electric cars with their deadly trolleys. With astonishing good nature and blindness to danger, village and county authorities have allowed electric roads to appropriate the wagon roads, to the constant terror and jeopardy of those who drive or walk upon the highways. The natural result is such a rapidly increasing number of accidents that local authorities are now awaking to a sense of their folly, and speculative builders of electric roads are not likely to proceed much longer without restrictions that shall protect the public.

The danger from grade crossings has become so great and threatening that the directors of the Pennsylvania Railroad Company were compelled to raise a warning against it in their last annual report. They say:

The policy of elevating or depressing the tracks so as to avoid grade crossings was further carried out, resulting in the elimination of several dangerous street crossings in the city of Philadelphia, and in considerable progress toward the elevation of your tracks in the city of Elizabeth, N. J. The object sought to be attained, however, through the large expenditure made in this direction, both by the railroads and the local authorities throughout the State, will be almost entirely defeated if the electric railways now being promoted throughout the country are permitted to cross the steam railways at grade, and thus create a new and most serious element of peril for the traveling public. It must be borne in mind that the entire movement on these electric railways is in the transportation of passengers, and that, therefore, the risk to life and limb from such crossings, owing to the frequent service, is proportionately much greater than on the steam railways, where the trains are not nearly so frequent, and where the movement is made up largely of freight traffic. It would hardly seem reasonable that the electric railways should be permitted to indefinitely increase the number of crossings, while at the same time your company and the city of Philadelphia are expending over \$400,000 to remove grade crossings of your road by the North Pennsylvania Railroad in the northern portion of the city.

\* Railway Age.



**UNDERGROUND CABLE RAILWAY IN GLASGOW.\***

Comparatively little attention seems hitherto to have been directed to the subway now under construction in Glasgow, and yet it promises to possess one of the largest and most interesting cable traction plants in the world. It has generally been thus with the cable system, both in the United States and in Great Britain. Its engineers and supporters have been satisfied to work away with little publicity, content in the knowledge of the possession of a good thing and seemingly quite devoid of desire to push business by converting others to a belief in the excellence of their methods.

The line, which is entirely underground, is 6½ miles long, and is roughly circular or slightly elliptical in course. The Glasgow Subway does not penetrate the east end of the city, but runs north and south through the central and most congested district, and then bends round through the residential parts in the southwest and west. The river Clyde is tunneled under twice. The stations are 15 in number, being on an average less than half a mile apart.

It is predicted that the new road will be well

and the engineers are nearly finished with their excavating.

A single arch, with a span of 38 feet, covers both tracks at each station, with an island platform 10 feet wide. The platform is 150 feet long and is reached by staircases from 6 to 8 feet wide. The depth of the platforms below the street level varies from 18 to 32 feet. Where shield tunneling was necessary, an iron lining was used.

The engineers early decided upon the cable in preference to electricity. As a precaution, an engineer was sent to the United States, where he made an exhaustive inquiry regarding cable traction. He returned satisfied that the cable system was well adapted for carrying enormous numbers of passengers over a short line, where the great majority of passengers would not travel over half of the six and one-half miles. The speed did not trouble the engineers or directors, as they held that with stations less than half a mile apart a cable speed of 15 miles an hour would give an average speed as great as could be attained by electric haulage. They also concluded that the starting would be quicker and easier.

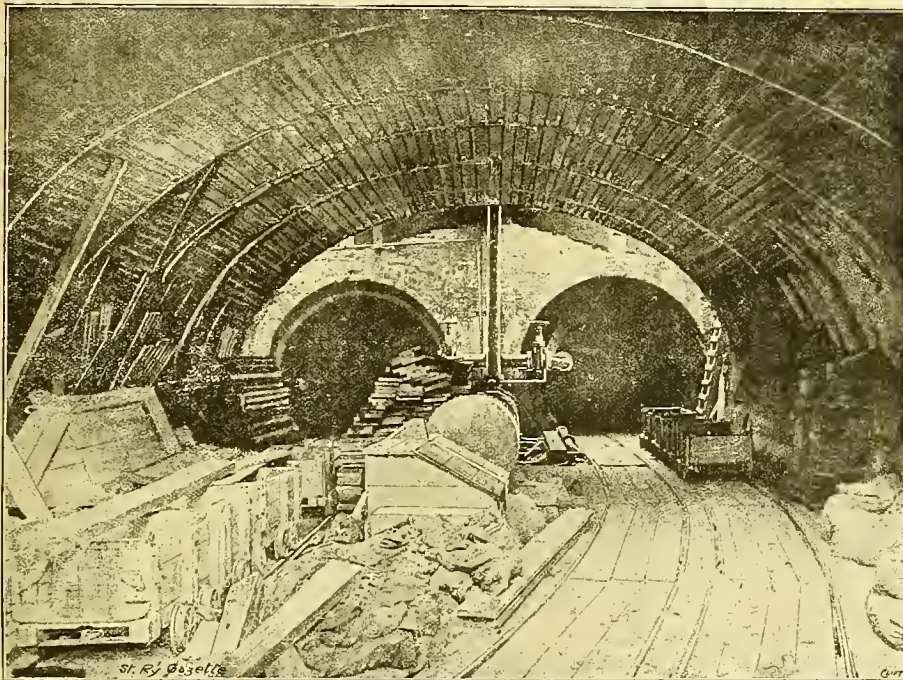
The gauge of the railway is 3 feet 9 inches instead of the standard 4 feet 8½ inches. The object

so that if necessary each will be able to carry about double the above number. Each when empty will weigh at least 7 tons, so that a train of two cars with all seats occupied will run to about 20 tons. It is probable that the greatest number of trains which will be run at one time on each track will be 15 or 30 for both tracks. This is, however, not in the near future, as the engineers estimate that at the first only seven trains on each track will be required.

The power station is a structure 138 feet long and 100 feet in width. The tension run structure is 190 feet long by 33 feet wide. The power plant is similar in design to the most recent plants in America. The engines will be two Corliss horizontal, single cylinder non-condensing, each developing from 1,000 to 1,500 H. P. The cable winding drums will be driven by means of cotton ropes.

**TEMPERATURE REGULATING SWITCH.**

The accompanying cuts illustrate the temperature regulating switch of the Consolidated Car-Heating Company of Albany, as used in connection



TUNNEL FOR THE UNDERGROUND RAILWAY IN GLASGOW.

patronized. The fares will be cheap—one penny for second class and twopence for first class for any distance.

The railway is carried in double tunnels, generally cylindrical in shape, and similar to those used for the City & South London Underground Electric Railway. Each tube is 11 feet in diameter in the clear, as against 10 feet for those in use on the last mentioned road, and 12 feet for those on the Waterloo & City road [see last issue of STREET RAILWAY GAZETTE]. The depth beneath the surface is much less than in the case of the London Greathead tunnels, although it averages 25 or 30 feet in some places, owing to unequal surface of the ground, as Glasgow is by no means a level city like London. Especially in the northern parts the ground is very high. There a great deal of hard rock was met with, but that was nothing to the troubles of the engineers and contractors in cutting their tunnels in the lower-lying grounds and in passing twice under the Clyde. Here, not only water-bearing sand was encountered, but sheer mud. The engineers adopted compressed air, as has been done in London, and in all the necessary parts the tunnels have also been lined with iron built up in segments and fitting water-tight. The work has now been going on for nearly three years,

is to secure a better permanent way, as the rails are farther removed from the invert of the tunnel than if the usual gauge had been employed. The cables will be carried on the usual sheaves, and will be two inches or so, as a minimum, above the level of the rails. The conduit and slot of the cable street tramway are, of course, unnecessary. Owing to the high speed these sheaves with their bearings will be more carefully constructed than usual, and each will run in a little cast iron box, so as to prevent the ballast from coming in contact with it. On the Glasgow Subway the total amount of curvature is, of course, great, but then there is no single curve of less than 10 chains radius, a very favorable state of matters compared with many cable tramways. Besides this, about half of the whole line is straight. There are a considerable number of grades, the heaviest being about 1 in 20.

The present idea is to run trains of two cars each. Every car will be fitted with a grip, but only one will be required at a time for each train, the other being held in reserve. Each car will be about 41 feet long over the platforms, or 32 feet in the body. It will be mounted on two trucks giving 8 wheels in all. There will be longitudinal seats as in the case of a street car. The nominal seating capacity per car is for 42 passengers, but the cars are to be made very roomy transversely,

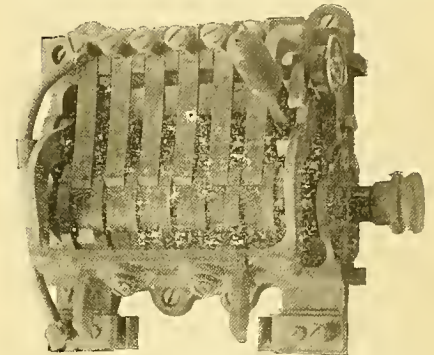


Fig. 1—Temperature Regulating Switch. Top View with its systems of electric heating for street cars and offices. Figs. 1 and 2 give top and side views with the cover removed. Fig. 3 is a front

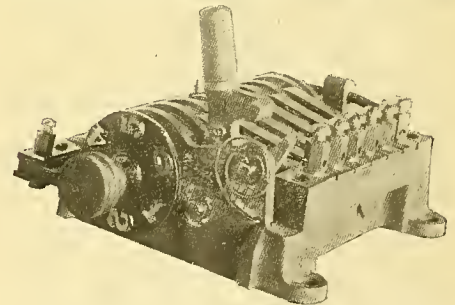


Fig. 2—Temperature Regulating Switch. Side View with the cover in place. The object of this switch is to change the arrangement of heating coils so that they may be placed in series or in



Fig. 3—Temperature Regulating Switch. Cover in Place.

multiple series, and thus vary the flow of current to adjust the intensity of heat to the requirements of the weather. By this method of varying the intensity of current, the loss of current by the use of rheostats and other wasteful devices is entirely

\* From the *Railway World*, London.







off the line current and then reversing the controlling apparatus, a moving car would suddenly stop itself. There was a little comment on this apparently mysterious action in one or two electrical journals at the time but no extended explanation was published that was very intelligible to men not accustomed to studying such things out for themselves. With the intention of clearing up the mystery that surrounds this phenomenon, the writer has thought it advisable to publish the accompanying diagrams and explanation, for the better information of any who may be interested.

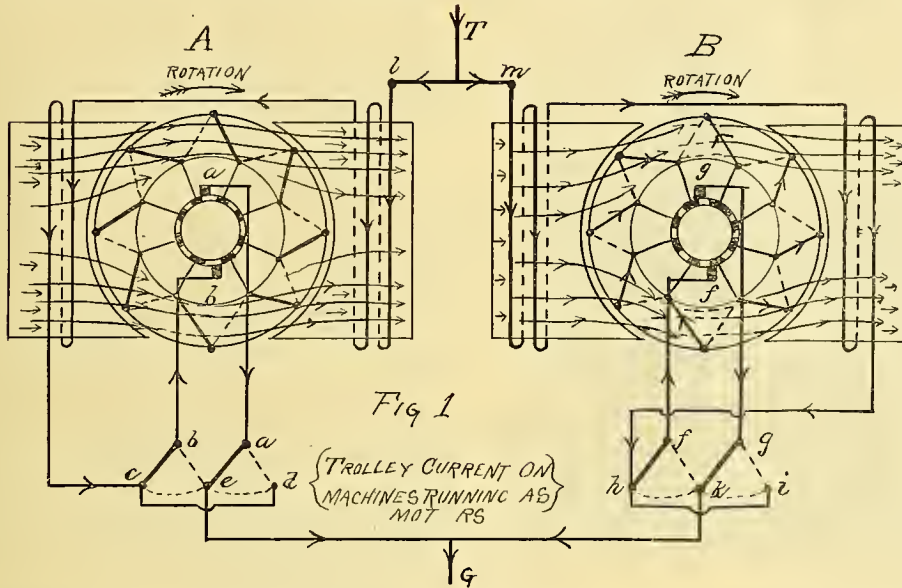
Two motors, *A* and *B*, are here represented dia-

overpower that of *B*, and send a current through the two motors as follows :

The lines of force in the magnetic circuit of *A* retaining their original direction, the electromotive force in *A*'s armature is opposite to the original impressed electromotive force, and current now flows out at the brush *b*, where it formerly entered. Thence it flows through *e* on *A*'s reversing switch to *k* on *B*'s switch, thence to *f*, and there enters *B*'s armature in the same direction as did the trolley current. On leaving *B*'s armature at the brush *g*, it flows through *i* to *h*, the former negative terminal of *B*'s field, but now made the

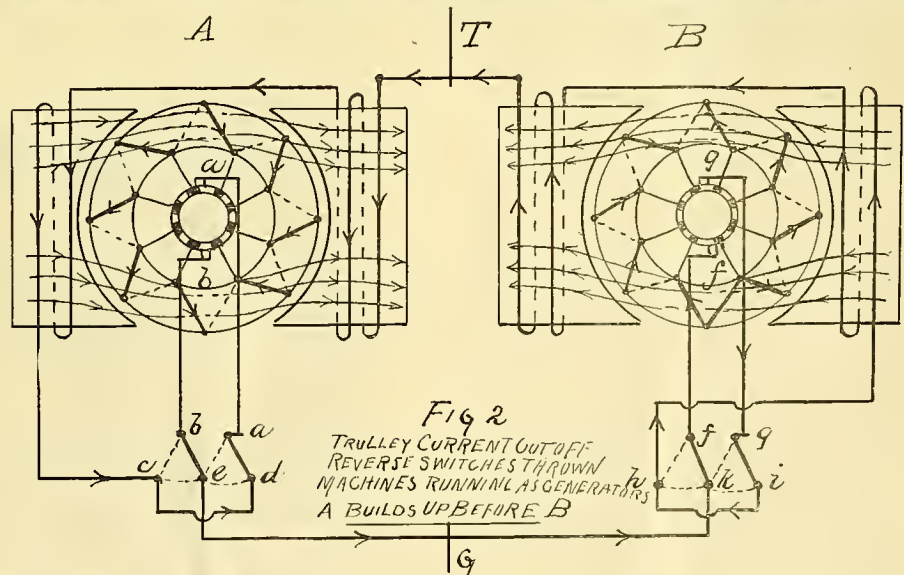
forms the connections, the aggregate resistance being quite small. Consequently it takes but a few seconds to generate a current so strong as to drag heavily against the armatures, thus acting through the gearing as a brake against the wheels. As was pointed out in a recently published description of the Sperry electric brake, which converts the motor into a generator, the wheels can hardly cease revolving for an instant, as the consequent stoppage of the armatures means a stoppage of the current which is the cause of the slackening. So the tendency is to continually slacken the speed of the car as long as the car moves without actually stopping it. The moment the wheels stop turning the brake is off, but while they turn it is always on. Therefore it is impossible to lock the wheels tightly; but it is possible to continually slacken them to the slipping point. This gives the wheels the greatest effect in checking the speed of the car, for it is a well-known fact that a brake is most effective when "skidding" is impending, but not actually taking place.

The application of this electric brake which every double motor car is thus seen to possess has its limitations. Of itself, it cannot bring a moving car to a quick and sudden stop. It will check a rapidly moving car with such force as to cause momentary discomfort to its occupants, but it is quite evident that as the speed of the car decreases its effect diminishes in proportion to the speed, because the electromotive force of the two armatures, and consequently their current, depends upon their speed of rotation. A very slowly moving car will hardly generate sufficient current to quickly slacken its speed, though, of course, the small current that is then generated will assist the rail and journal friction in doing so as it does under all conditions of speed. And the fact that the motors are connected as above indicated, prevents a slowly moving car from exceeding a certain speed whether on a grade or on a level. The quickness of action of the brake seems to vary somewhat with the make of the motor. The writer has noticed in his experience that a car equipped with motors of a certain manufacture would, at the moment of applying the electric brake, receive a sudden check upon its speed, which would gradually diminish as the speed diminished, until its effect became so small that the actual stoppage of the car appeared to be due solely to the rail and general friction. But with a car equipped with motors of a differ-



grammatically, each with its own independent reversing switch, which makes the armature and field of *A* independent of *B*; each motor is complete in itself as to external connections. They are shown connected in parallel as is usual when running at full speed. Being somewhat simpler to illustrate, the Gramme ring type of armature is represented, and each field spool is indicated by one or two turns of wire around each pole piece, as being sufficient to determine the direction taken by the current about the magnets, and the consequent direction of the magnetic lines of force. Fig. 1 shows the machines acting as motors in the ordinary way. The direction of the current is shown by the arrows, entering from the trolley at *T*, then dividing and flowing through each motor, first through its two fields in series, then to its reversing switch, then to the positive brushes, there dividing into two paths through the armatures and coming out at the negative brushes, there uniting again and going to ground at *G*. The direction of armature rotation is shown by the arrows. For the sake of simplicity, the reversing switches are supposed to be of the familiar three-point type, which has practically the same action as the switch usually found in the series-parallel controllers now in such common use. The controller, for simplicity's sake, is omitted. Suppose now that the trolley current entering at *T* be cut off, the reversing switch thrown, and the controller set so that the motors are again in parallel as regards their connection with each other, just as before. Let us see what happens. In the first place there is pretty sure to be a difference in the residual magnetism of the motors—it would be a very unusual thing to find two motors exactly alike as to their residual magnetism and reluctance of magnetic circuit. As seen by the connections shown in Fig. 2, the motors, though connected as before, are short-circuited on each other. The car being still in motion, the motors tend to generate their own electromotive force in the same direction as they did when the trolley current was on; that is, in opposition to the trolley current and to each other. If motor *A* has the greater residual magnetism, the counter-electromotive force developed in its armature will "build up" first, and

positive one. As the current now flows through *B*'s field in reverse direction, it changes the direction of the lines of force through *B*'s armature. This makes the electromotive force now generated in *B*'s armature of opposite sign to the original counter-electromotive force generated in it, and therefore of the same sign as the original trolley current and also the current now being sent through it by *A*. The current on leaving *B*'s field at *h* enters *A*'s field at *l* in the same direction that it originally took when coming from the trolley, and therefore helps *A* build up a still greater elec-



tromotive force. After flowing through *A*'s field it arrives at *e* on *A*'s reversing switch, then flows through *d* to *a*, the negative brush of *A*'s armature, then through the armature to the starting point at *b*. So by originally reversing its direction in *A*'s armature it has eventually reversed *B*'s field, thereby developing an assisting electromotive force in *B*'s armature, which also has aided it in strengthening *A*'s field. Thus the two motors help build each up with no resistance to work on but their own, and that of the car wiring that

ent make, though of the same general type, the initial shock of checking was not so noticeable, but the retarding effect of the motors appeared to be more continuous and held on until the car was actually stopped within a comparatively short distance. It is probable that the relative resistances of armatures and fields, which of course differ with the differences in manufacture, are largely responsible for such noticeable differences in action.

(To be continued.)



### MACHINE TOOLS FOR STREET RAILWAY REPAIR SHOPS.

The accompanying illustrations represent several of the machine tools especially designed by the Niles Tool Works, of Hamilton, O., for use in street railway repair shops. The importance of executing repairs quickly and at a minimum cost is now thoroughly realized by every street railway manager, and the tools herewith illustrated have been constructed to meet the requirements of this special class of work. Fig. 1 shows the 24-inch

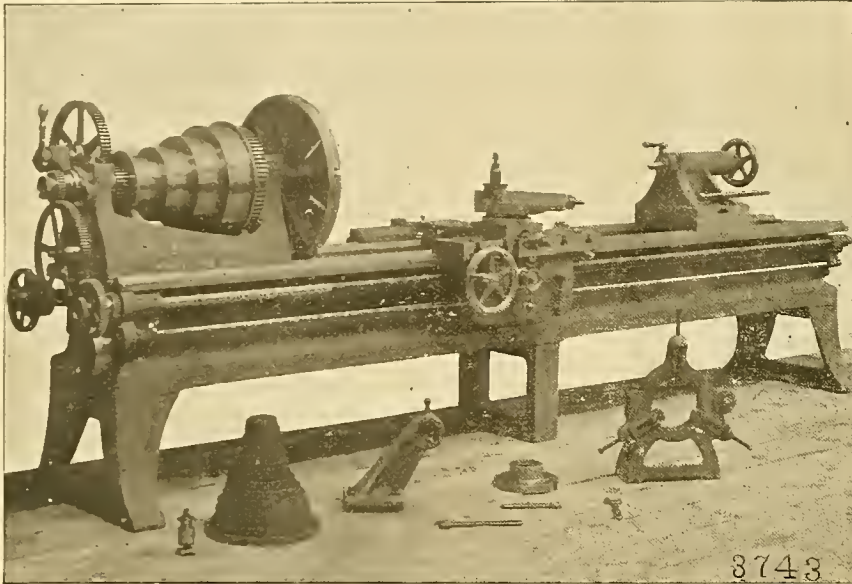


FIG. 1—TWENTY-FOUR-INCH ENGINE LATHE.

engine lathe which is complete with screw cutting attachment and compound rest so that it may be used for general work as well as turning and finishing car axles from the rough or for turning up rough or irregularly worn journals. The lathe swings 24 inches over the ways and 17 inches over the carriage. The cone pulley has four steps ranging from 7 inches to 15½ inches diameter for 3½-inch belt, and is perfectly balanced. An interior sleeve gives it a continuous bearing its whole length and thus prevents it from wearing loose on the spindle.

