Electric Railway Journal

A CONSOLIDATION OF

Street Railway Journal and Electric Railway Review

VOL. XXXII NEW YORK, SATURDAY, JUNE 6, 1908 No. 1

PUBLISHED EVERY SATURDAY BY THE

McGraw Publishing Company

James H. McGraw, President. J. M. Wakeman, 1st Vice-president.
A. E. Clifford, 2d Vice-president. C. E. Whittlesey, Sec. and Treas.

Henry W. Blake, Editor.
L. E. Gould, Western Editor. Rodney Hitt, Associate Editor.
Frederic Nicholas, Associate Editor.

MAIN OFFICE:
NEW YORK, 239 WEST THIRTY-NINTH STREET.

BRANCH OFFICES:
Chicago: Old Colony Building.
Philadelphia: Real Estate Trust Building.
Cleveland: Schofield Building.
London: Hastings House, Norfolk St., Strand.

Cable Address, "Stryjourn, New York"; "Stryjourn, London"—Lieber's Code Used.
Entered at the New York Post-Office as Second Class Mail Matter.

TERMS OF SUBSCRIPTION

In the United States, Hawaii, Puerto Rico, Philippines, Cuba, Mexico and the Canal Zone:

Street Railway Journal (52 issues).....$3.00 per annum
Single copies.....10 cents
Combination Rate, with Electric Railway Directory and Buyer's Manual (3 issues—Feb., Aug. and Nov.).....$4.00 per annum
Both of the above, in connection with American Street Railway Investments (The "Red Book"—Published annually in May; regular price, $5.00 per copy).....$6.50 per annum

To Dominion of Canada:

Street Railway Journal (52 issues), postage prepaid.....$4.50 per annum
Single copies.....10 cents

To All Countries Other Than Those Mentioned Above:

Street Railway Journal (52 issues), postage prepaid.....$6.00
25 shillings. 25 marks. 31 francs.
Single copies.....20 cents
Remittances for foreign subscriptions may be made through our European office.

NOTICE TO SUBSCRIBERS.

REMITTANCES.—Remittances should be made by check, New York draft, or money order, in favor of the STREET RAILWAY JOURNAL.

CHANGE OF ADDRESS.—The old address should be given, as well as the new, and notice should be received a week in advance of the desired change.

BACK COPIES.—No copies of issues prior to January, 1907, are kept on sale, except in bound volumes.

DATE ON WRAPPER shows the month at the end of which the subscription expires. The sending of remittances for renewal prior to that date will be much appreciated by the publishers.

Of this issue of the Electric Railway Journal 10,000 *copies are printed.*

The Electric Railway Journal

With this issue the *Street Railway Journal* and the *Electric Railway Review* are merged into one paper entitled the ELECTRIC RAILWAY JOURNAL. It is thought that the new name recognizes better than the old the existing and the future condition of the industry we represent. When the *Street Railway Journal* was established 24 years ago the only cars that existed for local transportation were properly called street cars. The evolution which has followed the application of electricity, the rapid development of interurban systems, the increasing use of private rights-of-way and finally the adoption of electric power for trunk line service, are responsible for the electric railway of to-day, destined to be the foremost factor in the solution of the world-wide problem of transportation. The history of this evolution has been told in the pages of this journal, and in the future as in the past it will chronicle and interpret through editorial comment the broad questions of electric railway engineering and management, whether applied to street railways, interurban roads or heavy transportation.

The ELECTRIC RAILWAY JOURNAL, a national technical paper, will describe fully the progress of electric railways. Its interests are necessarily bound with those of all the companies. What this journal relates that is done by railways in the East or West, North or South, is of interest to officials of all lines, without respect to location. The problem of one company always bears some resemblance to the problem which another road has settled or with which it will be confronted at some later time. The interurban officials in the West, the Eastern officials whose great problem is that of serious congestion and the representatives of small roads may be the means of furnishing information through the columns of the ELECTRIC RAILWAY JOURNAL that will be of vital importance to others whose lives are to be passed in this industry.