Fig. 2 shows the 36-inch car wheel borer having universal chuck arranged in the table and provided with crane. This machine is of the same general design as the company's standard 42-inch car wheel borer used in so many railroad shops. The car wheel borer may be used for boring gear wheels.

The diameter of the table is 41 inches, and the neat swing of the machine is 44 inches. The maximum distance from the table to the bottom of the cutter bar, when at its highest position, is 16 inches. The table is driven by bevel gear. Three feeds, two roughing and one finishing, are provided.

Fig. 3 shows the No. 1 hydrostatic car-wheel press, by which worn wheels may be replaced with a minimum of time and labor. The press is applicable to wheels 36 inches in diameter. These machines are tested up to a pressure of 100 tons on the ram before leaving the works. The cylinder is made of the best cold-chast iron and lined with sheet copper, the lining being carefully spun and burnished into place. The ram is 8 inches in diameter, and has 18-inch stroke. The pump has a single plunger, ½-inch diameter. The machine is equipped with the company's patent valve attachment, by means of which the movement of the ram can be stopped and started instantly. This is an important feature in pressing on wheels where it is required to bring them either to a line or a shoulder. The valve controls the operation of the plunger positively, so that it is impossible for any movement of the ram to take place after the valve is once set. This is accomplished by either raising

or dropping the rod shown on the side of the pump plunger.

The 50-inch gear cutter is shown in Fig. 4. This machine, which is entirely automatic, is arranged for cutting spur gear only. One belt is used to drive the entire machine, changes of speed being obtained by changing one gear, no cone pulleys and no belt tightener being used. The cutter is placed in the center of the cutter carriage and the feed screw in the center and so located as to take the thrust in a direct line, thus giving the minimum of wear on the side bearings. The spindle is so

arranged that the cutters can be taken out and replaced without the removal of the bearings. Various size arbors can in that way be inserted without loss of time. The base of the machine, as shown in the cut, has a pan around it whereby liquid can be used and properly collected. By this method of cutting the cutter and the works are kept well lubricated.

**Independence, Kan.**—The directors of the Farmers' and Merchants' Suburban Railway and Fair

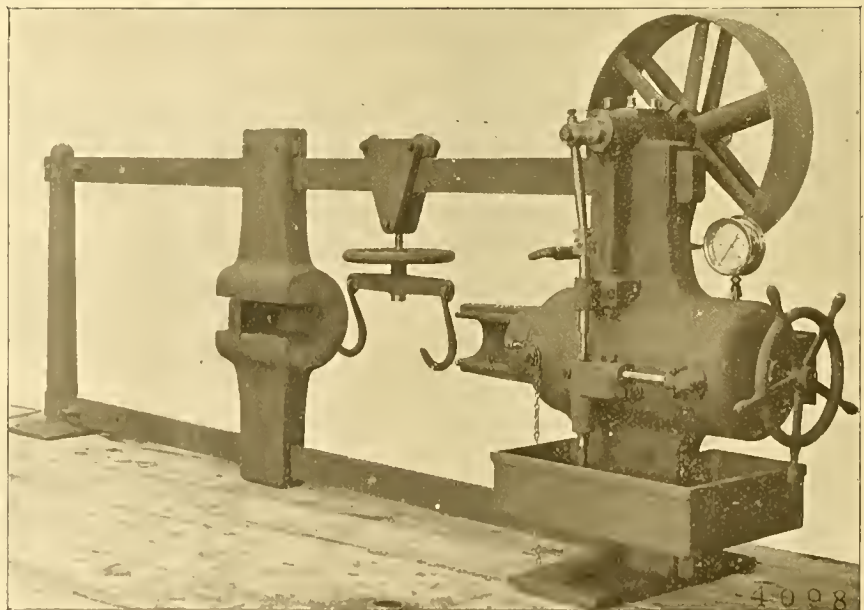


FIG. 3—HYDROSTATIC CAR WHEEL PRESS.

Association have elected the following officers: Joseph Chandler, president; M. F. Wood, secretary and treasurer; J. H. Brewster, O. P. Ergenbright and Ed Foster, executive committee. The object of this organization is to lay out county fair and assembly grounds and to construct and equip a motor line connecting Independence, Coffeyville, Cherryvale and Neodesha with these grounds.

### ELECTRICAL STEEP-GRADE TRACTION IN EUROPE.\*

BY C. S. DU RICHE PRELLER.

The rapid growth of electrical traction in Europe, wherever local conditions and reasonable official regulations are conducive to its adoption, is evidenced by the fact that within the last few years it has also been extensively applied, and is in course of further application, on steep-grade, or mountain railways properly speaking that—is, on lines which have not only occasional steep-grade sections, such as occur, for instance, on many electrical tramways, but continuous gradients varying from 5 to 25 and upwards of 60 per cent. (1 in 20, 1 in 4, and 1 in 1.6 respectively), and which connect either the base and summit of a given declivity, or different districts separated by a mountain range.

It will, therefore, not be inopportune if I place before the Institution a short synopsis of what has been already done in Europe in that branch of electrical engineering, together with certain conclusions and proposals founded on my own experience.

Leaving aside for the present, as being more suitable for separate treatment, the question of heavy—viz., 50 to 100 tons—electrical locomotives for trunk railways, the working of steel grades by electricity may be considered under two heads:

1. By cable traction; and,
2. By motor cars or locomotives with fixed conductors.

#### CABLE TRACTION.

Up to a recent period, steep-grade cable railways in various parts of the globe, but notable in Switzerland and in the Alps generally, where they alone exceed 20 in number, have been constructed for being worked either by component of gravity with water ballast, in conjunction, on some lines, with a second or compensation cable, or in some cases by fixed hydraulic, gas, or steam motors.

The principal disadvantage common to all lines worked by component of gravity consists in the excessive additional dead load due to the water ballast, which entails not only a great deal of additional brake power *per se*, but a variety of complicated safety brakes, involving very careful manipulation; while the three systems of fixed motors are either uneconomical, or unwieldy and obsolete.

The superior advantages of cable traction by electrical motors, as compared with all the other systems referred to, have been attested by three lines in Switzerland, all of which have been constructed within the last four or five years, to wit: the Burgenstock, on the Lake of Lucerne; the Monte Salvatore, on the Lake of Lugano; and the Stanserhorn, near the Lake of Lucerne, which last named was opened for traffic only last year. It is not the purpose of this paper to give a detailed description of these lines; suffice it to point out

their salient, and more especially their electrical features.

(a.) *Burgenstock*.—The summit level of this line is 2,884 feet above the sea, the total rise being 1,443 feet in a little over 1,000 yards, the minimum grade 32, and the maximum 58 per cent. Electric motive power for working the cable and cars is obtained by high-tension (1,600-volt) transmission

\* Paper read on Nov. 22 before the Institution of Electrical Engineers, London.



from a hydro-electric power station 2.5 miles distant, the output of the two series-coupled direct-current Thury dynamos, given by a high-pressure turbine, being 40 kilowatts, or 60 H. P. Two corresponding series-coupled motors at the summit of the cable railway drive the cable-winding drum through belt, countershaft and bevel gearing; the total reduction being 700 to 5 revolutions, or 140 to 1, corresponding to the regulation car speed of about three miles per hour. The car speed is regulated from the motor station, and not by the driver, except in case of emergency.

(b.) *Monte Salvatore*.—This line has a summit level of 2,900 feet, the rise being 2,000 feet in a length of 1.2 miles, the initial grade at the base 17, and the maximum at the summit 60 per cent. The motor station is situated midway up the incline, and the power is derived by a 2,000-volt transmission from a large hydro-electric 1,500-H. P. power station five miles distant: the output of the Oerlikon (Brown) direct-current generator, driven by a high-pressure turbine, being 60 kilowatts. The corresponding motor on the line drives the cars and cable in precisely the same way as on the preceding line, except that the Salvatore incline is worked in two sections.

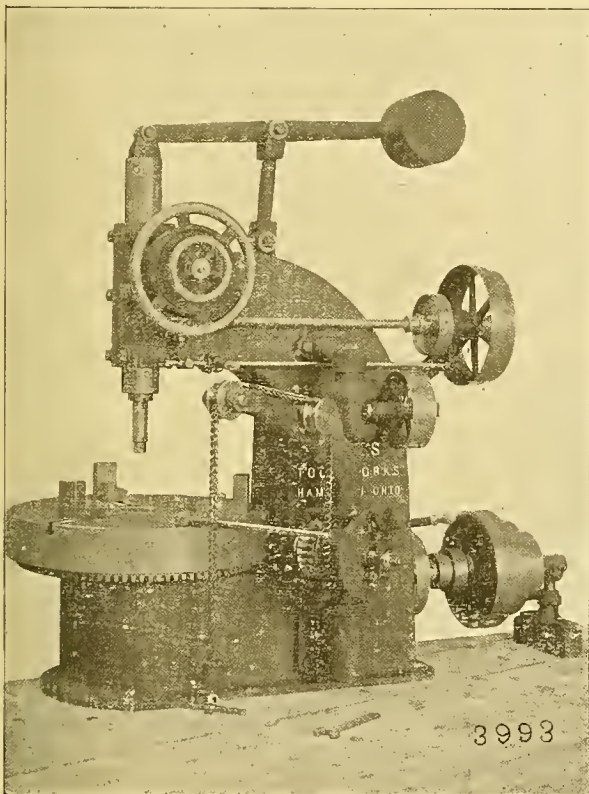


FIG. 2—CAR WHEEL BORER.

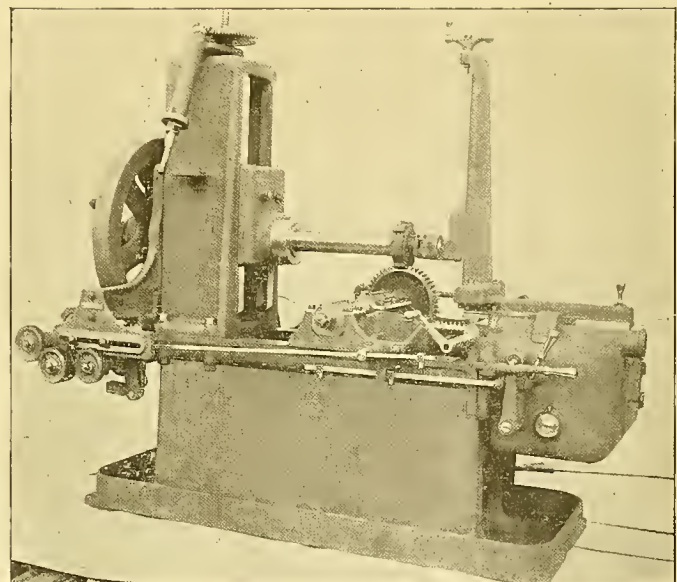


FIG. 4—GEAR CUTTER

straight and level. And, lastly, the superior safety and smoothness of electrical working, attested by the Burgenstock and Salvatore lines, has made it possible to dispense on the Stanserhorn incline with the rack used as a safety factor on its two predecessors; so that on Stanserhorn electrical traction has achieved the feat of scaling Alpine altitudes which, it was hitherto believed, could only be reached by rack railways worked with special steam locomotives, such as those used on the neighboring mountain Pilatus, at more than double the cost per train mile.

TRACTION BY MOTOR CARS OR LOCOMOTIVES WITH FIXED CONDUCTORS.

The first steep-grade railway worked by electrical traction with fixed conductors in Europe was the Florence and Fiesole line, opened in 1891. It was in succession followed by the Murren mountain railway, in Switzerland, opposite the Jungfrau; by the Mont Salève line, in Savoy (near Geneva); by the Genoa, and then by the Zurich steep-grade road railways; and quite recently by a similar line at Barmen, in Rhenish Prussia.

Of these lines, those of Florence, Murren, Genoa and Zurich have continuous grades of 8, 5, 7 and 6

(summit level, 3,700 feet above the sea) is situated about a mile from the line, and comprises two low-pressure turbines and two separately excited Thury multipolar dynamos mounted on the vertical turbine shafts, and giving, at the low turbine speed, 500 H. P., or only a quarter of their combined normal output of 2,000 H. P. The 12 motor cars are each fitted with two 30-H. P. four-pole Thury motors, with double spur gear reduction, and current is taken from the outside conductor rail by metallic slide contact shoes. Owing chiefly to the unnecessarily heavy gearing, the total efficiency is only about 52 per cent.

(d) At Genoa the power station is about 1.3 miles distant from the line, and contains at present two boilers, two compound condensing Tosi 160-H. P. engines, and two belt-driven 119-kilowatt Siemens inner-pole dynamos. The present line, which is the nucleus of a projected suburban system, is worked by six cars, each fitted with two 16-H. P. Siemens motors; the reduction being 10 to 1 by chain and toothed wheel. Current is taken from the overhead wire by two Siemens & Halske's rectangular metallic contact frames.

(e) The Zurich power station is placed at the upper end of the line, and comprises two boilers, two 100-H. P. Oerlikon vertical engines and dynamos, together with an accumulator battery of 300 Tudor cells for compensating the variations of load of the steam engine. The 12 motor cars are each fitted with two 12-H. P., Oerlikon motors. The total efficiency of the line is 65 per cent.

(f) At Barmen, the power station is situated at the foot of the incline, and contains two 225-H. P. compound condensing engines driving direct two Siemens inner-pole ring dynamos, whose output is 155 K. W. each. The line is worked by 10 motor

(c.) *Stanserhorn*.—This line ascends an altitude of no less than 6,200 feet above sea level, and has a total rise of 4,570 feet in a length of 2.5 miles, worked in three sections, having maximum gradients of 30, 60, and 62 per cent. respectively. The requisite power per car is 40-H. P., and a motor station is placed at the summit of each section. The three Thury motors actuate the winding drums as before described, and are fed from the same power station as the Burgenstock line, but by a separate high-tension (2,000-volt) transmission 2.5 miles in length. The total efficiency on this, as on the other lines, is about 69 per cent.

(d.) *Conclusions*.—The three lines, of which I have given a necessarily very incomplete résumé, mark a conspicuous advance in cable traction. As compared with haulage by the other systems referred to, they show a saving in car weight of no less than 50 per cent., the full car load, with 36 passengers, being in the former case 12 to 15 tons, and on the electrically-worked lines only 6 to 7 tons. Again, the average cost of construction of the Swiss cable railways worked on the older systems is no less than £41,000 per mile, while that of the electrical lines is only £24,000 per mile, or 40 per cent. less. Similarly, the working expenses on the older lines vary, with one or two exceptions, between 60 and 80 per cent., whereas the electrical lines are worked at 45 per cent. of the receipts. These three lines also show a remarkable development due to electrical traction *per se*, inasmuch as, apart from the unprecedented grades, up to 62 per cent., or 1 in 1.6, the length of the incline has been gradually increased from 1,000 to 2,200 and 4,500 yards, which, having regard to the mechanical work performed on the grades, is equivalent to 14, 20 and 44 miles respectively on the

per cent. respectively, and are worked as simple adhesion lines, with overhead contact wires, and return circuit by the electrically bonded rails; while the Salève and Barmen lines, having continuous inclines of 25 and 18 per cent., or 1 in 4 and 1 in 6 respectively, are worked with the aid of a rack, and the former has an outside conductor rail in the shape of an inverted ordinary flange rail, while the latter has overhead contact. The Murren line is the only one worked with electrical locomotives; all the others are worked by single motor cars.

(a) At Florence, the power station, situated at the foot of the incline, comprises three Tosi boilers, three Oerlikon vertical compound 90 H. P. engines, and three belt-driven Edison bipolar dynamos with a total effective power of 245 H. P., equal to 93 per cent. efficiency. The 12 motor cars are each fitted with two 20 H. P. spring-suspended and series coupled Sprague-Edison motors, the original ones having double reduction, the more recent ones single reduction spur gearing. The contact is by trolley wheel and pole, and the total efficiency of the system is 66 per cent.

(b) On the Murren railway, whose altitude is 5,300 feet above sea level, power is generated by a high-pressure turbine, which drives a direct-coupled Oerlikon (Brown) bipolar dynamo of 120 H. P. The power station is situated about midway of the line, the power being derived from the torrent of the celebrated Staubach Fall. The four locomotives weigh 7.5 tons each, and carry two 30 H. P. single reduction spur geared motors; the tractive force of each locomotive being about one-third of its weight, and the total efficiency of the system 68 per cent.

(c) The power station of the *Mont Salève* line

cars, each provided with two 36-H. P. Siemens motors, which, by single spur gearing, actuate the rack pinions mounted direct on the car axles. The total efficiency is, like that of the other lines, from 60 to 65 per cent.

(g) *Conclusions*.—It seems that the primary generating power is steam on the Florence, Genoa, Zurich and Barmen, and hydraulic on the Murren and Mont Salève lines; the dynamos being direct-driven in four, and indirect in the other two cases. Notwithstanding the high cost of fuel in Italy and Switzerland (as much as 30s. per ton), and the steep grades on the Florence, Genoa and Zurich lines, the running expenses do not exceed 4.5 pence per car-mile; while the total working expenses, including administration and renewals, are within 7.5 pence per car-mile, or about 50 per cent. of the receipts. On the Murren and Salève lines the cost of hydraulic power per annum is, of course, restricted only to wages and repairs. In the former case the working expenses do not exceed 40 per cent. of the receipts; while in the latter they are as much as 80 per cent., this high rate being due chiefly to inadequate fares. A specially noteworthy feature is the steady speed of 8 to 10 miles per hour with which motor cars run up the steep adhesion inclines of 6, 7 and 8 per cent. at Zurich, Genoa and Florence; while on the descent a speed of even 15 miles per hour has proved perfectly safe, in conjunction with the powerful and instantaneous action of the electric safety brake constituted by the motors acting as dynamos on the descent, although, for all ordinary purposes, even the mechanical brake alone suffices to stop the car within its own length.

As regards the comparative working cost of steep, grade adhesion or rack railways by steam



and by electricity. I can affirm from my own experience, as well as from every other case which I have had occasion to investigate, that, irrespective of the immensely greater elasticity of the service, and consequently the far more rapid development of the traffic, electrical working ensures an economy of at least 50 per cent. as compared with steam.

#### GENERAL CONCLUSIONS.

With regard to electrical traction on flat, as well as steep, grade lines generally, I am led to the following conclusions:

**Direct and Indirect Driving of Generators.**—Although direct driving, whether by steam engines or by turbines, is the ideal standard, and, therefore, always preferable, it cannot, for tractive purposes be laid down as a dictum *a priori*. On lines having steep, and more especially alternately rising and falling, grades, coinciding with sharp curves, an intermittent traffic, and frequent stoppages the variations of load are so great and so rapid—often from zero to maximum in the space of one minute—that vertical high-speed engines suitable for direct driving generally work very uneconomically. This is, *e. g.*, the case at Florence, and in an even greater degree at Marseilles, where high-speed direct-driving engines had actually to be replaced by horizontal low-speed Corliss engines, with belt driving. In the case of hydraulic power, high-pressure turbines always admit of economical direct driving, whereas low pressure turbines involve for direct driving proportionately larger dynamos, giving only part of their normal output; so that here, too, indirect driving by gearing or belt is generally more economical. The same applies where gas engines are used.

**Steam, Hydraulic and Gas Generating Power.**—The first cost of a hydro-electric installation often exceeds that of steam plant, more especially in the case of a variable volume and small head of water, involving the use of low pressure turbines. High-pressure turbine installations are always preferable and more economical. Where cheap hydraulic power is not available within a distance of about four miles from the line, and fuel is dear, gas manufactured on the spot is much more economical than steam power.

**Conductivity of Rails.**—Where the rails serve as the return circuit, the ordinary fish-plates should have the same sectional area as the rails, so that, together with stout fastenings, they make a joint as stiff as the rail itself. In this way, and especially when laid on metallic sleepers, the permanent way gives 50 per cent. of the required conductivity at the joints: so that only 20 per cent. has to be made up by copper bonding, plus an adequate margin of, say, 10 per cent. Solidity, compactness and careful maintenance of permanent way, as is usually found on electrical lines, as well as on railways generally in Europe, go far to make up for the elaborate copper bonding which the often defective condition of permanent way necessitates on American lines. It is for the same reason that electrolytic action or gas and water pipes, which is so common a phenomenon in the States, is practically unknown in Europe.

**Conductor Rail.**—Where a conductor rail is used, it should preferably be placed outside, instead of inside the ordinary rails, because the outside conductor obviates all complications, and the contingency of short-circuit at points and crossings. On specially steep grades, involving the use of a central rack, the rack rail or bar itself, having continuous contact with the pinion wheels, constitutes an excellent conductor, provided it be effectually insulated from the sleepers by porcelain bells serving as supports.