Activity and progress in any industry can be gaged very closely by the character of its technical papers. If the field is developing or stagnant, if it possesses or lacks individual initiative and effort, this condition is sure to be reflected in its representative periodicals. On the other hand, if a technical paper fulfils its duties and lives up to its opportunities, it can and should exercise an important influence on the future of those in whose interests it is published. Under the stress of modern business conditions the technical journal has become a necessity. In no other practicable way and with such a minimum of trouble can the active workers in any field acquire the information which they require.

These conditions apply with special force in the electric railway field. The subjects to be discussed are daily becoming more intricate, and each new subdivision makes the problems more difficult. The business which but a few years ago concerned isolated communities only is now in many cases interstate. Motor capacity, which was reckoned in tens of horse-power, now requires expression in three figures. A proper knowledge of electric railway engineering at present includes acquaintance with formulæ undiscovered 10 years ago. We are dealing constantly with power stations whose auxiliaries alone easily surpass in output and efficiency the generating units of a decade since. Questions of legal, accounting, financial and operating na-

ture, as well as those of the relations of corporations to the public, to the state and national governments and to their employees, are also crowding on apace.

To keep abreast of the development, one cannot rely upon his own ability or experience, nor can he afford long to sit back in a state of complacency over the virtues of his "standard" system or apparatus, else he will soon be left far in the rear of the procession which is continually on the move. Neither can he rely entirely upon the knowledge acquired from attendance at occasional meetings of engineering or other professional societies. He must know how others in all parts of the world are solving the same problems which he is facing, what new avenues are opening up for his progress, what short cuts if any are available, what difficulties are lying in his path.

A technical journal is valuable, not because it is omniscient, but because it is the business of its editors to collate and present this information in readable form. And the more thoroughly the paper performs this task the more necessary it is to its readers. It is because the *Street Railway Journal* and the *Electric Railway Review* have supplied this service with at least some degree of success that they have received the support which they have from the electric railway field. The traditions, resources and energies of the separate papers have now been united, and it is believed that the Electric Railway Journal will be of even greater efficiency and usefulness than either of its predecessors. The publishers appreciate and are grateful for the assistance which they have received in the past, and with the same kind cooperation hope to make the Electric Railway Journal the ideal of what a technical paper should be.

The Central Electric Traffic Association

If the Central Electric Traffic Association is properly supported by the railways, its work should be of value in conserving and developing existing and new sources of revenue. Announcement that seven companies have agreed to meet the expense of establishing the association means that the next few months will determine whether the important movement which has been undertaken through this association is to succeed or fail. While the question of membership must be decided by each company from knowledge of its own business and possibilities, it seems to us that a traffic association, well organized and administered, can be made to produce results that will yield an attractive return on the small expense involved, and that such an association deserves the most cordial cooperation that can be given by the companies for whose benefit it is to be conducted.

Coney Island Service

Further evidence to show the injustice of a 5-cent fare to Coney Island has been presented before the Public Service Commission by Howard Abel, comptroller of the Brooklyn Rapid Transit Company. After the arguments of the attorneys are concluded the issues involved will be taken under advisement by the commission. No testimony has been introduced to controvert that which has been offered by representatives of the companies concerned to demonstrate the unprofitableness of a 5-cent fare. It would not be just to hold that in the construction of the Coney Island lines the companies made investments that were so unwise that the public cannot fairly be expected to support them. The plain fact is that there is a public demand for the service on pleasant days during a period lasting from three to four months only. A 10-cent fare does not and would not restrain people from going to Coney Island, but poor service would. Under present conditions speedy transportation is given between the two terminal points for 10 cents. The companies cannot afford to give for a 5-cent fare the same service that can be provided for a 10-cent fare. If the density of traffic that prevails on the Coney Island lines during the summer months could be extended throughout the year conditions would be changed radically. But with conditions as they are a large investment is required for equipment used only a small part of the year.

Statements of Earnings

Electric railways will feel immediately the effect of the improvement in general business which is more plainly in evidence as each day passes. Public service corporations of this character do not experience abnormally large gains in periods of great prosperity, and in times of reaction in business the decline in earnings of such properties is not so severe as that suffered by other transportation companies. Industrial expansion and activity produce increases in passenger traffic on electric lines, but the travel does not ordinarily decrease sharply with recession in business. Electric railways have an advantage over steam roads in the fact that, taking the companies in the aggregate, their gross earnings are derived almost wholly from short-haul passenger business, which, unlike the freight business, is not usually subject to abrupt change. Earnings of the steam railways have been seriously affected by the reduction in freight shipments, but the volume of freight traffic handled by interurban electric lines has not reached such proportions that decreases in receipts from this source change materially the total gross earnings.

In our issue of this week, we publish the usual monthly table of earnings. The revenues of individual companies, taken at random, show some indication of the results which have been brought about by the changes in the business situation. Thus the Northern Ohio Traction & Light Company, of Akron, Ohio, showed gross earnings of $129,804 in April, 1908, a decrease of 2.3 per cent from the corresponding period of the previous year. Gross earnings of the United Railways of St. Louis in the four months ended April 30, 1908, decreased 1.6 per cent as compared with the corresponding period of 1907. The Detroit United Railway Company showed a decline of 1.4 per cent in gross earnings in the three months ended March 31, 1908, as compared with the quarter ended March 31, 1907. On the other hand, the Milwaukee Electric Railway & Light Company gained 2.1 per cent in gross earnings during the four months ended April 30, 1908, as compared with the corresponding period of 1907.

Some lines show larger percentages of change than those quoted, but it is significant of the reasonably stable character of the business that a change of 5 per cent to 10 per cent, if no alteration in mileage occurs, is regarded usually, in a monthly statement, as one of great importance.

Transfers for "Continuous" Trips

The man who introduced transfers on street railway properties probably had little realization of the extent to which this privilege would later be abused. From a "necessary evil" the transfer has grown to be a loophole for the barest kind of fraud and a stretch of the principle beyond all reasonable limits. The number issued has grown in proportion, so that while only 1.1 per cent of all the riding in New York was on transfers 20 years ago the ratio last year has increased to 55.13 per cent. The railway companies have not been lax in opposing the enforcement of this condition of universal transfers. They have been obliged by statute to extend their systems of transfers, but have vigorously fought damage suits resulting from the ejectment of passengers found violating the terms of its issue. New York City railways have been especial sufferers in this respect, owing partly to their extent and configuration and partly to the wording of the State law, so that though different colored transfers of various designs have been adopted, the courts have so ruled against the railways in ejectment cases that a practically universal transfer system has been forced upon them.

In the light of the preceding state of affairs an announcement is welcomed that the New York Court of Appeals has decided that a "continuous" trip is not necessarily an all-day excursion. In the recent case of Kelly vs. New York City Railway Company, (New York *Law Journal,* May 1, 1908), the court held that the New York statute requiring consolidated street railway lines to carry over their various routes and for a single fare any passenger who should desire to make a continuous trip does not convey the meaning that this passenger may, even though by the abuse of the transfer privilege, reverse his course of travel and thus make a round trip.

Popular prejudice against public-service corporations has had much to do with the regulation, or rather the non-restriction of the transfer privilege. The Court of Appeals did what generally would be recognized as just, were it not for this feeling, when it determined that the railway should, within limits, have the power to regulate the time and manner in which its passengers are transported. To emphasize more fully this exemplary judicial policy, we quote the concluding language of an opinion by Judge Gray:

> A railroad corporation, however artificial a person in contemplation of law, and however subject its charter to the reserved power of the Legislature to alter, has a right to exist under conditions as favorable as a sound State policy, a due regard for the public interest and a just and reasonable interpretation of the law will permit. It should not be burdened by unnecessary implication of a legislative meaning beyond what those considerations demand. When the Legislature, in unmistakable terms and within constitutional limits, has exercised its power to regulate corporate operations, it should be given full effect by the courts; but no inferences unfavorable to a reasonable operation of its franchises should be allowed from words susceptible of use in more than one sense.

The Supreme Court of the United States has recently decided that conspiracies to boycott interstate commerce are offenses against the Sherman Act and that service corporations upon which confiscatory rates are imposed by State statutes are entitled to relief by injunction against State administrative officers attempting to enforce the oppressive laws. The highest Federal tribunal has of late made other determinations in the same general line—that is, to the end of upholding equality before the law, whether the interested parties be corporations or individuals. The decision of the New York Court of Appeals in the Kelly case is an example of the same enlightened judicial firmness.