**Overhead Trolley Wheel and Slide Contact.**—Contact by a trolley wheel whose spindle is rigidly held by the trolley pole is suitable for lines on which straight sections and flat curves predominate; but for lines with numerous and sharp curves, the rectangular single or double slide-contact frame, used by Messrs. Siemens & Halske on their overhead lines, is far preferable. It is lighter and more pleasing in appearance than either the rigid trolley, the flexible South Staffordshire trolley, or the slide-contact bars used on the Isle of Man line. It obviates, moreover, many of the objectionable cross and diagonal wires, and hence the infinite variety and complexity of fastenings which the use of the rigid trolley wheel involves, and many of which, however neat as mechanical contrivances *per se*, are not exactly ornamental objects when suspended at a height of only 20 ft. above the roadway. The only defect to which the Siemens slide contact is subject consists in the upper, slightly arched, and, of course, renewable contact side of the frame being liable to become grooved, whereby the easy play to right and left of the contact wire is impaired; but this defect can be easily remedied by employing material of adequate resistance. Another and very simple form of slide contact is that used on an electric road railway from the Lake of Lucerne to the foot of Stanserhorn, and consisting in a crescent-shaped grooved

contact piece of bronze, which is loosely hinged to the trolley pole, and thus, in conjunction with the lateral play of the pole, adjusts itself to the sinuosities of the line.

**Underground Contact and Accumulator Cars.**—It is generally recognized that the overhead trolley system, which in reality is only a makeshift, is unsuited for the central parts of the large towns, and *a fortiori* of the metropolis of this country; and the same applies equally to the other largest capitals of Europe—to wit, Paris, Berlin and Vienna. In these cases the conduit system or accumulator cars are therefore at present the only practicable solution of the problem. In Europe the conduit system, whether it be that of Buda-Pesth, or with a central slot, may be estimated to cost complete £10,000 per mile and upward, according to local conditions, though this is not too costly, having regard to the enormous traffic in large towns; but its efficient working presupposes, among other things, very perfect drainage of the trench. As regards accumulator cars, they would really constitute an ideal form of electrical tramway traction, if the present car-weight of 12 to 15 tons, and the power and traction expenses of 8d. to 10d. per car-mile, could be reduced to half. As a case in point may be quoted the unwieldy accumulator cars which run on Madeleine and St. Denis Tramway in Paris, and give fairly satisfactory results; but which, owing to their heavy weight, are not infrequently deficient in torque on the long 1 in 20 grades, when the motors become saturated. The overhead system, on the other hand, is very well adapted for suburban tramways, and eminently so for light railways and road railways in the country. The cost of such road railways, if constructed on the meter or 3 ft. 3 in. gage, can well be kept within £6,000 per mile, including electrical equipment; and the already quoted road railway from the Lake of Lucerne to the foot of Stanserhorn, which only cost £4,500 per mile, as well as another similar line near Bale, have demonstrated what a cheap and convenient motor car service can do in essentially agricultural districts.

**Gearless and Geared Motors.**—Gearless motors are eminently suitable for high speeds, while for low speeds they require to be of inconveniently large size. For geared motors single reduction is, of course, always preferable, although on exceptionally steep grades, where the motors have to develop their maximum power at minimum car speed, double reduction may in some cases be unavoidable. In any case, spur gearing is always preferable to worm gearing or chain motion, both of which involve too much friction and consequent loss of power.

**Parallel and Series Coupling of Motors.**—This much debated question cannot be decided *a priori*, but depends on individual cases. For level or easy-grade lines, parallel coupling is more suitable; whereas on steep grades, where starting requires always the maximum torque, series coupling is generally called for.

**Variations of Load.**—On lines with steep or rising and falling grades, these variations cannot be mitigated, much less equalized, simply by increasing the number of cars or trains on the line, since the variations are caused not only by the varying traffic, but by the varying grades and curves and by the varying degrees of adhesion, more especially in starting. Where separately excited dynamos are used, a partial means of compensating the variations of load is, as is well known, that of varying the excitation by the main current passing through the exciter. But the most effectual remedy is the addition of an accumulator battery, which absorbs any excess of supply from the generator over demand on the line, and, *vice versa*, makes up for any deficiency of supply, so that the steam engine and generator can always run at full and constant load. Accumulator batteries have fully vindicated their claim as an important auxiliary and as a means of economical working of traction installations at Zurich, and subsequently in the Isle of Man, and well repay the additional cost of plant.

**Continuous and Alternate Current.**—Hitherto continuous current has been exclusively used for electrical traction. But, having regard to the high degree of efficiency and perfection and the ease of starting recently attained in alternate current motors, thanks notably to the persevering efforts of such constructors as Messrs. Brown, Boveri & Co., it may be confidently predicted that, as in lighting installations and in power transmissions for industrial purposes, so also in electrical traction alternate is destined to supplant continuous current. Alternate current, whether single or multiphase, will not only admit of electrical traction being applied over much longer distances than is economically possible with continuous current, but it will insure a saving of something like 30 per cent. in the weight of dynamos and motors, irrespective of the saving in copper of feed and contact wires, and will thus considerably simplify and cheapen electrical installation and equipment for tractive purposes. But, whether by alternate or by direct current, on flat as on steep grade lines, on so-called

light railways as on tramroads in town and country, we may be well assured that electrical traction in its various forms has, both in this United Kingdom and throughout Europe, a brilliant and triumphant future.

## FINANCIAL NOTES

**North Attleboro, Mass.**—The Attleboro & North Attleboro Street Railway has been sold for \$50,000 to Edward R. Price.

**Norwich Dividend.**—The Norwich (Conn.) Street Railway Company has declared its second semi-annual dividend of 2½ per cent., payable January 1 to stock of record December 26.

**Receiver in Adrian, Mich.**—Frank E. Snow, of Detroit, has been appointed receiver of the Adrian Electric Street Railway Company. The road was bonded for \$50,000 and defaulted in interest.

**Sale of a Street Railway Denied.**—The reported sale of the franchise of the Gloucester, Beverly & Essex Street Railway Company of Gloucester, Mass., to the Boston & Maine Railroad Company has been denied.

**Suburban Traction Assets.**—Watson Whittlesey, receiver of the Suburban Traction Company, of Orange, N. J., has filed his report. The total debt of the company is \$150,089.03, and there are \$535,000 of bonds. The total assets are \$309,913, and there is \$69,889 of unsecured debt.

**Union Traction Bonds.**—The Union Traction Company, of New Jersey, has filed a \$1,000,000 mortgage in favor of the Metropolitan Trust Company, of New York, to secure its issue of 5 per cent. bonds, the proceeds of which will be devoted toward equipping and extending the line.

**New London Railway Dividend.**—The New London (Conn.) Street Railway Company has declared a semi-annual dividend of 3 per cent., payable January 1 to stock of record December 26. This is the company's second dividend, and is an increase of ¼ per cent. over the previous one.

**New Orleans Traction Loan.**—The New Orleans Traction Company has perfected arrangements for securing a loan of about \$1,000,000. The bonds will be taken by a local syndicate. The proceeds will be devoted toward the completion of a number of branches aggregating about 20 miles of track.

**Columbus Street Railway Earnings.**—The gross earnings for the month of November increased \$5,322.13; operating expenses decreased \$1,278.44, and net earnings increased \$6,657, making for the eleven months ending Nov. 30 an increase in gross of \$23,964.93, the extraordinary decrease in expenses of \$60,365.90, and an increase in net of \$84,330.83.

**Verdict in Condemnation Proceedings.**—A verdict for \$62,959 was given by a jury in Chicago last week against the Metropolitan West Side Elevated Railway Company in the suit to condemn the right of way along the proposed branch of the road which will leave Milwaukee avenue near the junction of that avenue with Roby street and proceed west. The property included 43 pieces, nearly all improved, and the amount awarded by the jury is said to have been more than the company could have purchased it for before the cases came to trial. The company moved for new trial.

**Buffalo Railway Earnings.**—The gross earnings of the Buffalo Railway system for the month of November show a comparative increase over the same period in 1893 of \$7,488.52, a decrease in operating expenses of \$7,734.58, and an increase in net of \$15,223.10. It will be noted that notwithstanding \$7,488.52 more business was done last month than in 1893, the cost of handling it was \$7,734.58 less, making the gain in net nearly twice as much as the increase in gross. For the eight months to Nov. 31 there was an increase in gross earnings of \$9,417.50, a decrease in operating expenses of \$14,897.62 and an increase in net earnings of \$24,315.13.

**Nashville Dummy Line Sold.**—The West Nashville Dummy Railroad was sold at auction on Dec. 11 at the court-house door by L. H. Davis, president. The company some time ago decided to go into liquidation and sell the property. Mr. Davis stated that the road cost \$169,000. The bidding was opened by J. H. Acklen, who bid \$10,495 for the company. E. Pollak, representing the Block-Pollak Company, of Chicago and Cincinnati, raised this bid \$5, making it \$10,500, at which figure it was sold. The company purchasing the property was represented at the sale by Mr. Pollak, president, and Harry Benjamin. The purchase includes roadbed, rails, rolling stock, terminal facilities, franchises and car sheds and ground in West Nashville. Mr. Benjamin said he did not know what his company would do with the road, but it is understood that it will be operated for a while at least.

**To Consolidate Sioux City Companies.**—An effort has been made recently to secure a consolidation of



the Riverside Park and the Sioux City cable companies. For some time past this plan has been in contemplation, and it is hoped to put it into effect in the course of the next few months. The proposition of the Riverside bondholders is to push the foreclosure cases against the two roads until a decree is rendered and to bid them in at sheriff's sale for a sum sufficient to cover the amount of the bonds on both roads. A new company will then be formed to take charge of them both, and stock will be issued and given in exchange for the bonds. It is said that a large majority of the bondholders of both companies will enter into the reorganization. The local representatives of the companies are using every endeavor to push the foreclosures as rapidly as possible, and believe they can get decrees by next spring at the latest, after which the reorganization will follow in a few weeks.

**General Electric.**—We understand that the General Electric Company is doing as large a proportion of the electric business of the country as ever in its history. Of course the electric business is not now on the scale of two years ago, but the company is now doing its proportion upon a cash basis at lower prices and lower cost sheets, and increasing its output. It has now 3,100 men at Schenectady and 1,700 at Lynn, the latter number being an increase from 1,200 in September. The gross volume of its business is now more than \$1,000,000 per month and the balance sheet shows a reducing deficit on capital account, notwithstanding the charging off process which in diminished degree still goes on. The cash balance of the company still remains over \$500,000. The General Electric Company has recently had to increase its expense account \$75,000 for new tools to meet its increased business. Some departments which have shown a decrease for many months by comparison with the previous year now show very handsome increases.—*Boston News Bureau.*

## NEW INCORPORATIONS.

**Detroit, Mich.**—The Detroit Railway Company has been incorporated with a capital stock of \$1,000,000. The promoters are Greene Pack, Oscoda, Mich., Albert Pack, Detroit, Mich., Henry A. Everett, Cleveland, O.

**Chicago, Ill.**—The Interurban Railroad Company has been incorporated with a capital stock of \$50,000 to construct a street railway from Highwood station to Fort Sheridan depot, in Lake County, Ill. The promoters are John W. Harrington, John H. Dymonde, Edgar H. Thorpe.

**Pittsburg, Pa.**—The Washington Inclined Plane Company has been incorporated, capital \$1,000; directors, C. Cramer, L. E. Burton, Henry Bohm and John Naegley, Pittsburg, and John S. Chambers, Jr., Allegheny. The company is to run in opposition to the Monongahela incline company.

The Corning Traction Company has been incorporated to construct a street surface electric road between Corning and Painted Post, capital \$40,000; directors: Fred E. Lyford, Percy L. Lang, Clay Clapp and Frederick E. Hawkes, of Waverly, Tioga County; D. N. Johnson, of Ithaca; Nathaniel C. Harris, F. K. Harris, Charles Kellogg and A. C. Robertson, of Athens.

**Philadelphia, Pa.**—The Fairmount Park Transportation Company has been incorporated under the laws of New Jersey. The company is to build and operate a railway in Fairmount Park. The company's capital is \$2,000,000. The stockholders named are John B. Peddie, of Woodbury, N. J.; Alexander Renwick, of Philadelphia; and John D. Yarrow and Richard F. Bower. It has been rumored that men prominently identified with the Philadelphia Traction Company will have a controlling interest in the new road, and this is borne out by the statement that the four incorporators of the new company are clerks in Philadelphia Traction Company's offices.

**Chicago, Ill.**—The Chicago & Worth Street Railway Company has been incorporated with a capital stock of \$2,000,000. W. W. Beaty, J. H. Smith and M. Skinner, of Chicago, are the incorporators. The railway will be built in South Chicago, and, it is said, will reach all of the important suburban towns in that vicinity. The company will put in service an electric car fitted with a lately improved storage battery. It is said that in all probability ground will be broken in a month's time, so as to have the new line of rapid transit in operation sometime next summer. The company is made up of several Chicago and New York capitalists. It has been stated that Mrs. Hetty Green, of New York, is one of the heaviest stockholders in the organization.

**Hackensack, N. J.**—The Bergen County Traction Company has been incorporated. The capital stock of the company is \$500,000. The road will extend from the Hudson County line at Bull's Ferry to Fort Lee, east to Leonia, north to Englewood, Tenafly, Demarest, Closter, Creskill, Norwood, to the Rockland County line east from Hackensack to New Bridge, south to Fairmount and Hackensack,

through Main street to the Essex street station; also south to Little Ferry and Ridgefield, south from Leonia to Fairview. John Aird Dempsey is the only stockholder in this section, the syndicate being composed of Philadelphians. They are: Jacob E. Ridgeway, Joseph M. Gazzen, Charles T. Colladay, Alexander Balfour, J. Elwood Peters, Charles P. Finchman, R. M. Hartley, William P. Datz, S. Davis Page, William H. Clark.

## NEWS OF THE WEEK.

**Islip, L. I.**—The Islip town officials have granted a franchise to the Electric Railway Company.

**Portland, Me.**—The platforms of the electric cars are to be protected by removable vestibules.

**Atchison, Kans.**—The completion of the electric street railway was celebrated last week. Governor-elect Morrill made an address.

**Philadelphia, Pa.**—The Hestonville Company has withdrawn all of its cars from the Arch street line, and trolley cars alone are operated.

**Kingston, N. Y.**—The Colonial City Electric Railway was formally opened last week and the occasion was made a public celebration.

**Kansas City, Mo.**—A Metropolitan electric car collided with a hook and ladder truck a few days ago. Two firemen were quite badly injured.

**Patchogue, L. I.**—A trolley line is to be built from Patchogue to Port Jefferson, about 14 miles. The stock will be owned by New York men, it is said.

**Media, Pa.**—The Media Council has granted a franchise to the Delaware County & Philadelphia Electric Railway Company to lay tracks on Washington street to connect with the line of the Media & Chester Electric Road.

**Philadelphia, Pa.**—Work has already been commenced on taking up the Seventh and Ninth streets and Columbia avenue cable, which is to give way to the trolley. It is expected that the road will be electrically operated in the spring.

**Baltimore, Md.**—Contracts have been let for grading the Washington-Laurel section of the Washington & Baltimore Boulevard Company's electric line, and bids for the construction of the line will in all probability be awarded by Jan. 1.

**Woodbury, N. J.**—The Gloucester County Rapid Transit Company has made an application to the council for a franchise on Dalloy street. This company proposes to introduce the McLaughlin underground system, if it is granted a franchise.

**Chicago, Ill.**—The South Park board has given Chicago City Railway permission to run trolley cars on Twenty-sixth, Thirty-first and Forty-third streets, crossing Michigan avenue, Grand boulevard and Drexel boulevard at Forty-third street.

**Flushing, L. I.**—Work has begun on the new Flushing & Newtown Electric Railroad. The contract calls for the completion of the road by April 1. Two other roads are about to build extensions into Flushing, the Brooklyn City and Gleason's road.

**Detroit, Mich.**—James A. Randall, E. W. Voight and other residents of Detroit have formed a syndicate for the purpose of constructing an electric railway from the dividing line between Wayne and Oakland counties, through Birmingham to Pontiac.

**Philadelphia, Pa.**—Judge Dallas has dismissed the suit of the Cutter Electrical Manufacturing Company against Henry A. Cleverly and others, brought to recover damages for alleged infringement on patented improvements in electrical switches.

**St. Johnsbury, Vt.**—The bill to incorporate the Mount Mansfield Electric Railroad Company passed the legislature and is now a law. The company will be formed with a capital stock of \$300,000, and it is expected that the road will be running by the 1st of next July.

**Franklin, N. J.**—At a recent public meeting it was unanimously resolved that the township committee be instructed to grant a franchise to the Passaic Electric Railway to run through the town and connect with the Consolidated Traction Company at Belleville.

**Morristown, N. J.**—A public meeting was recently held to consider the advisability of forming an electric railway company to construct a line from the D. L. & W. station through the town to the tracks of the Rockaway Valley Road. I. R. Pierson was chairman of the meeting.

**West Chester, Pa.**—Engineers of the Pennsylvania Traction Company are laying out a line from the terminus of Chestnut street to a point near the Matlack homestead, as the borough's council has signified its willingness to grant the company a franchise through the town.

**Brooklyn, N. Y.**—Work has been commenced on suspending the trolley wire for the new electric lighting service of the Brooklyn Bridge cars. The contract was recently granted to the Electrical

and Mechanical Engineering and Trading Company. It is announced that the coaches will be illuminated within a month with electric lights.

**Alexandria, Ind.**—The Alexandria City Council has passed an ordinance, giving a franchise for an electric railway to Joseph E. Jeffries and C. L. Henry. It is announced that work will be begun next spring. The council has also granted a franchise through the city to the Indianapolis, Anderson, Alexandria & Marion Electric Railway.

**Denver, Col.**—An electric car collided with a city ambulance a few days ago, wrecking the wagon and seriously injuring the three occupants, the police surgeon and two officers. The street railway employees declare that the accident was due to no carelessness of theirs, as the gong was ringing as the car reached the crossing where the collision occurred.

**Brattleboro, Vt.**—It is expected that the electric railroad between Bennington and Woodford will be built and in running order by the middle of next summer. The distance is four miles, and the old roadbed of the abandoned Bennington & Glasbury road will be used. The estimated cost of the road, including the roadbed, cars and power station, is \$40,000.

**New York, N. Y.**—The Board of Aldermen has granted a franchise to the Forty-second Street, Manhattanville & St. Nicholas Avenue Railroad for a line to run through Eighty-sixth street from the Boulevard to Central Park, to connect with the line now running through Central Park, and over East Eighty-sixth street to Avenue A. One fare will be charged for the trip across town.

**Westminster, Md.**—The officers of the Westminster & Union Mills Electric Railway Company have issued a circular urging subscriptions to the stock. The line, which is to start at Reisterstown and end at Union Mills, will be 19 miles long, and can be built, the officers assert, for less than \$200,000. It is designed to form a connecting link in a continuous line from Gettysburg, Pa., to Baltimore.

**Chicago, Ill.**—A permit for the construction of the Chicago & Jefferson Urban Transit Company's railway has been granted and work has already been begun. A double track will be laid on Monroe street from Canal to Morgan, from Morgan to Fulton, Fulton to Ashland avenue, and thence on Fulton street from Ashland avenue to Monroe street. The work is to be completed within 90 days.

**Chicago, Ill.**—The Board of Trustees of the town of Cicero has passed an ordinance granting the Ogden Street Railroad Company the right to operate electric street car lines on various streets located in the southern part of the town. The president of the company is Henry G. Foreman, associated with whom is E. A. Cummings. The estimated cost of the construction of the road and the necessary rolling stock is \$1,000,000.

**Chicago, Ill.**—Mrs. Margaret Shannon has sued the Lake Street Elevated Railroad Company for \$5,000. The suit is similar to those which have been brought against the Manhattan Railroad Company in New York. The plaintiff claims her property is damaged by the passing of elevated trains and by the smoke and dirt. She owns property situated between Fortieth and Forty-second street, with fifty feet frontage on Lake street.

**Watseka, Ill.**—The project of constructing an electric railway between Orango and Watseka via Gilman and Crescent City, making the line 15 miles long, is under consideration. Colonel Arthur A. Spitzer, of Richmond, Va., is at the head of the movement. It is proposed to use the highways, thus in no way creating any inconvenience in the way of right of way through farms. If built the line will be used for both passenger and freight service.

**Brooklyn, N. Y.**—The Board of Railroad Commissioners has dismissed the charge made by H. M. Thompson against the Brooklyn City Railroad Company, in which he alleged that the reports of the company had been altered for the purpose of deceiving the stockholders. The board finds that the company's connection with the Long Island Traction Company is for the best interests of the stockholders and found all of its accounts were correct.

**Brooklyn, N. Y.**—The success of the trolley mail cars run between the post-office and Coney Island over the lines of the Atlantic Avenue Company has led to plans to put them upon the lines of the other trolley companies. Probably the first line of the Brooklyn Heights Company to be equipped with a mail-car will be the Flatbush Avenue line, which passes the branch post-office in the Twenty-ninth ward, formerly Flatbush, and the rural post-office in the town of Flatlands.

**Lowell, Mass.**—The Lowell and Suburban Street Railroad Company has petitioned the selectmen of Tyngsboro for a location to extend the electric road through that town to the New Hampshire line on the border of the town of Hudson. This line will practically parallel the Nashua & Lowell



Railroad from Nashua and tap a comparatively thickly settled farming district on the east side of the Merrimac River, extending over the 12 miles of territory between Lowell and Nashua.