Economies in Small Power Stations

The low costs of producing electric current in large power stations, which are frequently quoted in papers and discussions at meetings of technical societies and elsewhere, are the envy and despair of the man in charge of the small station, whose own costs are double or treble the figures set before him. Without carefully studying his own conditions of operation and upkeep he is likely to ascribe the difference, for the most part, to the modern auxiliary equipment of the large station, coal handling machinery, automatic stokers, superheaters, efficient condensers and other devices for saving labor and conserving every unit of energy in the coal fired, which are refinements he cannot afford. It is true that these complicated and expensive auxiliaries contribute in no small part to the efficiency and economy of the generating station as a whole, but without constant careful supervision over every detail of operation, the large plant would burn almost as much coal per kilowatt delivered to the busbars as the smaller one. The secret of the efficiency of large power stations lies as much in their management and operation as in their equipment. Every ounce of coal and every drop of water and oil is made to do its full duty; every employee and every machine is worked at the most efficient load. Waste is reduced to a minimum.

There is, of course, more energy unavoidably wasted in the small plant through lack of auxiliary apparatus than in the large plant, but it is also true that there is frequently an unnecessarily large percentage of lost energy. The problem before the manager of the small plant is to cut down this avoidable waste. He must begin by learning first, what each piece of apparatus is actually doing; second, what each piece of apparatus is capable of doing under different conditions. Few power station engineers are thoroughly familiar with the first of these requisites and fewer still with the second. They do not know, for example, the number of heat units in each pound of coal fired in their boilers. The coal is usually bought from a local dealer by specifying the size and district from which it is shipped. Soft coal, in particular, varies widely in its composition and combustible qualities. One pound of coal may contain several thousand less heat units than another pound of coal taken from the same district or even from the same mine. Most large power stations buy coal under specifications requiring a given number of heat units per pound, as shown by analyses of samples taken as delivered Many such contracts, as has been explained in this paper, contain a sliding scale of prices, depending upon the combustion tests of samples. Payment is made for a given quantity of heat units and not for a given number of tons of a mixture of combustible and non-combustible, varying

widely in its composition. Paying for ashes, sulphur and moisture in coal is the first and one of the largest wastes which can usually be found in the operation of a small power plant.

Automatic stokers, forced draft fans, coal conveyors and other auxiliary apparatus in the boiler room are not necessary or essential for economical burning of coal on the grates. A skillful fireman who will anticipate to some extent the demands on the boilers for steam and who knows how to handle the draft dampers and feed water pumps, can make a record in the average small boiler room which will compare favorably with the records of the largest steam generating stations. Perhaps the greatest difficulty is experienced in having the boiler room force anticipate the demand for steam from the engine room without blowing off or wasting coal. The usual practice in stations which have a peak load is to keep the fires under one boiler banked and to start this boiler when the peak comes on. Very often the boilers under steam could carry the peak without starting up the extra boiler if they were forced beyond their maximum rating. It is true that they might not steam as economically under a heavy overload as under normal conditions; but the loss due to lower efficiency should be compared with the total consumption of coal under the extra boiler during the time its fires are banked and the time it is working. The maximum capacity of stationary boilers is seldom reached in practice. Compared to a locomotive boiler, they are worked at a very low rate of evaporation.

Another common source of waste in the boiler room is cold air leaking through the boiler settings and lowering the temperature of the furnace gases as well as reducing the effective draft over the grates. A draft gage and one or two high reading thermometers are convenient instruments for locating leaks of this kind.

In the engine room, the measure of efficiency is the consumption of steam generated in the boiler room. The steam passing through the main steam pipes contains a certain amount of energy and the engines have a certain maximum capacity for converting the latent heat energy of the steam into mechanical energy which is in turn converted by the generators into electrical energy. Every pound of steam which leaks from the pipes or passes into the exhaust without having given up the maximum possible amount of energy is lost. Condensation in the pipes due to defective or insufficient lagging, inefficient adjustment of valve gears, creation of excessive back pressure in the exhaust are all sources of avoidable waste. These are some of the operating features of a power plant which are often neglected in the small station and are always carefully watched in the large station. The operation of multiple units in the engine room presents the same chances for waste as in the boiler room. If by a slight change in the valve gear an engine can be operated at 50 per cent overload on less steam than two such units operating at three-quarters load, then it is economy to run the single unit.

Maintenance in the large plant is usually more thorough and constant than in small stations. The chief engineer of the small power station ought to spend from four to six hours a day on maintenance work, which he can do by overlapping the engine room shifts. Adjusting valve gears, cleaning boilers, packing pumps, tightening steam fittings and many other details of general maintenance work can be attended to with the occasional assistance of one of the working shift and at no extra cost for labor or material. Simple records of this work are valuable in determining when any part of the equipment has outlived its usefulness or is being forced too hard.

Control of Municipal Public Service Corporations

There has been no noticeable decrease in the agitation over the regulation of public-service corporations compared with that of a year ago, but less bitterness is being expressed by public officials and in the daily press than during 1907. Whether this condition is due primarily to the public alarm over the effect of the campaign conducted with so much display of hysteria against all corporations in control of public utilities or to a better knowledge of the conditions, is another question. Probably both reasons have had their influence. Looking back upon the path which has been already made a variety of conditions is found. The problem of each municipal public-service corporation is essentially local and many individual electric railways have escaped the burden of drastic legislation, with which other less fortunate, but not necessarily poorly managed, companies are contending. Few railways have passed through periods of readjustment of relations with municipalities unscathed. Some have been overwhelmed by their troubles, and in Detroit, Toledo and Cleveland they have borne more than their full share of the violence with which the problems of regulation and franchise relations have been attacked.

With the public in a calmer frame of mind, the question of regulation may be approached with proper appreciation of the needs and rights of the railways. Consideration of the extent to which regulation is advisable, is necessary, because of the general insistence upon some form of supervisory State or municipal control. It is just as proper that the demands of the public should be tempered as that the service of the corporation should be regulated. The attitude of a public-service commission should be founded upon the desire to do justice to each interest. If the corporations have committed misdeeds in the past, so have the people and their representatives in public office. If corporations have rendered inadequate service, they have done so frequently because of the fact that their rates of fare have not enabled them to furnish good service. When a corporation is driven to the last extremity by demagogic public officials and makes the best bargain it can for its life by accepting an ordinance based on improperly low rates of fare, it saves its corporate existence, but at the expense of distress to security-holders, for which the public through its representatives is partly responsible. Before there can be judicious regulation of public utilities the public must recognize that the rate of fare should leave sufficient margin above expenses and taxes to permit a fair return on the investment. The facts concerned can be taught only by intelligent discussion, in which the representatives of the public and the corporations must participate, with the identical object of solving problems in the best and most equitable manner.

An interesting contribution to this subject is contained in

the Annals of the American Academy of Political and Social Science for May, 1908, which is a monograph on the "Control of Municipal Public-Service Corporations." The articles are not confined to a consideration of the transportation situation only, but embrace gas, electric lighting, telephone, sewerage and water supply as well. The principles involved in all are so largely the same that they can well be considered together. All are based, or should be based, upon the theorem well expressed in the communication of William A. Bancroft, president, Boston Elevated Railway, on moderation in the control of public-service corporations. He says:

That the public should be assured of getting the best attainable facilities at the lowest fare charge for which they can be given, every intelligent street railway man agrees. That no quasi-public service of any character can be rendered for a price less than one which will provide an income sufficient to pay operating expenses and give an adequate return on the capital invested, every fair-minded citizen admits.

The broader-minded members of several State commissions have approached the question with this intent, but in other cases no great concern has been shown over the cost of furnishing the service. To demand 3-cent fares with franchises limited to a short term of years and to disregard entirely the cost of car operation or the question of amortization is virtually to preach confiscation. While the latter doctrine may win the votes of the unthinking, it is not one of which this country is proud, nor will it long find acceptance in a land where respect for property rights is a fundamental principle. If the companies do not find in new legislation the protection they require they must seek refuge in the courts.