**Detroit, Mich.**—The acceptance of the street railway franchise in behalf of the stockholders of the Detroit Railway Company was received by the council at the last meeting and the official \$100,000 bond and the \$50,000 certificate of deposit from the company, given to secure faithful performance of the terms of the contract with the city, have been also received. The company elected officers as follows: President, Green Pack; secretary-treasurer, Albert Pack; vice-president and general manager, Henry A. Everett; assistant secretary, S. R. Break. The company is already hauling ties to Warren avenue in preparation for beginning work. It is expected that the rail will be here in a few days.

**Brooklyn, N. Y.**—Several ticket sellers, platform men and porters have been dismissed from the service of the Brooklyn Elevated Railroad Company for stealing tickets. The plan that they followed is explained by Superintendent Barton as follows: "Their plan was easy enough. Say, for instance, a party of half a dozen comes into the station. The agent, instead of tearing off the tickets singly, will tear off the six tickets in a string. The passenger throws the string into the chopper's box, and it's next to an impossibility for it to go through in that manner. It's more likely to be cross-wise in the box and act as a clog to all the tickets which follow. Meanwhile the industrious chopper keeps chopping away, but he knows no tickets are falling through, and when the coast is clear he fishes them all out, turns them back to the agent, who sells them over again and then divides the proceeds. It is necessary to take the porter into the game to prevent him turning informer."

PERSONALS.

**Mr. L. Warfield**, of the Detroit Electrical Works, was in New York last week.

**Mr. Eugene Kelly**, the well-known banker, of New York, died on Dec. 19.

**B. E. Sunny**, of the Chicago office of the General Electric Company, was in New York this week.

**Mr. John Worthy**, president of the Metropolitan West Side Elevated Railroad, of Chicago, died in New York last week.

TRADE NOTES.

The Berlin Iron Bridge Company, of East Berlin, Conn., has just completed a new boiler-house for the Metropolitan Electric Company, at Reading, Pa. The Clinton Wire Cloth Company, at Clinton, Mass., has just completed a new boiler-house. The roof is of iron, covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron.

**Waddell-Entz Cars Sent Abroad.**—Two Waddell-Entz storage battery cars, similar to those operated recently on the Second Avenue surface road, in New York, have been sent to Vienna, Austria, where they will be tested by a commission of representative electrical and civil engineers. The cars will be operated on a road now run by steam, and will thus be enabled to run at high speeds.

The Berlin Iron Bridge Company, of East Berlin, Conn., is building a new gas house roof for the Massachusetts Reformatory, at Concord, Mass. The same company, of East Berlin, Conn., is furnishing the iron work for the new office building of the Pope Manufacturing Company, at Hartford, Conn. The Naugatuck Malleable Iron Com-

pany, at Naugatuck, Conn., has placed the contract for its new annealing room with the Berlin Iron Bridge Company, of East Berlin, Conn. The building will be 94 feet wide and 175 feet long, constructed entirely of fire-proof construction.

**Graham Steel Push Plows.**—A. E. Hess, engineer of the Lehigh Traction Company, Hazleton, Pa., ran one of these plows all last winter, and writes as follows: "Replying to yours of July 11th, would say that the snow plow was in use all last winter. It snows up to a depth of 15 in. it worked admirably with one car, but in the extreme depth of snow it required two motor cars to push it; so that we found it better to keep it moving steadily through the storm. It works very much more expeditiously than a sweeper, particularly for country lines. We have tried sweeper and plow, and as a result will order one or more additional plows for use during the coming winter."

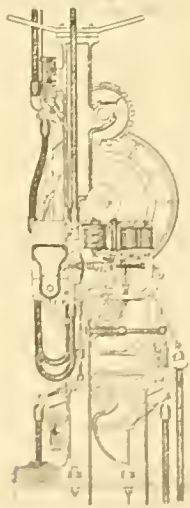
**General Electric Business.**—The increase in the business now being done by the General Electric Company has necessitated an extension of its already extensive facilities at Schenectady, and two large buildings are now being constructed by Grattan & Jennings. One of these is a storehouse, 353 feet long and 52 feet wide. The foundations are already laid and the superstructure is rising rapidly. This will relieve the smaller storehouses, now found entirely inadequate. The other building will be used as a laboratory for standardizing. It will be erected on the very outskirts of the tract of land owned by the company at Schenectady, in order that it may be as far away as possible from the disturbing influences of moving iron and heavy electric currents in and around the many buildings of the plant proper. This laboratory will contain all the standard instruments of the company, and with these the working instruments, which are in use throughout the factories for testing purposes, will be compared each day.

RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Dec. 11, 1894.

**530,198. Insulator for Electric Overhead Construction;** Henry P. Ball, Bridgeport, Conn., Assignor to the General Electric Company, Boston, Mass. Filed June 28, 1891. This is a strain insulator comprising a part provided with a flange having one diameter of its opening greater than the other, and an eye-bolt having an engaging part formed with one diameter smaller than the other. The two parts are arranged to engage, when the longer diameter of the eye-bolt is transverse to the short diameter of the flange, insulating material securing the parts together and insulating them from each other.

**530,507. Controller for Electric Locomotives;** John W. Darley, Jr., Baltimore, Md., Assignor to the General Electric Company, Boston, Mass. Filed Nov. 16, 1893. There is an electro-magnetic circuit-breaker and a commutating cylinder and mechanism operated thereby, which are adapted to vary the capacity of the circuit-breaker in accordance with the position of the commutating cylinder. (See illustration.)



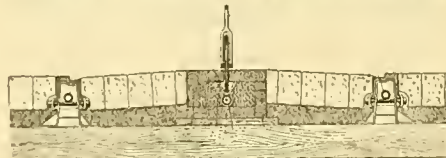
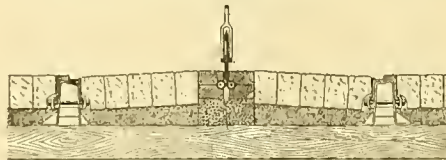
No. 530,507

**530,513. Conduit Electric Railway;** David Mason, Schenectady, N. Y. Filed June 8, 1893. This electric railway system has one or more hollow or tubular conductors held between one or more pairs of insulating supports in close proximity to the surface of the railbed. An electrical generator is connected thereto, a heating apparatus being adapted to force heated liquid vapor or gases therethrough. (See illustration.)

**530,569. Trolley Wire Clamp;** Montraville M. Wood, Chicago, Ill., Assignor to the Ohio Brass Company, Massillon, O. Filed July 2, 1891. The clamp comprises two jaws, each provided with projecting lugs. An interlocking pin passes through holes in the lugs, by which the jaws may be held about the pin. A stud bolt, which the clamp is supported by, is provided with a head adapted to be received into recesses in the jaws of the clamp.

**530,651. Rail Hood or Connector;** Charles J. Reed, Philadelphia, Pa., Assignor to the Reed Electric Company, same place. Filed Sept 29, 1891. The hood

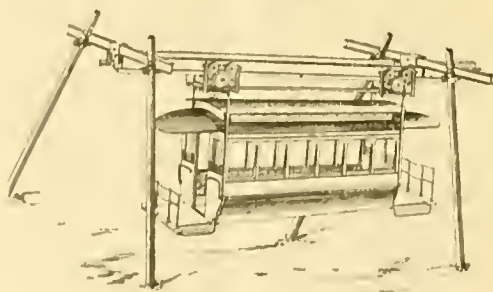
consists of two separate parts screw-threaded into the lateral faces of the rails and afterward bent so that their opposite ends overlap each other, means being provided for electrically uniting the ends together so as to constitute a single continuous bond.



No. 530,543.

**530,661. Switch for Overhead Trolley Tracks;** Charles G. Schmidt, Cincinnati, O. Filed Aug. 13, 1891. The switch is hinged to the main track. The hangers supporting the branch track are each provided with a support for the free swinging end of the switch to rest on when in alignment with either track. A guide bar is guided and supported by and on these hangers, which support the switch and track ends. Guards are carried by the guide bar, and an operative connection is made between this latter and the switch. (See illustration.)

**530,671. Trolley-Wire and Support Therefor;** Herbert H. Astley, Springfield, Mass. Filed Aug. 25, 1891. The support consists of two parallel cheek plates suitably milled so as to have at their end portions clear, downwardly and endwise opening spaces, and having at such end portions rearwardly and downwardly inclined slots. The trolley wire has at its extremity a bar, with an upstanding longitudinal web which is provided with the laterally extending projections.



No. 530,661.

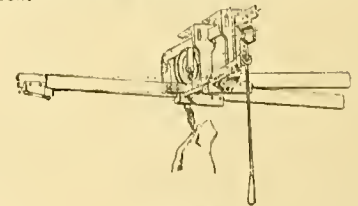
**530,688. Conduit-Railway Trolley;** Joseph C. Hawley and William J. Black, Duncaunon, Pa. Filed March 22, 1891. In the underground conduit there is a depending arm and upon its lower end is a vertically movable spring actuated brake, extending downward at an angle from said standard. This bracket carries a contact wheel at its outer end.

**530,717. Brush for Dynamo-Electric Machines;** Edward T. Platt, Chicago, Ill., Assignor of two-thirds to William Freise and Charles O. Moyer, same place. Filed June 11, 1894. The brush is provided with a flexible body portion and a series of rolls arranged on an arc of a circle to contact at least two segments of the commutator.

**530,727. Rheostat;** Thomas W. Shelton, St. Louis, Mo. Filed Aug. 29, 1894. The rheostat comprises a cylindrical casing, a cover bolted to this casing, a series of fire-clay disks or plates, in which are embedded suitable wire coils. Bolts connect each pair of disks, suitable conductors leading from the bolts to the outside of the cylindrical casing.

**530,783. Brake-Shoe;** Harry A. Lewis, Norristown, Pa., Assignor to himself and William M. Sullivan, same place, and David O. Kerbaugh, New York, N. Y. Filed July 27, 1894. The brake beam is pivoted to the holder and is provided with a transverse end pin, and the keeper connecting the hanger bolt and the end of the brake beam the keeper having a slot to receive the pin on the beam.

**530,807. Rail-Cleaner and Car-Fender;** John S. Tomer, Pittsburg, Pa. Filed April 28, 1891. The rail cleaner and car fender consists of slotted brackets attached to the forward truck of the car, a shaft operating therein capable of a limited vertical movement; brushes are attached to toe shaft, and a pulley is attached to the shaft and connected by a belt to a pulley secured to the forward axle of the car, as a means for rotating the brushes. A lever is arranged within the car, and connected by suitable cranks and links to a shaft whereby the shaft may be elevated or lowered.



No. 530,809.

**530,809. Carriage for Elevated Railways;** John N. Valley, Jersey City, N. J. Filed Dec. 19, 1893. Driven wheels are secured on the axles of two of the running wheels, on the outside of the carriage frame, and a driving wheel is in engagement with the said driven wheels. (See illustration.)

**530,810. Elevated Railway;** John N. Valley, Jersey City, N. J. Filed Dec. 20, 1893. The supported hangers each have two depending arms. The respective meeting ends of the rail carrying stringers are each secured to one of the depending arms of the same hanger.

**530,828. Conduit-Railway Trolley;** Walter E. Delabarre, Francis M. Frazer and Robert A. Carrick, New York, N. Y. Filed Jan. 26, 1894. The transmitting arm is adapted to project through the slot of a conduit, and to it a trolley is connected. A covering of an insulating material is secured to the arm, being provided, at its ends, with bevels facing in the opposite direction from that of the trolley.

**530,912. Brake for Railway Cars;** Josiah A. Webster, Brooklyn, N. Y. Filed Feb. 3, 1894. Serial No. 898,965. (No model.) This is the combination of a longitudinally movable rod, a horizontal bar connected with friction straps having brake shoes, toggle arms supported at one end by the frame of the truck and engaging with a horizontal bar at their other end, and by longitudinally moving rod at their knuckle, and means accessible to the operator for longitudinally moving the rod.



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As the **STREET RAILWAY GAZETTE** is published 52 times a year, and is the only weekly publication devoted to Street Railway Interests, its value as an advertising medium will be apparent to Manufacturers and Dealers in Street Railway Apparatus and Supplies of every description. We will take pleasure in quoting rates for advertising space.

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**New York Rapid Transit.** The last report of the chief engineer of the Rapid Transit Commission in New York,

which is presented elsewhere in this issue, condemns the plans of the old commission as inadequate and impracticable. It suggests a new plan that will involve an expense of \$65,000,000, without any allowance for damages to abutting property-owners. This is \$15,000,000 in excess of the amount voted in aid of the enterprise at the last election.

**No Free Rides for Policemen.** After the first of January policemen in New York State will be deprived of one of

their most esteemed privileges, that of free transportation on street railways. According to one of the provisions of the new constitution public officers are debarred from accepting favors in the way of passes from railroads, and there seems to be no question in the minds of legal gentlemen that the police are public officers within the meaning of the constitutional provision. There is already heard a great deal of grumbling on the part of the guardians of the law, and there is talk of securing legislation to enable them to continue in the enjoyment of street railway generosity. Policemen have always been among the most liberal patrons of street railways, and if they continue to be as persistent travelers street railway revenues ought to increase in the big cities.

**Accumulator Traction and Power Storage.** A paper on accumulators for tramcar traction, by Alfred H. Gibbings, presented

elsewhere in this issue, covers a much broader field than its title suggests. The author believes in the combination of municipal undertakings, because, as he says: "I have come to the conclusion that the secret of success lies not so much in the adoption of any particular method of electric traction, however superior, as it does in enlisting and utilizing services which other enterprises can be made to contribute. Separately, they may be only just paying their way, but, combined, it will probably become possible to make an exceptional success of both." The author then describes the advantages attending the consolidation of refuse destruction, electric railway service by means of accumulators and electric lighting. While we do not believe in the municipal control of lighting and railway enterprises on this side of the Atlantic, there is no reason why Mr. Gibbings' arguments should not apply to the consolidation of such undertakings under the control of private corporations. Our experience of the consumption of refuse as fuel is too limited in the United States to warrant any expression of opinion as to the profitability of destructors. Certainly if there is sufficient fuel lost in every city through throwing away house waste to supply power for generating current for one 16-c. p. lamp for two hours daily for every inhabitant, plans for utilizing it are well worth attention. This estimate of the heat value of house waste was given by Professor Forbes in his address at the Electric Light Convention at St. Louis in 1893. A necessary adjunct of a refuse destructor is a storage system. Professor Forbes believed in thermal storage; Mr.

Gibbings pins his faith to accumulators, and certainly makes out a good case.

**Useless Fenders in Service.** A poor fender is infinitely worse than none at all. It

inspires in the public an unwarranted confidence, with the result that less caution is exercised than would be the case if the cars were not so equipped. In a number of places there are types of fenders in use that are utterly valueless as far as protection to life and limb are concerned, but it is probably true that such devices would never have been adopted had not the companies been obliged to equip their cars, hurriedly and without sufficient investigation, with some sort of a fender in deference either to a mandate of a common council or in response to an urgent demand on the part of the public. It goes without saying, that every street railway company is anxious to secure some sort of a reliable life-saving apparatus, being influenced by considerations of economy as well as by a regard for human life; and had the adoption of fenders not been made compulsory within certain prescribed time limits in the cities referred to, fewer of these alleged life-guards, that are a menace to life rather than a protection, would have been in service. Within a year or two considerable progress has been made in the development of the fender; some forms of undoubted utility are now procurable and inventors are still at work turning out new styles. It would be an unusual week when several varieties were not mentioned in our patent record, and it is safe to assert, we think, that over 300 patents for inventions of this description have already been issued—some of them good, but more of them, it is true, bad or indifferent. Could the companies that have been forced to select fenders in haste, and have adopted poor or unreliable types, have been left free to choose until the variety was greater, fewer mistakes would have been made, and accident lists would not have been much greater than they now are. This statement finds corroboration in an accident that occurred in Brooklyn a few days ago. A lad of fifteen was run down by a car that was equipped with a fender, that, so far from tending to save life, seemed actually to aid in destroying it. The iron guard struck the boy, knocked him flat upon the track, and then passed over his body, leaving him in a position where the wheels inflicted such injuries that death followed his extrication from under the car. No arguments are necessary to prove that a device that makes such an accident possible is untrustworthy for life saving purposes, and if it does seem occasionally to rescue a victim from the consequences of his own carelessness, it is almost a matter of pure good luck. As we have said before, if the public had not been so clamorous, such a fender, which it requires only a glance to condemn, would not have been adopted; and probably before this time something calculated to be of actual service in the protection of life and limb would have come into use. It is hard to be obliged to discard an entire fender equipment, but this is doubtless what must be done in Brooklyn, and perhaps the sooner the better. When this is done, the best plan to follow will be to investigate the whole fender question carefully and exhaustively, as it has been attempted in more than one place, for, to adopt a fender in haste means repentance at leisure.



### THE TUNNEL ACCIDENT IN CHICAGO.

A coroner's jury in Chicago last week investigated the recent tunnel accident in which two persons were killed and 20 others injured by the rear collision of two trains consisting of grip cars and trailers. The testimony showed that a cable grip broke on the steep descent in the tunnel, and as the brakes were unable to hold the cars on the grade, the train crashed into the preceding train. It was shown that the company's rules made the following provision :

Fares must not be collected while in the tunnel, but at this point the conductor's place must be on the rear platform, with his hand upon the brake handle, which he must use in case of emergency.

When the gripman of the train that ran away found that he could not hold the cars by his brake he rang for conductors of the trailers to set the hand brakes. It was asserted that they were engaged in collecting fares. The conductors testified that the rule was a dead letter. The jury then brought in the following verdict :

"We, the jury, find that John Donohue came to his death from shock and injuries caused by being crushed in a collision between the Milwaukee avenue grip car 884 and Ogden avenue car 1,260 in the Washington street tunnel on Dec. 11, A. D. 1894, while a passenger on said car 1,260, said car belonging to the West Chicago Street railroad company. And from the evidence presented we, the jury, believe the death of the deceased Morris Smith resulted through the criminal carelessness of Gus W. Dahlen, conductor of Armitage avenue car 1,843, Conductor R. W. Ross, of North avenue car 1,266, for not being at their posts at the brakes on their respective cars as they should have been, and Gripman Thomas Moran, of Milwaukee avenue car 884, for not applying the brakes in time, and also to the wanton negligence and greed of the West Chicago Street Railroad Company for not providing proper protection for the public using its cars while passing through the tunnel.

"And we further find that the most important rule issued to conductors and the only one that has a tendency to protect the passengers in the tunnel has almost been a dead letter, namely, the collection of fares in the tunnel, as we know it has been the rule and not the exception with conductors to collect fares in the tunnel going west, and the said company should have known it.

"We further recommend that the above named conductors and gripmen be held to await the action of the grand jury until discharged by due course of law.

"We, the jury, having the welfare of our fellow-citizens at heart, recommend to the common council of the city of Chicago that they pass an ordinance compelling the West Chicago Street Railroad Company and the North Chicago Street Railroad Company to station a police officer at each entrance to the tunnels and prevent more than one train entering the tunnel until the train preceding it has begun to ascend the grade at the other end of the tunnel."

### NO FREE TRANSPORTATION FOR POLICEMEN.

The counsel of the Brooklyn Heights Railroad Company have given an opinion that policemen are public officers, and as such are not allowed to accept free transportation by the provision of the new constitution of New York State. They add :

"It will, of course, be a hardship on the policemen whom your company has heretofore allowed to ride free on the cars. They must look for relief through State or local legislation authorizing the city to furnish them with railroad tickets or giving them an increase of pay sufficient to make up for the additional expense to which they are now to be put. However desirous you may be to help them you cannot do so without violating the law.

"As to whether this constitutional provision applies to members of the Fire Department there may be some doubt. While the firemen are public servants, they have not heretofore been considered public officers. Their duties relate principally to the putting out of fires, but they are not confined to that. The firemen make inspections of buildings and do many other things under the laws and regulations which seek to prevent fires and consequent injury to property and to life and limb. It might be argued that they, too, should be kept free from any influence which might possibly interfere with the full discharge of their duties toward the classes of corporations mentioned, and that they are, therefore, public officers within the meaning of the provision we have quoted. Until the courts shall have passed upon these questions

definitely we think it would be best for your company, in order to be certain of keeping within the law, to assume that both the patrolmen and the firemen are such public officers."

### SAFETY IN CHICAGO STREET RAILWAY TUNNELS.

A committee of the Chicago City Council was recently appointed to investigate the accident in the Washington street railway tunnel, by which two persons were killed and 20 others were injured. The accident resulted from the failure of the brakes to hold a train consisting of grip car and two trailers which collided with a train in front. At the meeting of the investigating committee Mr. Yerkes, president of the West Chicago and North Chicago Street Railway companies, expressed his willingness to pay for the services of an engineer selected by the city to examine the street railway tunnels and suggest the application of safety measures. Mr. Yerkes made this statement :

"It is impossible to get appliances that will always obviate accidents. You can operate steam car lines, steamship lines, factories, but you will always have accidents. If there is any way to improve our system we are anxious to do so, but we don't propose to take up every fellow that comes along with a crank idea.

"On all of our cable cars there are three brakes. Two are operated by the gripman and one by the conductor. There is the track brake that tends to raise the car from the track. The next brake, and the one we depend upon, is what we call the combination lever brake ; it is operated by the gripman, and it brakes all the cars in the train."

Mr. Yerkes described the operation of this brake, saying that 20 pounds weight put upon the gripman's lever would stop the whole train ; but the gripman in the Washington street tunnel accident kept on pulling the lever after he had locked the wheels, which was of no use.

"Many people who are ignorant," Mr. Yerkes continued, "say, when there is an accident, 'Put on your hand brakes.' There is no use of the hand brakes when the combination brakes have already been applied—the combination brakes have already locked the wheels. If you gentlemen have some engineer—I don't want the city to be at any expense in this matter—who can better our system, we want to use his appliances. We feel, as I have said, as if we have pretty nearly obviated accidents. We have thought perhaps we might be able to fix that shoe brake so it would work better in slippery weather, and we have made three brakes that we are now trying. As to the block system I do not think it is practicable. One thing is sure: if it be adopted, the North and West Chicago street railways will be obliged to give up running cars through the tunnels, because to wait until there was the distance between the top and the bottom of the tunnels between cars is out of the question, and we would have to go back to the bridges. There have been times when it was a good thing to have the trains close together.

"I have thought, sometimes, it would be better to have about five trains coupled together, but one grip might be doing the work for four or five trains and that grip would break. With the block system on steam roads we find accidents. In our system it would not operate at all. I think it would bring infinitely more danger."

Ald. Madden asked: "Do these accidents occur usually through failure of the brakes?"

"They happen through different causes. Of course, if the grip breaks and the brakes work all right there is no trouble. There was a strange combination of circumstances the other day in the Washington street tunnel. There was an old grip that had made its second trip that day—enough for a test. Yet it broke. Then in addition to that there was a wet and greasy track. We take a great deal of care of those tracks. There is always sand on them. This day the mud got mixed with the sand, and the wheels slid on it,"

Ald. Coughlin said : "Weren't some of the people hurt on account of the narrowness of the tunnel?"

"Well, if the tunnel had been wider there would have been more chance for people to get off on the other side."

"Wouldn't it be a good thing to widen it?"

"I question if it can be widened."

Ald. Coughlin wanted to know if a system of cogs like that in the Van Buren street tunnel would not give safety.

"Well, sir," said Mr. Yerkes, "there's a thing that we thought would surely work. Still it is liable to fail."

### DECREASE IN THE NUMBER OF PHILADELPHIA CAR HORSES.

There are about 6,700 fewer horses on the streets of Philadelphia than there were a year ago, for those figures represent the number that the passenger railway companies have disposed of since the trolley lines began running. There are now nearly 2,800 more in the stables of the various lines, which a year from now will also be doing other work than drawing horse cars. The Philadelphia Traction Company has sold about 3,000 horses since the Thirteenth and Fifteenth streets trolley cars began running, on Dec. 16, 1893. The company has nearly 2,000 horses employed on the lines still operated by the old style of motive power. More than 2,000 horses have been sent away from the different stables of the Electric Traction Company, and there are 500 more to go when the trolley system is completed on the numerous branch lines operated by the company.

Since July 1 the People's Traction Company has disposed of nearly 1,250 horses, but it takes 240 to operate the Callowhill street line, which is the only road of the system not operated by electricity. The starting of the trolleys on the Arch street line of the Hestonville, Mantua & Fairmount Passenger Railway Company, a few weeks ago, threw about 400 more horses on the market, and 150 or 200 are at present required to furnish the motive power for the Race and Vine street cars.

Nearly all the horses that have been crowded out of employment on the street railways have been sent to dealers and sold. The companies got rid of their poorest stock, sending the best to the lines still operated by horse power, and saving the expense of purchasing new stock last fall. The prices obtained varied. The poorest brought as little as \$10, the average was perhaps \$40 to \$50, and a few selected horses were sold for as much as \$75. A great many were secured by farmers, and will probably prove good investments. Hucksters bought the poorest, and they are still traveling the streets of the city. A few good, sound animals were sold to men who knew how to care for them, and have made excellent driving or family horses.

### TROLLEY MAIL LINES AND STRIKES.

As there has been considerable talk of a street railway strike in Brooklyn of late, Postmaster Sullivan, of that city, was asked regarding the effect of a general tie-up on the trolley mail service. He made the following statement :

"The companies will be responsible for seeing that the mails go through all right. If there is a strike, it will be the duty of the companies to see that their lines are not blockaded, and I suppose the United States marshals might be used for that purpose. But I do not think they would be called upon to act until it was shown that the municipal and State aid had failed. The strikers would not be allowed under any circumstances to interfere with the United States mails. The men who run the mail cars are sworn agents of the government. The companies will be compelled to keep their lines open all the time, and in order to do so they must utilize their men instead of throwing up their hands in case of a strike and saying they can do nothing. If the companies should use the fact that they are carrying the mails to coerce the men in any way, I would cancel the contract on 30 days' notice."



**POWER PLANT, STEINWAY RAILWAY COMPANY.**

Among the power stations contiguous to New York City which have been recently constructed is that of the Steinway Railway Company, located at

feet below mean low water, and were put in position by divers. This task was very difficult on account of the swift flow of the tide and the swash caused by the large boats passing to and fro.

The station was originally designed for about

such apparatus: at the same time the results obtained in its operation are such that it leaves little to be desired in the way of economy, as the appended report of a test will show.

The station is provided with one 1,250 H. P. Worthington duplex independent condenser, built especially for the work. When the entire plant is completed one more of these condensers will be put in.

The boiler-house contains 1,000 H. P. of Babcock & Wilcox tube boilers, set with McClave rocking grates, and arranged for burning cheap grades of coal. These boilers are fed by Worthington duplex pumps, the water passing first through individual National heaters at each engine, and then through a Berryman auxiliary heater into which the exhaust steam from condenser is turned. By this process the temperature of the feed water is raised to 212 degrees.

The steam piping is in duplicate throughout, so that a shut down is almost impossible. Chapman valves have been used throughout and all live steam pipes are of wrought iron with flanged joints, and put together with copper gaskets. Separators designed by the engineer and built by the Dickson Manufacturing Company, of Scranton, Pa., have been placed in the steam mains. Benjamin F. Shaw, of Wilmington, Del., was the contractor for the piping, and John W. Ferguson, of Paterson, N. J., was the contractor for masonry work.

Coal is brought directly to the dock adjoining the boiler-room in boats, there being sufficient depth of water for large coal barges. A coal pocket of 900 tons capacity is located on the dock. The coal is hoisted from the boats to the by pocket by a specially designed hoisting service, operated by a 20-H. P. gas engine railway motor.

The entire plant was designed by and constructed under the immediate direction of J. H. Bickford, consulting and constructing engineer, of Salem, Mass.

**TEST.**

The following figures were obtained at a test of the power plant conducted by J. H. Bickford and G. H. Davis. In order to provide a steady load for



POWER STATION OF THE STEINWAY RAILWAY COMPANY.

Hell Gate, on the Long Island side. The company owns about 28 miles of road, operating through the residence and business sections of Long Island City, Ravenswood, Astoria and Steinway, and extends to Bowery Bay Beach. The track is laid with girder rail, ranging in weight from 70 to 90 pounds.

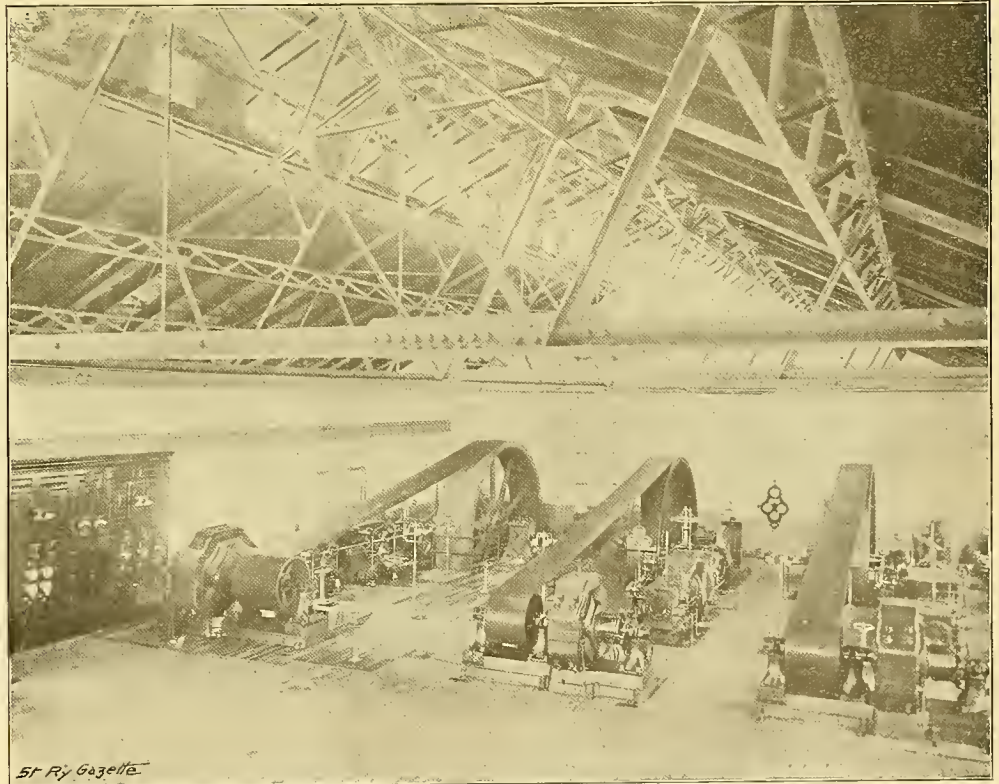
The cars are handsomely painted and decorated with interiors finished in mahogany with maple ceiling, and were furnished by the American Car Company, of St. Louis. The cars are mounted on Peckham trucks, and are equipped with General Electric motors. The company has commodious car house and repair shops at the Steinway terminus of the road. The repair and machine shops are equipped with modern appliance for making all necessary repairs.

The power station, as will be seen by the engraving, is constructed of brick, and the chimney is built of the same material. The former is built in the form of an L, with the engine-room, 70 feet  $\times$  128 feet, representing the long side, while the boiler-room, 66 feet  $\times$  87 feet, represents the short side. The roof trusses are of steel, and were furnished by the Berlin Iron Bridge Company, of East Berlin. The station is provided with a traveling crane of 12 tons capacity, also furnished by that company. The chimney is 150 feet high, with an internal diameter for the flue of 8 feet.

One feature of this station is the location of the boiler-room floor on a level with that of the engine-room, so that under each is a basement with a head room of 9 feet; that under the engine-room is used for piping, heaters, condensers, etc., while under the boiler-room provision has been made for the removal of ashes, which are dumped directly from the furnaces into hand carts and wheeled directly out of the building, a door being provided at the level of the basement floor and opening immediately on a dock constructed in the rear.

The character of the soil where the building stands was such that it was necessary to go to solid rock for all foundations, both of house and machinery. The rock varied in depth from 3 feet to 26 feet below grade; a number of the piers supporting the rear wall of the boiler-house were over 16

3,500-H. P. engine capacity, 1,500 H. P. of which has already been installed, consisting of three Corliss, tandem, compound, condensing engines, built by the Dixon Steam Engine Works, of Newburgh, N. Y. Directly belted to these engines are



ENGINE AND GENERATOR ROOM—STEINWAY RAILWAY COMPANY.

two 300 K. W., and one 500 K. W. General Electric generators, the belts being of the make of Charles A. Schieren & Co.

The station was not equipped with direct connected engines and generators, because it was designed and begun previous to the introduction of

the engine, a water rheostat was used; and by arranging a circulation of the water a comparatively even load was maintained. The quality of the steam was determined by a Barrus separating calorimeter; a Heysler calorimeter was also used. Pea coal (anthracite) was used and was taken from



the regular storage and not culled. Cards were taken from the engine at regular intervals of 15 minutes; also all other readings were taken at the same intervals.

**BOILER TEST REPORT.**

Type of boiler.....Inclined Water Tube  
Commercial rating.....250.00 H. P.  
Maker's name.....Babcock & Wilcox Co

**RESULT OF TEST.**

Duration of test.....	6,000 hrs.
Revolutions per minute.....	70,500
Average gauge pressure at throttle.....	127.500 lbs.
Average receiver pressure by gauge.....	17.370 "
Average vacuum by gauge.....	24.500 in.
Temperature of injection water.....	66.000°
Temperature of discharge from condenser.....	103.000°
Engine constants—High pressure H. E.	4.207
1,319 C. E.	

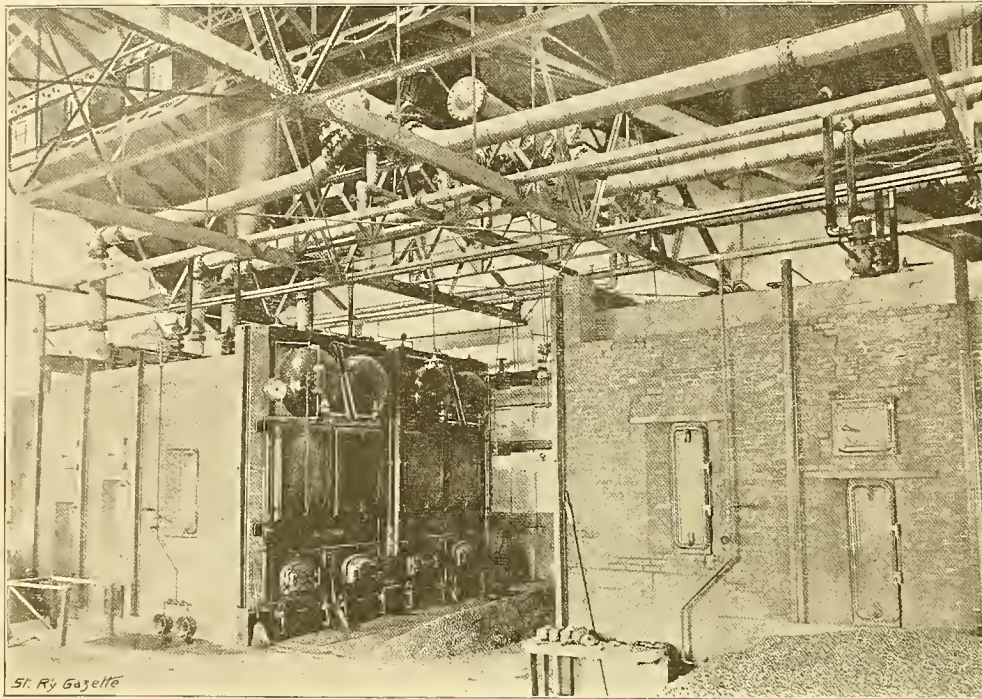
Maximum H. P. developed.....	415.6300
Minimum H. P. developed.....	334.6800

**DESCRIPTION OF GENERATOR.**

Type—Multipolar.  
Form—Direct belted.  
Capacity in K. W.'s.....300  
Maker's name—General Electric Company.  
Revolutions per minute.....400  
Generator percentage over compounded... 10

**REPORT OF TEST.**

Duration of test.....	6 hrs.
Average amperes by ammeter.....	478
Average volts by voltmeter.....	531
Total watts.....	253,818
Average electrical H. P.....	310.6
Pounds dry steam per electrical H. P. per hour.....	20.510
Pounds dry coal per electrical H. P. per hour.....	2.770
Ratio of electrical H. P. to indicated H. P.....	89.000%



**BOILER ROOM--STEINWAY RAILWAY COMPANY.**

Grate surface area.....	59.50 sq. ft.
Water heating surface.....	2,758.00 "
Superheating surface.....	None
Ratio of water-heating surface to grate surface as 1 to.....	46.35
Draft.....	Natural
Fired.....	By hand
Duration of test.....	6.00 hrs.

**AVERAGE PRESSURES.**

Steam pressure in boiler, by gauge.....	131.00 lbs.
Absolute steam pressure.....	148.70 "
Atmospheric pressure, per barometer.....	
Force of draft in inches of water on down-take.....	.25 (0) lbs.

**AVERAGE TEMPERATURES.**

Of steam.....	357.697°
Of escaping gases on downtake, about.....	300.000°
Of feed-water, city mains, 60', to boilers....	211.400°

**FUEL.**

Kind, Delaware & Hudson pea coal.....	
Total amount of coal consumed.....	4,838,969 lbs.
Moisture in coal.....	424,000 "
Dry coal consumed.....	4,414,969 "
Total refuse, dry.....	485,000 "
Total combustible (dry weight of coal, less refuse).....	3,929,969 "
Dry coal consumed..... per hour	740,660 "
Combustible consumed..... per hour	659,830 "

**RESULTS OF CALORIMETRIC TESTS.**

Quality of steam, dry steam being taken as unity.....	97.69%
Percentage of moisture in steam.....	2.31%
Number of degrees superheated.....	None.

**WATER.**

Total weight of water pumped into boiler and apparently evaporated.....	44,614.00 lbs.
Water actually evaporated, corrected for quality of steam.....	43,583.42 "
Equivalent water evaporated into dry steam from and at 212° F.....	45,631.84 "

**ECONOMIC EVAPORATION.**

Water actually evaporated per pound of dry coal from actual pressure and temperature.....	9.800 "
Equivalent water evaporated per pound of dry coal from and at 212° F.....	10.27 "
Equivalent water evaporated per pound of combustible from and at 212° F.....	11.52 "
Horse-power developed expressed as the commercial equivalent.....	220.40

**RATE OF COMBUSTION.**

Dry coal actually burned per square foot of grate surface per hour.....	12.44 lbs.
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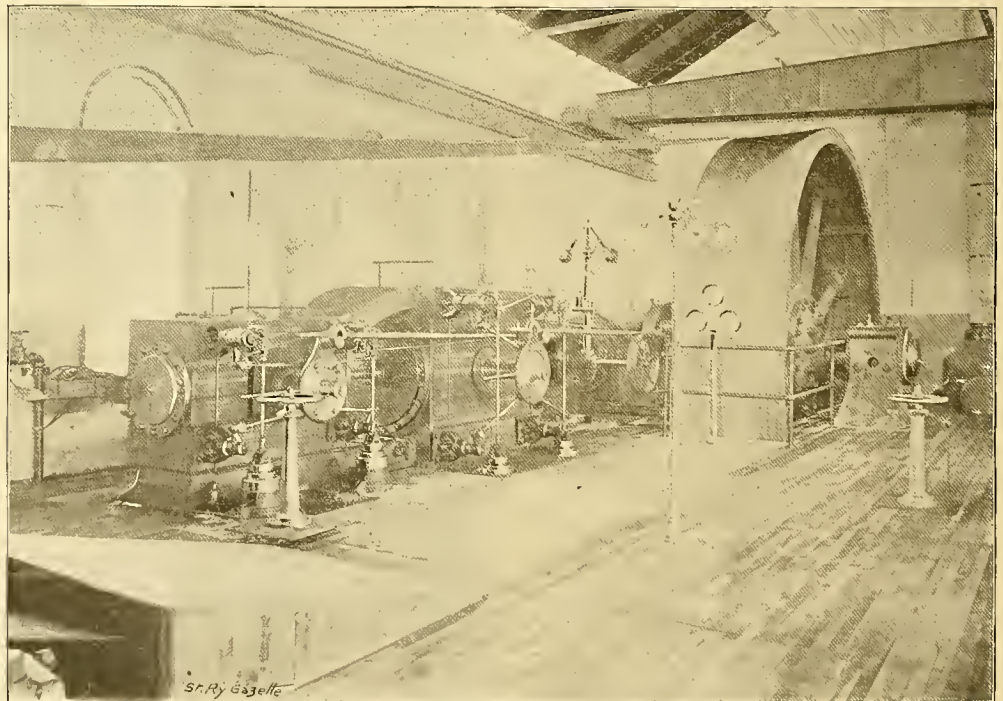
**DESCRIPTION OF ENGINE.**

Type of engine.....	Corliss
Form of engine.....	Tandem compound
Maker's name.....	Dixon Steam Engine Co.
Diameter of cylinders, high pressure.....	18 in.
" " low pressure.....	34 "
Length of stroke.....	43 "
Diameter of piston rods, high pressure.....	3.250 "
" " low pressure.....	4.875 "
Scale of indicator springs, high pressure.....	60 lbs.
" " low pressure.....	20 "
Diameter of fly wheel.....	20 ft.
Weight of fly wheel.....	50,000 lbs.
Width of face of fly wheel.....	38 in.
Width of belt.....	36 "
Cylinders not steam jacketed.....	

Engine constants—Low pressure H. E.	15.195
15,328 C. E.	23.300°
Average cut-off per cent. of stroke H. P.	10.000%
Compression per cent. of stroke: High pressure.....	4.600%
Compression per cent. of stroke: Low pressure.....	8.000%
Average M. E. P.: High pressure H. E. 52.77 C. E.	51.250
Average M. E. P.: Low pressure H. E. 13.23 C. E.	13.700
Horse power: High pressure C. E. 107.54 H. E.	114.748

**TROLLEY AND TELEGRAPH WIRES.**

Judge Dallas, of Philadelphia, has granted an injunction against the Philadelphia, Cheltenham & Jenkintown Passenger Railway Company restraining it from interfering with the wires of the Western Union Telegraph Company. It is alleged that the railway company, in constructing its trolley road, is building its own line of telegraph from Jenkintown into the city, on Germantown avenue and along old York road; that the defendant company, in erecting its poles and wires, has done so in such a way as to seriously interfere with the Western Union. At one point, it is charged, the trolley poles have been erected so that the tops of the poles extend up between the wires of the plaintiff, so that the span wire which extends from pole to pole across the road is in among the wires of the plaintiff, and so that the same are either in constant physical contact or brought in contact by any vibration occasioned by the blowing of the wind or otherwise, the result of which physical contact on the defendant's poles or wires with the wires of the plaintiff is to immediately destroy their usefulness. That this caused such an interruption, delays and errors in the transmission of intelligence along the wire affected as to render it worse than useless. From Branchtown to Jenkintown, a distance of about four miles, the interlacing of the wires is complained of, and it is charged that, when the defendant's line goes into operation, and the dynamos are con-



**DIXON ENGINE IN STEINWAY RAILWAY POWER PLANT**

Horse power: Low pressure C. E. 101.066 H. E.	101.394
Average H. P.: High pressure.....	232.552
" " Low pressure.....	392.461
Total average H. P. of engine.....	425.812
Friction load in H. P. including belt and generator.....	46.875
Condition of steam at throttle, percentage of moisture.....	.0065
Pounds dry steam per indicated H. P. per hour.....	16.2300
Pounds dry coal per indicated H. P. per hour.....	1.7400
Pounds combustible per indicated H. P. per hour.....	1.5500

nected with the trolley wires and started up, the Western Union line will be rendered useless for the four miles; and the use thereof for all practical purposes, for the circuit extending from New York, via Philadelphia and Baltimore, to Washington and the intermediate places, will be destroyed. This constitutes one of the main trunk lines of the Western Union south from New York.



**UNDERGROUND TUBES FOR RAILWAY FEEDERS.**

The success which has attended the use of the underground feeder in the electric street railway practice of Philadelphia has called general attention to the desirability of doing away with the objectionable obstruction of the overhead feeder wire, and substituting for it the equally effective underground feeder. The question is coming

double and triple conductor form. The conductors of pure lake copper tinned are 20 feet 4 inches long and project some two or three inches beyond the end of the thoroughly japanned welded steel tubes. Every precaution is taken in the manufacture of tubes to insure perfection of insulation and efficiency. The compound used is the result of 12 years' experience, and is tough and plastic even below freezing point. Thus it can adjust it-

**THE ELECTRIC BRAKING OF MOTOR CARS.**

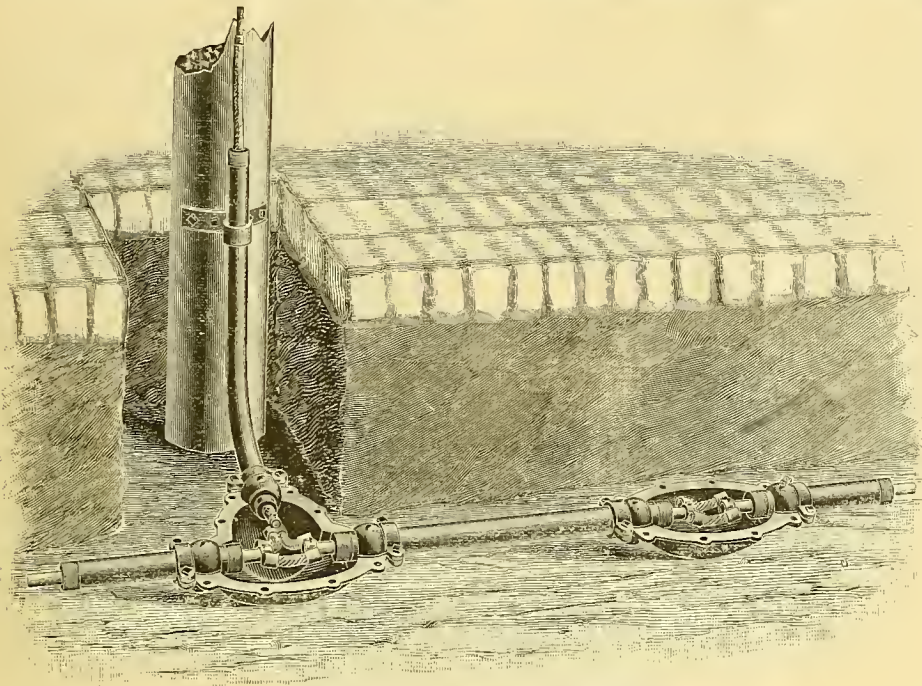
BY W. NELSON SMITH.

*PART II.*  
(Concluded.)

A car on a grade, with the electric brake applied, will roll down gently and gradually attain a uniform speed, which will be maintained all the way down. The work done by gravity in pulling the car down the grade reappears in the form of heat developed in the motors by the current they generate in themselves, in addition to the work required to overcome the rail and journal friction of the car. With certain systems of wiring, the rheostat can be thrown wholly or in part into series with the motors, thus permitting of more gradual application if desired.

This method of braking is evidently an inherent quality of the ordinary double motor equipment, as usually installed, and is entirely independent of the common friction brake in any of its forms. A single motor equipment can also be used in the same way, if proper arrangements be made for short circuiting the motor, and giving it a chance to generate a current of its own, and so perform work. This is what is accomplished in the Sperry electric brake. This brake, however, goes a step further, and combines friction braking with purely electric braking by using the current generated by the motor, to energize a magnetic clutch, which brings both friction and magnetism into play to complete the work of stopping the motion of the wheels, and to lock them when stopped. This brake is too well known by this time to need further description here. Few who saw it in practical operation at Atlanta during the recent convention could fail to be convinced of its effectiveness. The writer has long been of the opinion that future progress in motor car brakes will be along this line. One objection to the use of this brake has been that it becomes necessary to use the gears in stopping as well as in starting the car; but if they are able to transmit the power required to accelerate a car from rest to full speed in the short time interval in which most motormen force them to do it, they certainly will not be damaged by transmitting the stress due to electric braking.

Another objection to the electric brake, even in its improved form, lies in its requiring the motion of the car in order to act at all. For instance, the wheels of a car cannot be locked by the Sperry brake when stopping on a grade exceeding four per cent., and then only because of the action of the magnetic clutch. Neither can it be applied



JOINT BOXES AND FEEDER TUBES.

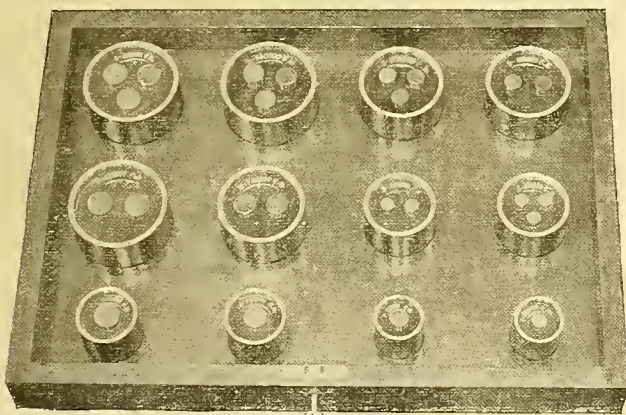
rapidly into prominence, especially in large cities where the overhead feeder has no better excuse than its rapidity of installation.

Some four years ago the Milwaukee Street Railway Company determined on a system of underground feeders. The Edison system of underground tubing, so well and favorably known in the field of electric illumination, was selected, and proved entirely successful. This led the General Electric Company to develop a full line of fittings, joints, boxes, pole tubes, etc., to meet demand for underground railway feeders, which has already commenced and is increasing. The advantages of

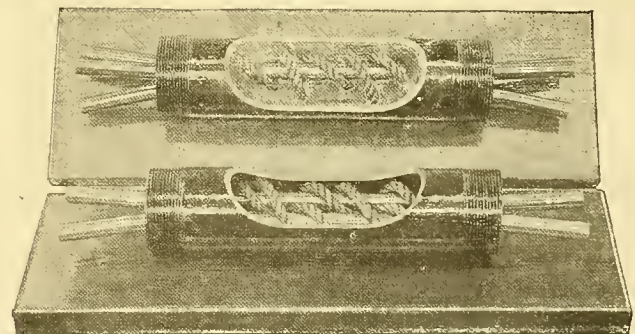
self to any expansion, contraction or movement of the tubes.

The junctions and branches are effected by means of boxes and flexible couplings, the boxes being filled with the compound after connection is made, and sealed.

A few of the especially valuable features of this system are the following: It has no ducts to fill with gas and blow up manholes; it may be tapped at any point without the necessity of a manhole; it does not allow of return circuits, and avoids to a great extent electrolytic dangers; tubes take up little or no room in the street; the system is dur-



SECTIONS OF TUBES SHOWING CONDUCTORS.



SECTION OF TUBE CUT AWAY TO SHOW CONDUCTORS.

the system of underground tubing are already fully demonstrated by the fact that 150 miles are laid in New York alone, and that Chicago, Philadelphia, Boston and other large cities are similarly canalized.

The underground electric tube consists of one or more conductors contained in and insulated from a steel pipe. Each tube, forming one section, is as complete when it leaves the factory as is a rail from a rolling mill, and like a rail need only be joined to other units to form a continuous line. For railway work these tubes have been standardized between 200,000 and 1,000,000 c. m. in single,

able; the insulating compound does not crack in cold weather, and will stand a temperature which would speedily ruin hard rubber, and the tubes one-eighth inch thick are not easily pierced. The system is "ironclad," and as such offers great advantages for railway underground feeder work.

**Taunton, Mass.**—The Taunton Street Railway Company has been granted a franchise through Dighton. An extension of time was granted several weeks ago, but the action was questioned by the Fall River & Taunton Company. It was ratified at a special town meeting Dec. 20,

while the car is at rest on a level unless the car be first given a little motion in order to excite the magnetic mechanism. The latter objection will probably always hold good unless auxiliary appliances be introduced, operated by current from the trolley wire. But it seems to the writer that the former objection can be overcome by the introduction of some positive electromagnetic mechanism that will not only stop the wheels, but prevent their starting again under any circumstances until the operator desires it.

It cannot be claimed even for a perfect brake, electrical or otherwise, that it will perform impos-



sibilities in stopping a rapidly moving car within the space of a few feet, and any brake that acts through the wheels must necessarily have well defined limitations. Wheel brakes appear to be more generally in favor than track brakes, and, as can be seen from the above explanation, the braking force can be more effectively applied to the wheels in this way than in any other.

It has also this advantage, that the power station is not called upon to furnish any additional energy for braking purposes, as is the case with air brakes or any other that may be directly or indirectly operated by the trolley current. Sufficient power for braking purposes can be derived from the energy of motion of the car itself, provided the electrical engineer can devise apparatus adapted to make use of it. And one very great advantage is, that the higher the speed of the car the more powerful does the braking force become.

Another curious fact has been observed, when the electric brake is applied as described above. As the car slackens speed after the application it has been noticed that one pair of wheels will gradually cease revolving, slide a short distance, and then begin to turn the other way. This reversal may only last a second or two at a time, but it recurs again in a moment. In short, one pair of wheels revolves in the same direction continually, while the other pair revolves alternately forward and backward, until the car has come to rest.

To account for this apparently contradictory state of affairs, the following explanation is offered: It is probable that the rail friction of one pair of driving wheels is greater than that of the other, not to mention minor differences in the internal friction of the motors themselves. This may be due to the distribution of weights in the car, and to the condition of the track and wheels, its effect being to keep that pair of wheels in motion longer which has the greater frictional grip on the track. If the total friction acting against motor A be greater than that acting against B, the latter will be first to have its wheels slipping, the supposition of course being that the application of the brake tends to stop the wheels from turning. Suppose A to continue revolving by virtue of its more powerful grip on the rails; then, if B's rotation ceases, its electromotive force ceases also, and it is no longer a generator. It is now in the position of a motor, receiving current from A, which is still acting as a generator. The current from A continues in the same direction as before, and so B's field is magnetized in the same polarity as when B was generating a moment before—see Fig. 2 [last issue]. We now have a series motor with the current traversing field and armature in the same direction as when it was a generator, therefore its rotation as a motor must be in the opposite direction from its rotation as a generator; for the current flows as it did before, and the counter-electromotive force, which must oppose it (magnetic polarity being in the same direction as formerly), must be induced by motion in the opposite direction. This rotation of B's wheels in the opposite direction can only last as long as those conditions of speed and rail-friction exist, which permit the wheels to slip. As soon as previous conditions are restored, B's wheels will resume their original direction of rotation, and B will again become a generator; and the same cycle of operations may be repeated. Of course the effect of this momentary reversal is to put an additional check on the speed of the car.

If the resistance of the motors and their connections be known and an ammeter be cut into the circuit, the electromotive force built up in the two motors can be calculated for any ampere reading, and the electrical horse power developed can also be determined. It is better to use for this purpose an instrument whose indications are independent of the direction of the current through it; otherwise the frequent reversals of current when changing the machines from motors into generators may damage the instrument or affect the accuracy of its readings,

In conclusion, the writer recommends the subject to any who may have the time and facilities for systematic investigation as being decidedly interesting and likely to repay careful study. Any additions to existing knowledge of the possibilities of electric braking apparatus will surely be appreciated by all who are interested in electric railway technology.

**MAIL CARRIERS' STREET RAILWAY TICKETS.**

The accompanying cut illustrates a new form of street railway ticket intended for the use of mail carriers. It was designed by J. H. Stedman, of Rochester, N. Y., and the object which it is designed to accomplish is obvious. By its use the postmaster is enabled to tell whether money appropriated for street railway fares is expended properly. It is intended that each carrier whose route demands street railway transportation shall have a package of these tickets, which are consecutively numbered and put up in pads of 100, issued by the superintendent of carriers, each ticket bearing his own number. At the end of the month when the

sewers along the balance of the route. The reconstruction of the sewers can only be done through disturbance of the street surface. The railway and sewers would require a total width of at least 62 feet; such a width would not only occupy a large part of the vault spaces along Broadway, but would bring the excavation for the railway so close to the buildings as to require a large amount of underpinning of their foundations. Work of that description is very expensive and is accompanied with great risk. It involves so many contingencies as to render the making of a reliable estimate almost impossible.

Third.—The construction of a four-track road without disturbing the surface of the street involves tunneling methods that are without precedent. The success of such methods is entirely problematical, and the great risk to all the interests involved do not justify their consideration. Broadway is not the place for experiments. The only practical method by which such a road can be constructed would be by open cut.

The objections to a "double deck" plan, especially if a clear height in each tunnel of 13 feet were required, are:

First.—A much deeper excavation, keeping the street open for longer periods and involving the underpinning of foundations.

Second.—The upper tracks would not be on a solid foundation, and would therefore increase the vibration and noise.

**STREET RAILWAY SYSTEMS, BALTIMORE, MD.**  
**U. S. LETTER CARRIER TICKET.**

Good for one ride only when Carrier is on duty with satchel. The Conductor taking this ticket will punch the month, day, and interval of time nearest to the exact time when he received it, and turn it in with his report.

14982      CARRIER NO.      105

COPYRIGHTED BY J. H. STEDMAN, 1894.

105	STEDMAN TIME-LIMIT, PAT. AUG. 23, 1892. OTHER PATENTS PENDING.																																	
	Jan.	Feb.	Mar.	11	10	9	8	7	6	5	4	3	2	1	12	11	10	9	8	7	6	5	4	3	2	1								
	Apr.	May	June	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	12	11	10	9	8	7	6	5	4	3	2	1				
	July	Aug.	Sep.	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
	Oct.	Nov.	Dec.	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
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**AFTERNOON.      FORENOON.**

street railway companies return the tickets to the superintendent, they can be easily sorted out into the separate lots of each carrier. Each lot may be arranged in sequence of consecutive number. It is then readily seen if each ticket was used at the proper time when the service and instructions required its use, and if any were improperly used, the carrier at fault must reimburse the department. Where more than one street railway system is operated in a city, the post office officials can arrange to have separate tickets for each company, or to have any or all of them accept one form of ticket for fare, and to pay each company by the vouchers it presents in tickets at the end of the month. Counterfeiting need not be feared as it is provided that tickets are only good for a carrier with a mail satchel, and any fraudulent use, abuse or false return can be instantly detected by the carrier's number, the time punched, and the consecutive number.

**NEW YORK RAPID TRANSIT.**

The New York Rapid Transit Commission held an unusually important meeting last Wednesday. The chief engineer, Mr. Parsons, presented a report in which he enumerated his objections to the plans of construction heretofore provisionally adopted as well as to a double deck-plan. Mr. Parsons' objections were:

First.—The cross-section is entirely too small for the safe and efficient working of a rapid-transit railroad. With cars similar to those used on the Manhattan Railway, which he thought advisable to use, a width of 50 feet in the clear between side walls was, in his opinion, the minimum that can give the required facilities; 44 feet would be too narrow. Such a car requires in the tunnel a clear height of 13 feet, instead of 11 feet 6 inches, as per the adopted plans.

Second.—The provisionally adopted plans give no consideration to the question of sewers. Broadway has sewers for 62 per centage of its length south of Fourteenth street. With those plans not only must the sewers be reconstructed in advance of the railway work, and outside of its walls, but provision must be made for the construction of

Third.—The distance from the street level to the platforms of the lower tracks would generally necessitate elevators.

The construction of a four-track road in Broadway by any plan will be open to many objections, and Mr. Parsons suggested building a four-track railway from Union Square through New Elm street to the City Hall, and thence a two-track line through Nassau and Broad streets to the South Ferry. This can be supplemented at any time, if desired, by a two-track road from Union Square through University place, Greene and Church streets to the City Hall. Since the express trains would make no stops between Fourteenth street and City Hall, the two-track road on Church street would give the same accommodation between those points to the territory west of Broadway that the four tracks do to that east of Broadway. "If, however, you do not accept these suggestions, and decide to adhere to the Broadway route with four tracks, I submit for your consideration plans which have been designed to lessen the objections stated. The principle of the design is the treatment of the local tracks and the express tracks as separate railroads, and the construction of each double track independent of the other, so as to obtain the maximum of efficiency for both."

The railway would be constructed by taking one-half of the street at a time, laying the side walls in a trench, and then turning half the arch. The other half of the tunnel will be completed later. All the material beneath this arch could be excavated after the latter was completed and the street surface restored. Below, a tunnel could be constructed by means of circular shields, and as these would be driven beneath masonry, previously constructed, there would be little danger of a movement of the ground sufficient to affect the street surface. The running of the cable railway would not be interrupted.

Having advised you that it is not reasonably practicable to build a four-track railway without disturbing the surface of the street, I make no estimate for the work done in that manner. In the estimates I have added a large amount for contingencies, which is intended to cover such as may arise during construction, but nothing has been allowed for property rights or damages to adjoining property.

Mr. Parsons' report was accompanied by estimates of the cost of the work. The board adopted a resolution authorizing the president to appoint four engineers to consider Mr. Parsons' report and submit their findings to the board,



**THE COMMERCIAL POSSIBILITIES OF ACCUMULATORS FOR TRAMCAR TRACTION, CONSIDERED AS A MUNICIPAL UNDERTAKING.\***

BY ALFRED H. GIBBINGS.

**PART I.**

During the past 12 months I have had occasion to consider the question of electric traction in each of the many forms in which it is placed before the public in general and municipalities in particular, by the interested advocates of the respective systems. The fact is, the corporation of Hull had it in contemplation to apply for an act of Parliament empowering them to acquire and work the tramway system of their own borough. I was therefore requested by my committee to place before them a report as to what had already been done in this country in the direction of electric traction, so that, at least as far as this form of traction was concerned, they would be in a position to consider each of the different methods on its own merits.

In my final report to the committee I submitted that, in my judgment, accumulators would offer greater advantages to the town than either of the other forms. The technical journals, however, in which this recommendation was published, did not, I am sorry to say, include the whole of my report to the corporation. The consequence was (as might, indeed, have been anticipated) that several criticisms were passed questioning the commercial and financial results of the method I recommended, whereas, in fact, these results were the determining factors in the conclusion to which I ultimately arrived.

When the subject of electric traction is seriously approached by electrical engineers, corporations and companies, the usual course of procedure and investigation is to consider the relative intrinsic merits of the different systems apart from the very important question of the conditions under which the method is to be employed. Each of the three forms of electric traction, namely, the underground channel or conduit system, overhead wires or trolley system, and accumulators, has its own very able exponents in the technical press and elsewhere, but, unfortunately, the majority of the writers are themselves interested in the system which they advocate, and for this reason such papers cannot be considered to have the same value as if the authors had been entirely disinterested experts.

I am safe, perhaps, in admitting that the overhead wire or trolley system has proved a greater practical and financial success than either of the others. This statement, however, refers to cases in which a special plant has been put down to generate energy for the specific purpose of working whichever system has been adopted, and as far as my knowledge extends, every comparison between the three systems in regard to cost and working efficiency has been made under these especial circumstances. I am, however, digressing a little, and will now resume.

The recommendation to adopt accumulators, which I ultimately submitted to the Corporation of Hull, was based upon an entirely new departure, in the working out of which I have been very interested. My object in bringing the subject before your notice in this paper is that my reasons and conclusions may be fully discussed, in the hope that a new light may be thrown upon municipal undertakings. I have come to the conclusion that the secret of success lies not so much in the adoption of any particular method of electric traction, however superior, as it does in enlisting and utilizing services which other enterprises can be made to contribute. Separately, they may be only just paying their way, but, combined, it will probably become possible to make an exceptional success of both.

Let me clear the way, in the first place, by removing any misconceptions there may be that the circumstances and conditions of the town of Hull relative to electric traction are unique in their nature. Such is not the case. There are, indeed, dead level roads, and these certainly offer many advantages to accumulator traction which might not apply elsewhere. On the other hand, there are many dock bridges which open and close, and these present a mechanical difficulty which, however, can be surmounted without stopping the running of the cars, as it is very seldom that two of the docks' gates are open at the same time. But, in point of fact, these special features do not affect the general question we are now considering.

The basis on which I now propose to consider the subject of my paper has for its essential feature the possibilities in economical management and working which are within the power of municipal corporations. Municipal corporations are, in this respect, widely different from private or public companies, inasmuch as they are responsible, not for one business alone, but for many and varied undertakings. A public company restricted to the narrow limits of its single enter-

prise, will, of course, select a system which is likely to show the lowest working costs, and such a selection will be to the best interests of the shareholders. But municipal corporations should have wider views. They have many businesses to conduct in the interests of the ratepayers. The system, therefore, to be selected by a municipal corporation is that which has the greatest tendency to enhance the value and increase the profits of other departments of the corporation. The cost of working, considered from this point of view, though perhaps actually heavy and large, may be relatively small.

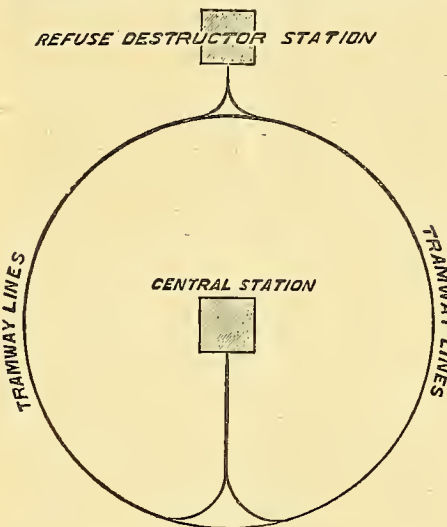
I will now proceed to a short general analysis of the combination of refuse destruction, electric tramway service and electric lighting on the low tension system.

For the purposes of illustrating the general arrangement I beg to draw your attention to the accompanying diagram. The large circle of lines represents the tramcar route, with the destructor station on the confines of the town, and the electric lighting station in the center.

**POWER FROM REFUSE DESTRUCTION.**

It is now a generally admitted fact that, given modern improvements for the generation of steam, some power can be obtained from refuse destruction. The publication of Mr. Charles Jones' book on "Refuse Destroyers" has thrown light upon a subject which has hitherto been neglected by engineers, while the popular articles by Mr. Thomas Thomlinson have brought new possibilities before the electrical engineer.

To sum up the whole of the evidence contained in Mr. Jones' work I find that out of 50 de-



structors at work destroying from  $3\frac{1}{2}$  tons to 10 tons per cell, the power obtained varies from 5 to 7 H. P. per cell. This power has been generated under conditions for raising steam which have had to be and will always have to be modified and made compatible with the complete destruction of the refuse from a sanitary point of view.

The question therefore arises: What is the best use to which this power may be put? Hitherto it has found its solution for the most part in the working of mortar mills and stonebreakers, or as a subsidiary power to an electric lighting station, possibly producing sufficient power for day load purposes. These applications, however, while their advantages are not denied, do not use one-half of the available power, for the simple reason that most destructors are in operation the whole of the 24 hours, and the hot gases are at night perforce turned into a by-pass flue and so far wasted.

Under every scheme which is at present being tried there is as much power lost as utilized, but in the scheme to which I wish to draw your attention this evening the whole available power is laid under contribution day and night without intermission, as far, of course, as the usual engineering considerations will allow.

Now this is a very important point, upon which I wish to lay particular stress.

The difference therefore between my proposition and the use to which the power has already been applied, or, in other words, between my scheme and the schemes for utilizing the power for the day load of electric lighting stations, may be stated as the difference between *horse power* and *horse-power-hours*. The available H. P. with a variable demand is practically an unknown quantity, whereas the utilization of the available H. P. continuously over a stated and prearranged number of hours is a definite quantity and one upon which calculations can be made.

The suggested probable economy in the first case

is a very doubtful matter, but under definite conditions the problem is resolved into calculating the usual losses which always occur through the transmission and transformation of power. Where the power is utilized as an auxiliary to electric lighting one other very serious drawback occurs which I just briefly point out in passing. I refer to the "standing by" of the main boilers and their consequent daily cooling during the time that the destructor boilers are supplying steam. The period of the earning capacity of the former is thereby rendered very short, and the increased economy of working by the combination is practically neutralized by being swallowed up in interest on the capital outlay. In addition the boilers are deteriorated by being alternately cold and hot.

**APPLICATION OF THE POWER.**

In a paper of this description it is quite unnecessary to deal in a detailed manner with all the applications to which it is possible to put the power derived from the destruction of refuse. The effectiveness of this power depends largely on the quantity and nature of the refuse to be destroyed, and this again varies enormously in different towns. But I have already pointed out that according to the best authorities and our own knowledge of the relative value of fuels as heat producing agents, it must be admitted that a refuse destructor cannot be depended upon without the extraneous aid of other fuel to provide its maximum power at any given time. I must not be understood to say that an advisable and economical arrangement might not be devised where coal, for instance, might be used as an auxiliary fuel; but taking the refuse destructor on its own capabilities alone, we may safely assume that as a power producer it is limited to this extent: namely, that it yields a mean steady power only, or, in other words, that it cannot be depended upon for sudden emergencies. We must take it for granted at the outset, I think, that in every case the refuse destructor may be depended upon to provide a certain minimum power. This minimum power must be adequate to meet the demand upon it, or, in other words, the plants to which it is proposed to apply the power must be so designed and arranged that at no time shall a sudden and unexpected demand be made upon the destructor which it is incapable of meeting.

In the town of Hull about 250 tons of miscellaneous refuse are destroyed weekly. This is a small quantity compared with that of other provincial towns. A large portion is composed of dry shop-refuse, such as paper, straw, wood and ashes, while it is not an infrequent occurrence to have to destroy whole ship cargoes of condemned fruits, vegetables and fish. From observations taken I am well within the mark in estimating that with the necessary alterations to the present destructor we could obtain a continuous power of 45 I. H. P. This 45 I. H. P. would give at least 40.5 E. H. P. at an efficiency of electrical machinery of only 90 per cent., or a continuous output of 400 amperes at 75 volts, for it must be borne in mind that under the scheme I am unfolding the electrical machinery would be designed to always work at full load. This arrangement would be amply sufficient to charge batteries of 25 cells, always keeping a certain number of batteries in parallel according to the rate of charge.

Of course, the number of batteries and their size would depend upon the size of car to be propelled, and I have already pointed out that the power at the destructor station can be supplied continuously for the twenty-four hours. This would be equivalent to doubling the capacity of the plant, as the batteries charged during the night would meet the requirements of the tram-cars for half the succeeding day. This power would charge a sufficient number of accumulators to run from about one-half to three-quarters of the trams according to whether the service consisted of twelve or more trams in the hour on the different routes. The remaining portion could be conveniently and economically provided for by supplying another charging station with power from the machines at the central electric lighting station, which machines would be available for this purpose during day or night, excepting only at the time of maximum demand.

In considering the whole matter I had brought before my notice what had already been done with regard to thermal storage. There may be possibilities in thermal storage which are not yet matters of common knowledge. This of course may be especially the case where sudden demands for abnormal power for short periods would be made, as in that case the steady and continuous power generated might be stored.

But the only reliable working statistics we have are those connected with a steam tramway in India, where the engines obtain sufficient power for one journey from a reservoir of high-pressure steam. It can easily be seen, however, that the hot climate of that country must conduce very largely to the success of the system, as radiation must be at a much less rate than would be the

\*Read at the Northern Society of Electrical Engineers, Manchester, England.



case in England. Indeed an English winter might render such a system quite inoperative.

Reverting to the two other alternatives, namely, the overhead cable or trolley system and the underground conduit system, the advantages of which mainly consist in economy of working (plant for plant), I may mention a few of the disadvantages (and consequent expense) attendant upon these systems which do not occur with the use of accumulators:

1. Irregular demands upon the generating plant.
  2. Greater wear and tear of the machinery.
  3. Capacity of generating plant must be equal to all possible demand upon it.
  4. Plant standing idle when cars are not running.
  5. Stringent requirements of the Board of Trade as to insulation and periodical tests.
  6. Greater original outlay of capital.
  7. Impossible to economically use the power which the electric lighting station might contribute during the day.
  8. Inability of the refuse destructor station to supply the whole of the power required; hence,
  9. Necessity to erect independent central generating station to supply additional power required.
  10. For reasons contained in 8 and 9, very little, if any, advantage in point of economical working would arise from the aid of the refuse destructor.
- The foregoing list of disadvantages is serious enough, but over and above all these I may point out that the power from a refuse destructor when applied to an overhead or underground system would only complicate what is merely a simple scheme. In fact, it would be more economical to put down one complete generating plant for the tramcars, appropriating the destructor power to some other purpose, where, as I have already mentioned, the whole power obtainable as calculated in horse-power hours would be turned to more remunerative account.

The most serious item to be considered is, after all, that of capital expenditure. A heavy original outlay runs away with so much of the profit in the case of municipalities in providing interest and sinking fund. Now the capital expenditure, be it observed, for the complete equipment of accumulator cars is usually from 50 per cent. to 75 per cent. only of that required for the overhead cable system according to the track mileage. If the accumulator system can be arranged and worked so that the entire depreciation of the accumulators can be written off per annum out of lower working costs than are possible with either of the other systems, then it is clear that traction by accumulators would be the most highly remunerative system of any form of traction yet devised.

#### THE ADVANTAGES OF ACCUMULATORS.

I have already pointed out that one of the greatest advantages of accumulators for electric traction purposes lies in the fact that the power of a refuse destructor may be utilized to the full, and that in consequence the cost of generating the power (both with regard to fuel and labor) would be extremely small. But if the scheme ended here the advantages would, perhaps, scarcely justify the especial prominence I have given to it. It is only as the destructor is brought into combination with the central station electric lighting plant that the matter becomes supremely worthy of consideration. I am of opinion, in the first place, that no town has sufficient refuse to supply of itself the whole power required to run its tramcar service, whether by accumulators or other system. Even supposing that sufficient power could be so obtained, it would necessitate an additional capital outlay on buildings, machinery, etc., so great that it would practically be the same as for an electrical station independently worked. But where merely horse-power is available, the necessary plant could readily be accommodated. The chief function and value in that case would consist in its being a "relief" station, which would obviate the running of all cars to one point only for recharging purposes. If there were more than one refuse destructor in a town, each, of course, could be used to form a relief station, according to the number and frequency of the cars.

I have so far endeavored to point out the advantages and uses of accumulators in connection with the utilization of the power derivable from refuse destruction. I now proceed to consider a far more important matter, namely, the advantages arising from charging accumulators for electric traction by means of the available and otherwise idle plant at a low tension electric lighting central station.

These advantages are based upon the following fact:

The cell charging can be stopped at the hour when the heavy lighting load comes on, and the full capacity of the plant can then be used for lighting purposes.

This at the first glance may, perhaps, appear a very small advantage, but its full significance consists in the fact that it provides a day load for the central electric lighting station. I have no need to here describe the *modus operandi*; suffice it to

say that low tension central stations are designed for charging accumulators, and by means of independent connections those machines not running in the day or night time could be employed in charging separate accumulators for the tramcar service. As the electric lighting load came on, so the different machines would be transferred from the tramcar plant to the main switchboard, and *vice versa*.

The question now is, What does this arrangement actually mean both to the tramcar and the electric lighting enterprises?

The tramcar enterprise would benefit in many ways, viz.:

1. Less capital would be required, not having to provide independent dynamos and engines.
2. There would be, of course, correspondingly less interest and sinking fund liabilities.
3. Such expenditure as would fall under depreciation of plant, repairs, rents, rates and taxes, wages of boiler and engine attendants, etc., would be equitably divided between the electric lighting and the tramcar concerns.
4. The management of the tramcars, while under the supervision of an official and staff, would also be controlled by a separate committee, which would act conjointly with the Electric Lighting Committee.

It must be quite clear, therefore, that co-operation must very largely reduce the working costs of a tramcar system. The cost per unit, whether we calculate per horse-power-hour per car-mile, or on any other basis, must be greater where the whole cost of management and working has to be borne by the tramcar service alone, than will be the case where, by using the resources of the electric lighting plant, handsome profits are made in what I may term "spare time."

To what extent this co-operation might be developed it is difficult to say, but the fact that each enterprise would save considerable expense to the other is perfectly obvious.

(To be continued.)

#### DOWN-TOWN LOOP IN CHICAGO.

It is now announced positively that the elevated railway companies of Chicago have signed the agreement to use the down-town loop to be built by the Union Elevated Railway Company. The route of the proposed loop, which will bring the lines into the heart of the city, was given in a map which appeared in the STREET RAILWAY GAZETTE of Dec. 15, and the companies which have entered into the agreement are the Chicago & South Side Rapid Transit Company, the Lake Street Elevated Railroad Company, the Metropolitan West Side Elevated Railroad Company (not yet in operation), Northwestern Elevated Railroad Company (not yet constructed), and the Union Elevated Railroad Company, which proposes to build the loop.

The Union Company was incorporated with a capital stock of \$500,000, and the directors, who are all connected one way or another with the Yerkes railway interests are D. H. Louderhack, Egbert Jamieson, John B. Parsons, John A. Rose, J. William Helm, LeGrand W. Perce, Edward Furthman, Edward Koch and L. D. Condee. The precise route of the loop is not yet given, for the consent of the owners of more than 50 per cent. of the frontage must be secured before even the ordinance can be granted. For some time the L interests, which have been antagonistic, worked hard to get property owners to consent. Now that these several roads have been brought into harmony the frontage obtained by each will be put together, and in that way there will not be so much difficulty in getting a right of way. All the details of the united project have been kept a close secret, for the roads apprehend serious opposition, and they do not propose to give any advantage to the objectors.

President Hopkins, of the South Side Rapid Transit Company, makes this statement regarding the loop project: "The men who are at the back of this loop scheme are prepared to expend large sums of money in the work, and have studied out all the problems, you may be sure. They know very well that they could not get the consent of the owners nor of the council to erect a structure to carry many tracks. The problem of moving trains here on a loop would be much easier than that which the engineers of the Manhattan 'L' roads have solved. There the tracks cross and recross in many places, and yet the trains get along all right on a forty-five-second schedule at certain times of

the day. They have only a stub terminal there, too, while here the proposed loop would be much easier to work."

#### CANADIAN NOTES.

(From our Special Ottawa Correspondent.)

**Hintonburg, Que.**—This municipality has granted the Ottawa Electric Street Railway Company the right of way in constructing their extension to the town of Aylmer.

**Toronto, Ont.**—A special general meeting of the shareholders of the Toronto Suburban Street Railway will be held at 151 St. James Street, Montreal, on the 12th of January.

**Huntsville, Ont.**—The Muskoka Improvement Company is applying to the Ontario Legislature for a charter to construct and operate electric railways in the district of Muskoka, with Huntsville as headquarters.

**Kingston.**—The president of the Kingston & Ottawa Railway says that the company is now considering the question of using electricity as a motive power on its projected line, instead of steam, as at first intended.

**Montreal.**—The Royal Electric Company, of this city, has made arrangements with the Stanley Manufacturing Company, of Pittsfield, Mass., for the use of such models and patents as the Royal Electric may require, and which are now owned by the Stanley Company.

**Montreal.**—A lawyer of this city has entered a suit against the street car company for ejecting him from one of the company's cars. He alleges he was expelled from a car by a conductor who could not provide him with tickets and who refused to wait until he could get them when passing the company's office.

**Hull, Que.**—The Canadian Pacific Railway Company is using every effort to prevent the Hull Electric Company from getting a charter through the Quebec Legislature to construct a road between Hull and Aylmer, a distance of 9 miles. The charter was once thrown out by the committee, but is again under consideration.

**Quebec, Que.**—A bill to incorporate the Quinze Electric Company has passed the primary stages in the Quebec Legislature. The company asks power to construct electric railways in the county of Pontiac, Hull being the principal place of business. The promoters of the company are J. Bryson, J. B. Klock, R. A. Klock, J. T. McDougall and J. M. McDougall.

#### COMMENTS AND VIEWS OF CONTEMPORARIES.

**SILLY TALK OF MONOPOLY.**—One of the most senseless arguments against the consolidation of street railway interests in this county is that it will create a monopoly. The man who will point out how the monopoly of the roads combined can be greater or more oppressive than the ownership of the three roads separately by substantially the same men, and run to help each other, will deserve a prize for his intelligence in showing the difference between tweedle-dum and tweedle-dee.—*Taunton (Mass.) Gazette*.

**VALUE OF THE TROLLEY.**—The success of the trolley is, of course, vastly more than a company concern. While the trolley means more earnings for the Traction stockholders, it means also vastly more money in the pockets of the people in innumerable ways; and not least in reduced suburban fares and in the saving of time for the whole community, which saving will be still more apparent on sleety days of winter. In truth, the benefits of the new system are mutual, and not for five times its cost of installation would Philadelphia be willing to abandon it and go back to the obsolete horse cars.—*Philadelphia Record*.

**ELEVATED RAILWAY POWER.**—Manhattan's only hope of competing with the Metropolitan Traction Company and other surface companies is in a new motor, which will work more lively than the existing arrangement. Electricity alone, it seems, can supply the need, but the point is to get something practicable, which is hard to find. It is reported from Chicago that the Manhattan Elevated Company has asked a Philadelphia electric concern to make an estimate for equipping the road, so as to operate it with electricity. The estimate will be shortly submitted to the management. These are times when Manhattan must "Step up lively, gentlemen," or get left.—*New York Daily Financial News*.

**CLAIM AGENTS.**—The street car company's claim agents say that they are censured more than they deserve. . . . They allege that they impose reticence on the victims of an accident, not to keep the news from the papers, but to put them on their guard against the "accident" lawyers, who are on hand with blanks to make contracts with the sufferers for suing the company and sharing the verdict, if any. They admit that their first object is to protect the company from large damage claims,



but say they have more trouble with the "claim" lawyers than with the claimants themselves; that the lawyers make cut-throat contracts with the claimants, under which they get more than half, and often two-thirds, of the amount of the verdict, if the suit results that way.—*Chicago Herald*.

**IS RAPID TRANSIT DEMANDED?**—There is a general belief that American people desire to go fast at top speed, and it is in compliance with this supposed desire that the street cars attempt on public thoroughfares the speed of railroad cars on tracks from which pedestrians and vehicles are supposed to be excluded. Of course, if this risk is assumed through a mutual understanding and agreement between the companies and the public, then it must be kept up, but it should be understood that "he who breaks pays." The companies, even though obeying the general wish, must be prepared for \$25,000 verdicts. But is this rush and "get there" at any risk business what the public really desire? Would not our people, if they should try it awhile, be better satisfied with leisurely safety than with swift destruction?—*Kansas City Star*.

**VALUE OF GOOD BRAKES.**—There will always be a certain proportion of stupid, careless, nervous and infirm people in the mass of street foot passengers, as well as a number of heedless children, and it is a proper and merciful object to guard them as far as possible from the effects of their own absence of self-preservative ability. Car fenders are, of course, one means to this end, and far better than cutting down the speed; but the obvious remedy, now certainly available, is to apply high-class brakes to the car. Any one who has watched the marvelous quickness of these modern brakes in bringing a fast car to a standstill must have realized that here was the cure for the trouble without sacrificing any of the great boons of swift comfortable travel that trolley rapid transit is conferring on every large and busy city in the Union. It is an absolute waste of money to equip a road with first-class electric apparatus, and then to have it condemned to a low rate of speed because there is a want of control power.—*Electrical Engineer*.

**VESTIBULES NEEDED.**—Common humanity demands that something be done to protect the men whose position on the front platform of the trolley cars exposes them to the worst effects of the most severe weather. When the winter has fairly set in the thermometer gets down to zero, and the snow begins to fly, the work of the motorman will subject them to constant discomfort, and more or less actual suffering. But the motormen are not the only ones to be considered in this matter. Indirectly the general public is concerned, for the motormen's exposure to the fury of the elements will inevitably incapacitate them, to a certain extent, from running their cars with that care and caution which are so essential to safety. Half-frozen, half-blinded men on the front platforms will certainly not tend to make trolley tragedies any less numerous. Manufacturers and business men are compelled by law to surround their employees with safeguards, and the street railway managers should not be exempt from the same obligation. Nobody expects them to provide comforts for their dependents, but they certainly should protect them from unnecessary hardships.—*Philadelphia Call*.

## FINANCIAL NOTES.

**Sale of the Joplin (Mo.) Railway.**—The Joplin Electric Railway and Motor Company has been sold at Carthage at trustee's sale, and the property was bought in by Colonel Powell, one of the heavy stockholders, for \$35,000.

**Paterson Railway Bonds.**—The Paterson (N. J.) Railway Company has given to the Paterson Savings Institution a second mortgage to secure the issue of \$300,000 bonds. The bank will act as trustee for the bondholders. The first mortgage on the road, \$1,500,000 is held by the Knickerbocker Trust Company.

**Dayton Consolidation.**—The various electric traction companies have consolidated, and the Cincinnati, Hamilton, Middletown & Dayton Street Railroad Company incorporated. The new corporation is capitalized at \$500,000, which sum may be increased. The road will run through a well populated district, and will be in operation by June.

**Consolidation at Waverly, N. Y.**—The Susquehanna Electric Traction Company and the Waverly, Sayre & Athens Electric Traction Company have been consolidated, forming the Waverly, Sayre & Athens Traction Company; capital, \$200,000; directors, S. B. Broadhead, of Jamestown; F. K. Harris and A. C. Robertson, of Athens, Pa.; and William L. Watrous and Michael Quigley, of Waverly.

**New Third Avenue (New York) Stock.**—The stockholders of the Third Avenue Cable road have voted to issue \$2,000,000 new stock, which will be de-

voted to the payment of the floating indebtedness of the company created by the construction of the cable road and its equipment, and for such further expenditure as may be necessary for its completion and equipment. The road is said to be earning \$2,000 daily more than when it was operated by horses.

**New Orleans Traction.**—At a recent directory meeting of the New Orleans, City & Lake Railroad Company the following officers were elected: H. M. Littell, president; W. J. Behan, president *pro tem.*; A. H. Ford, secretary; George Denegre, counsel; Dr. R. W. Walmstey, surgeon. The directors elected were: Albert Baldwin, J. C. Denis, C. M. Scria, J. B. Sinnott, R. M. Walmstey, Frank T. Howard, John W. Castles, Thomas Pickles, A. A. Woods, C. H. Hyams, W. J. Behan, H. M. Littell.

**Failure of Neffel, O'Connor & Co.**—The sheriff has received an attachment against Neffel, O'Connor & Co. (corporation), electrical contractors, New York, for \$11,704, in favor of Bernard F. O'Connor, the treasurer, for salary and money loaned. The sheriff took possession of a lot of stocks and bonds of the Union Electric Light Company, the Green Island Electric Light Company and the Union Electric Light and Power Company, of Lansingburgh, which belonged to the attached concern.

**Bonds for Electrical Equipment.**—The Metropolitan Railroad Company of Washington, D. C., has placed on file a mortgage covering all the property of the road. The sum is for \$1,850,000, and the mortgage is to secure the Baltimore Trust and Guarantee Company of Baltimore for the loan. This was in compliance with the meeting of the stockholders last September to carry out the provisions of the act of Congress passed August 2, 1894, requiring the company to equip its lines with an underground electric system.

**Stock Issue in Cincinnati.**—The Mt. Adams and Eden Park Street Railroad Company, of Cincinnati, will probably issue \$500,000 of new stock. This matter will come up before the annual meeting of the stockholders of that company, which is to be held January 15. The proceeds will be used for building extensions for an enlargement of the power houses requisite to supply the necessary power to these new lines and to take up bonds. This stock will not be put on the market for months, and will probably be taken by the stockholders.

**No Consolidation in Baltimore.**—The report that the Baltimore City Passenger Railway Company and the Baltimore Traction Company, each of which operates several lines of cable and trolley street cars, are to be consolidated is not credited. Gov. Frank Brown, president of the latter company, denies that there is any such scheme on foot, although his company is apparently willing to make the change. Gov. Brown thinks that it would be a good plan to consolidate all the street car lines in the city, but does not consider that such an arrangement can be brought about at present.

**Chicago L. Roads Reports.**—The annual report of the Chicago & South Side Rapid Transit Company filed with the railroad commission, gives these figures for the year, June 30: Passengers carried, 25,122,087; revenue received from passenger traffic \$1,256,104.35. The Lake street elevated road, which was in operation from March 1 to June 30, reports 3,494,951 passengers carried, and the revenue therefrom \$174,733.07. On the former road two employees were killed and two injured; two passengers were killed, and three "trespassers" were killed and two injured. On the Lake street road no passengers were killed or injured, and three employees were injured.

**The Hess-Thomson-Houston Suit Dismissed.**—The suit of Edward B. Hess against the Thomson-Houston Electric Company for \$50,000 was on trial in New York last week. Mr. Hess alleges that in 1890 the company agreed to pay him a commission of five per cent. for electric appliances purchased by the surface roads above the Harlem River. He alleged he induced the "Huckleberry" Railroad to adopt the Thomson-Houston system, and to purchase about \$1,000,000 worth. The company, on the contrary, claims the contracts with the "Huckleberry" were not made through the efforts or influence of Hess. At the conclusion of the plaintiff's testimony, on motion of the defendant's counsel, Justice Williams dismissed the suit.

## NEW INCORPORATIONS.

**Natchez, Miss.**—The Natchez Electric Railway Company has been incorporated, with a capital stock of \$100,000, by R. F. Leonard, W. A. S. Wheeler and I. A. Clinton.

**St. Louis, Mo.**—Florissant Avenue Electric Railway Company has been incorporated with a capital stock of \$2,000. The promoters are E. R. Feueshorn, T. P. Bell, J. H. Schroeder, St. Louis, Mo.

**Chicago, Ill.**—The Calumet Construction Company has been incorporated with a capital stock of \$10,000 to construct buildings, water-works, electric power-plants, electric light plants, railroads, canals, sewers, etc. The promoters are: Edw. H. Corse, Jas. W. Burson, Clinton W. Howe.

**Youngstown, O.**—The Poland Railway Company has been incorporated with a capital stock of \$25,000 to construct and operate an electric railway between Youngstown and Poland, O. The promoters are: Gilbert M. Dill, Zebulon P. Curry, Arthur O. Fording, Asahel E. Adams, Henry W. Davis.

**Mount Holly, N. J.**—The Burlington and Mount Holly Electric Railway Company has filed articles of incorporation. General William J. Sewell, of Camden, is one of the incorporators. The road is about seven miles in length and is now operated as a steam road by the Pennsylvania Railroad Company.

**Cincinnati, O.**—The Cincinnati, Hamilton, Middletown & Dayton Street Railroad Company has been incorporated. The capital stock is \$500,000. The company proposes to construct and operate an electric street railroad between Cincinnati and Dayton, O. The promoters are A. Hickenlooper, Chas. Fleischmann, L. C. Weir.

**Asbury Park, N. J.**—The Deal Lake, Asbury Park and Ocean Grove Traction Company has been incorporated. The object of the organization is, as stated in the papers, "to build, equip and operate a railway for the transportation of passengers and freight in Neptune and Ocean townships," which embrace Long Branch, West End, Elberon, Darlington, Loch Arbour, Interlaken, Asbury Park, Ocean Grove, Bradley Beach and Avon-by-the-Sea. The road is to be operated by the trolley system. The capital stock of the concern is limited to \$150,000, in shares of \$100, and among the incorporators are: Halsey M. Bennett, of Bloomfield, N. J.; William E. Cottrell, of Newport News, Va.; R. Ten Brock Stout, Joseph C. W. Stout and Wesley B. Stout, of Asbury Park.

## NEWS OF THE WEEK.

**Oregon, Ill.**—The board of supervisors of Ogle County granted a franchise and right of way to the Rock River Electric Railway Company.

**Kansas City, Mo.**—The Kansas City Cable Railway has been granted permission to change the equipment of its Westport dummy line to electricity. The route is to be changed.

**Carthage, Mo.**—The Jasper County Electric Railway Company, of which F. H. Fitch is the projector, has purchased 40 acres of land on Center Creek to be used for park and power-house purposes.

**Newark, N. J.**—The threatened strike on the system of the Consolidated Traction Company has been averted. The company, through its representatives, acceded to the demand made by a joint committee of the Traction Union and Knights of Labor.

**Mauch Chunk, Pa.**—A corps of civil engineers in the employ of the Inter-County Electric Railway Company has staked out a road from Summit Hill to Mauch Chunk via Nesquehoning. The road will connect with the Carbon County Electric Railway at the east end of the East Mauch Chunk Bridge.

**Franklin, Ind.**—By a majority of forty-three the proposition to aid in the construction of an electric railway from Indianapolis to Franklin, was carried. The amount of aid voted was \$34,000. The road, it is announced, is now assured, to parallel the Louisville division of the Pennsylvania lines.

**Philadelphia, Pa.**—Since the new transfer agreement between the People's Traction Company and the Electric Traction Company has been in force, about 30,000 transfer slips have been used daily. When the public becomes thoroughly accustomed to the new system, it is thought that about 100,000 a day will be issued.

**Newburgh, N. Y.**—A four-wheel hose cart was assisted to a fire by an electric car a few days ago. The firemen were tugging the cart through the mud along the line of the road when the superintendent suggested that the foreman attach the cart to the car. This was done successfully, and the quickest run to a fire on record was made.

**Detroit, Mich.**—The Citizens' Street Railway Company has asked for an injunction to restrain the city from granting a franchise to a rival company and also to restrain the new company from proceeding under the franchise already granted. It is claimed that the granting of a new franchise is a violation of the old company's contract rights.

**New York, N. Y.**—An order has been issued to the station agents of the elevated railroads that after Jan. 1 no policemen are to be allowed to ride free in the cars of the company. This order is



made to conform to the requirements of Section 5 in Article XIII. of the amended Constitution of the State, and applies to all public officers. No passes will be issued to such officers hereafter.

**San Francisco, Cal.**—It is said that the right of way for an electric railway from Merced to the Yosemite Valley has been secured; the capital stock will be \$2,500,000. The power is to be generated at three points on the Merced River. The road will be broad gauge, and will serve the region for freight and passengers. The Pacific Improvement Company will take the contract for the construction of the line, it is announced.

**Flushing, L. I.**—Patrick J. Mara, of Flushing, and Hugh Hart, of Blissville, have taken the contract for placing the piles in position across the Flushing meadows, for Flushing & Newtown Railway. They are to complete the trestlework, which comprises 2,000 40-foot piles, ranging in diameter from 11 to 14 inches, inside of 90 days, under penalty of a forfeiture of \$35 for each day's time over that limit. The road is to be in running order by April 1.

**Easton, Pa.**—The supervisors of Palmer Township have commenced equity proceedings against the Easton Transit Company, to compel the company to tear up its tracks placed on certain streets just outside the city, because, as alleged, the company has failed to keep its agreement with the township supervisors to build a belt line via Richards Crossing at Odenweldertown. The bill also claims that the track to Island Park through Palmer Township does not leave the 20 feet required on the north side of the rails.

**Lewiston, Me.**—Notice has been served on the city of Lewiston that the Lewiston Bleachery and Dye Works will apply to the next legislature for a charter to construct an electric railway from the Maine Central station on lower Main street to the company's works, about one mile distant. The company constantly employs several heavy teams in hauling goods to and from the mills and depot, and it is expected the proposed road will connect with the mills by a spur track. The scheme will involve the expenditure of about \$25,000.

**Brooklyn, N. Y.**—The street companies have been furnished with copies of the contracts and agreements which the employees want to have in force

during the coming year. They contain a demand for \$2.25 a day for motormen and conductors, an increase of 25 cents on the present wages, and a restoration to the old wages for the electrical men and other employees whose pay was reduced last summer. There is a very determined feeling among the motormen and conductors to insist on the demand for the 25-cent increase, and there is much talk of a probable general tie-up, as the companies are strongly disinclined to make any further concessions.

**Pittsburgh, Pa.**—Street cars are now carried up the inclined plane railways. The new plan went into operation last week at the Knoxville incline, which rises from Sarah street 500 feet to the hill-top. Switches have been laid on Sarah street and at the top of the incline connecting the street railways with the incline cars. Trolley wires have also been arranged overhead, so that street cars can be switched onto the huge incline cars without difficulty. This will enable passengers residing in Knoxville, Allentown and Beltzhoover to reach their homes from the central part of the city without changing cars or getting out at the incline. One fare of five cents pays the entire bill, including the dizzy trip up the incline, instead of 15 cents, which was required under the old system. Short line cars will be carried up the incline every five minutes.

## PERSONALS.

**H. B. Wilber**, superintendent of the Erie Electric Motor Company, of Erie, Pa., was presented a gold watch by the employees of the company on Christmas Day.

**Mr. Martin J. Insull**, of the firm of Sargent & Lundy, Chicago, and Miss Virginia Van Vliet were married Dec. 13 at the residence of the bride's parents in Orange, N. J.

**Mr. Robert E. Jenkins** has been unanimously chosen by the directors of the Metropolitan West Side Elevated Railroad Company to the vacancy in the presidency caused by the death of Mr. John Worthy. Mr. Jenkins is a lawyer and has been a prominent figure in the public and business life of Chicago for a number of years.

## TRADE NOTES.

**Fire in the E. S. Greeley & Co.'s Store.**—A fire occurred in the building occupied by the E. S. Greeley & Co., 5 and 7 Dey street, New York, this week, and some of the stock was damaged by fire and water.

**The Berlin Iron Bridge Company**, of East Berlin, Conn., is building a new highway bridge for the Boston & Maine Railroad at Somerville, Mass. The Long Island Railroad Company has placed a contract for its new pier shed with the Berlin Iron Bridge Company, of East Berlin, Conn.

**J. W. Godfrey**, for eight years general manager of the New York Insulated Wire Company, has resigned that position to take charge of the selling department of the India Rubber and Gutta Percha Insulating Company, Room 38, No. 15 Cortlandt street, New York, manufacturer of Habirshaw wires. Associated with Mr. Godfrey will be F. W. Harrington and J. B. Olsen, who have previously been connected with the New York Insulated Wire Company.

**Electric Heating.**—Steamship heating is a new field for the employment of electric heat, which has attracted the attention of the Consolidated Car Heating Company, Albany, N. Y. Its regular form of street car heaters are in the main well adapted for steamship heating, but where desired it is furnishing special forms of its heaters. The Consolidated Company is already in communication with over a hundred steamship builders in this and other countries upon the subject of electric heating.

**Jacob Wendell, Jr., and R. L. MacDuffie** have recently formed a partnership under the firm name of Wendell & MacDuffie, as manufacturers' agents, representing the Rochester Car Wheel Works and other manufacturers of street and steam railway supplies, with office in the Havemeyer Building, 26 Cortlandt street, New York City. Mr. Wendell was formerly connected with the New York Central Railroad, and Mr. MacDuffie was auditor of material accounts on the same road, and also filled the same position on the New York, New Haven & Hartford Railroad during the past two years.

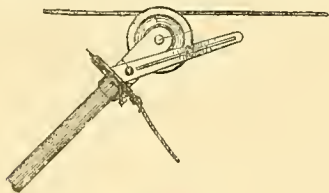
# RECORD OF STREET RAILWAY PATENTS.

U. S. Patents Issued Dec. 18, 1894.

**530,954. Trolley-Wire Fender;** Frederick F. Meyer and William S. Meyer, Newark, N. J. Filed March 14, 1894. Trolley-wire fender and fenders are mounted on the trolley pole. (See illustration.)

**531,020. Fare-Register;** Kohrsn Catlin and Gustavus Rein, St. Louis, Mo. Assignors to the St. Louis Register Company, same place. Filed Oct. 24, 1893. This is the combination of the permanent register mounted in a fixed position, a trip register normally connected to move in unison with the permanent register, and means for moving the trip register outwardly on its axis of rotation to disconnect the two registers and rotate the trip register to zero.

**531,026. Car Fender;** George W. Engel and William C. Juram, Philadelphia, Pa. Filed Sept. 11, 1894. The fender is provided with an apron or couch journaled to brackets, and having shielded wheels and a slanting catcher. Hand and foot operating levers and mechanism for controlling the elevation, and automatic return of the fender to its lowered position are provided.



No. 530,954.

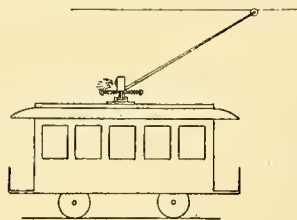
**531,052. Controller Handle;** Henry Mittelsdorf, Orange, N. J. Filed Aug. 29, 1894. The handle has a follower in it, adapted to fit against the angular side of the controller shaft. A cam is adapted to connect with the follower, and a screw is adapted to engage with the cam and to force the latter against the follower.

**531,116. Signal Lamp for Electric Railway Cars;** Charles H. Baker, Detroit, Mich. Filed April 24, 1894. A rotary support of a trolley arm carries a signal lamp. (See illustration.)

**531,155. Fender;** James M. Cabel, Brooklyn, N. Y. Assignor of one-half to Michael Spall, same place. Filed April 5, 1894. This is a tilting fender. A guide rod extends rearwardly and downwardly from its upper portion and is provided with an enlarged head. A bracket is secured to the platform, and is provided with an opening to receive the head of the guide rod and a catch locks the guide rod to the bracket.

**531,166. Switch-Operating Device;** Charles Diener, Brooklyn, N. Y. Assignor of one-third to Bernard Bomeisl, same place; filed Aug. 30, 1894. A box is secured to the platform, in which a vertical shaft having a crank upon the top is journaled. There is a collar below the crank, and a spiral spring surrounds the

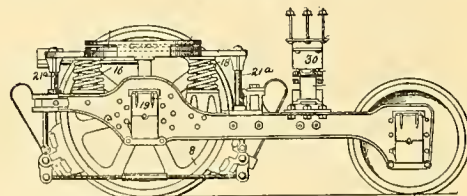
shaft between the partition and the collar, a sleeve being loosely mounted upon the shaft below the partition. A shoulder beneath the sleeve restricts the upward movement of the shaft, a radial arm projects from the sleeve through the box to slide therein. A pedal upon the said arm depresses the shaft, and a shoe upon the lower end of the shaft is adapted to engage with the switch and throw the same.



No. 531,146.

**531,208. Railway-Truck;** William A. McGuire and Moses G. Hubbard, Jr., Chicago, Ill. Filed May 27, 1893. This is a truck having means for varying the proportion of weight or load on the car axles by the action of curving. (See illustration.)

**531,231. Fare-Register;** Edward T. Taylor, Oakland, Cal. Filed Feb. 12, 1894. The register comprises a toothed disk rotating about a center, with an oscillating lever movable with relation to the disk. A pawl car-



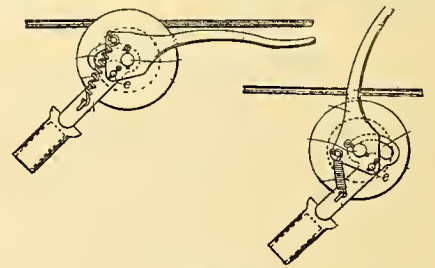
No. 531,208.

rying arm is fulcrumed with relation to the lever, and there is a diagonal guide whereby the forward movement of the lever first depresses the arm so as to cause the pawl to engage a notch in one of the disks preparatory to moving it forward.

**531,231. Automatic Street-Car Fender;** Jean T. Vao Gestel, New York, Assignor of one-fourth to R. H. Sherwood, Bensonhurst, N. Y. Filed Nov. 10, 1893. This is a folding fan-like fender, normally retracted under the car, a net being connected thereto and to the dashboard of said car.

**531,258. Fender for Street Cars;** William H. Brook, Brooklyn, N. Y. Filed June 4, 1894. The fender comprises a frame extending from end to end of the car with fending devices at both ends and with gearing for propelling the frame from the car axle. There is mechanism for raising and lowering the frame out of and into gear with the axle, and an automatically operated trip and a lever mechanism at each end of the car and connected with said raising and lowering mechanism.

**531,268. Brake and Power Controller for Electric Cars;** Andrew W. Mitchell, Boston, Mass. Filed Jan. 22, 1894. The brake rod of a car having either a handle or wheel, has a gear on its lower end, a projection or lug on the rod or gear with a rack bar



No. 531,291.

arranged to slide back and forth in suitable guideways, and to engage with said gear, and arranged to engage with the brake rod lug or projection. The rheostat or controller is arranged to be connected with the rack bar for operation thereof. (See illustration.)

**531,275. Street-Car Motor;** John Radomski, Baltimore, Md. Assignor of one-half to Mieczyslaw Barabasz, same place. Filed July 13, 1894. This patent combines the two track rails; a rack bar on the roadbed between said track rails; a car provided with wheels to traverse the rails; a draw-bar having one end pivoted to the car and the other end provided with two arms; a motor wheel mounted between said arms of the draw-bar and having teeth to engage with the rack bar; mechanism to impart motion to said motor wheels; a screw on the car; a nut into which the lower end of the said screw enters; and a yoke connecting the said two arms of the draw-bar and the nut.

**531,291. Guide for Trolley-Wheels;** William H. Dickerhoff, Cincinnati, O. Assignor of one-half to George W. Pollock, same place. Filed July 23, 1894. The trolley has its axis mounted on bearings and capable of a vibratory movement thereon independent of the movement of the bearings, guide-arms being connected with the axis and pivoted to the bearings, with a yielding connection between the guide-arms and the bearing supports. (See illustrations.)





































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