Tests of Power Consumption in the New York Subway

In the preliminary calculations of motor capacity for the trains in the New York subway, the electrical engineers of the Interborough Rapid Transit Company had to face a problem for which there was no precedent as a guide. It is true that the traffic and length of trains on the Manhattan Elevated Railway approximated to a certain degree those which were expected in the subway. It is also true that the Metropolitan Railway in Paris and several of the underground railways in London had been in operation for some time and their figures as to the resistance of trains in tunnels were available, but neither of these cases was so close to the conditions presented in the New York subway as to offer any exact criteria. The New York conditions were more similar to those in Paris than to those of the tube lines in London, because in the latter the cars fit very closely the cross section of the tunnel, and as each track is in a separate tube the movement of a train resembles somewhat that of a piston in a cylinder. But in all of the foreign examples, the trains are very much lighter and shorter than those which were proposed for the New York subway, and the traffic was much less than that which it was known would have to be carried by the trains of the Interborough Rapid Transit Company. In like manner the experience secured with the Manhattan Elevated Railway did not offer very much assistance in estimating the power required because of the very great difference when operating in a subway and in the open. Nevertheless, the scheme for electrical operation had to be determined long in advance of the completion of the subway and, as everyone knows, it was decided by L. B. Stillwell, then electrical director of the company, to use five motor cars and three trail cars in an eight-car train and three motor cars and two trailers in a five-car train. The question of motor capacity had then to be worked up with the meager data at hand, with the result that two motors of 200 hp were adopted for each motor car. The results attained are described in a very interesting article this week by Mr. Stillwell, entitled "Power Consumption and Speed in the New York Subway." They are the first authentic data on the subject.

Three points stand out prominently in this summary of statistics. The first is the closeness with which the required electric motor performance was predetermined. Engineering estimates sometimes have the reputation of being wide of the mark secured in the completed work. However this may be in other branches of engineering, the characteristics of electrical machinery are so well understood that preliminary calculations, if carefully made, can be relied upon as coming close to actual performance. In this instance the undertaking was the largest in the world, and the conditions were without precedent. Nevertheless, the actual performance of the motors was slightly better than that required by the specifications, in spite of the fact that the margin of safety allowed had been reduced by the later adoption of heavier cars. The curves of best performance show that with ideal acceleration and braking the results in practice would have shown an even greater margin between actual and theoretical motor performance. It has been in the additional length of station stops over that contained in the specifications that delay has come.

The second point worthy of note is the actual amount of the train resistance found in subway operation. The difference in power between rush hours and the slack hours is singularly little, being for express trains, per mile, 2.26 kw-hours in the rush hours and 2.02 kw-hours in the slack hours. The same figures for the local trains are respectively 2.89 and 2.74, with smaller loads of passengers and with the same length of train, but with more frequent stops. Reduced to a ton-mile basis the four figures respectively are 58.2, 56.8, 78.6 and 78.1 watt-hours. These figures might be found to vary considerably in the case of other subways, as they are necessarily dependent upon the shape of the tunnel and other factors. They would even vary in different parts of the New York subway. Nevertheless, as the first published statistics of power consumption under the conditions given, they are extremely instructive and will afford a good basis for future calculations.

The third point mentioned above relates to the possible means of reducing the effect of these long station stops or shortening the stops themselves in subway operation, especially during rush-hour service. This is a point which Mr. Stillwell does not discuss, but it is fair to assume from his article that no great relief would be afforded by an increase in the number or the capacity of the motors. Final help can come only from shorter stops, but how these can best be obtained yet remains to be determined. Whatever is done, it is clear that the present tests will furnish data which will be of value in any future work.

POWER CONSUMPTION AND SPEED IN THE NEW YORK SUBWAY

BY L. B. STILLWELL

"The difference between theory and practice" is a phrase often upon the lips of the man who loves to speak of himself as "a practical man." That from "theory" results inevitably realized in practice can be predetermined with precision is a fact which the man educated by experience only is slow to believe, and even engineers who should know that results attained can never involve contradiction of correct theory are but too apt to contribute to popular ignorance by careless use of these terms.

It has been suggested that publication of the results of certain speed and power tests carried out in the New York subway about two and one-half years ago will be interesting to the engineer as showing how accurately results planned for in the operation of electric trains can be attained in practice.

I may be permitted to express the hope, also, that publication of these and similar facts relative to the work of the Interborough Rapid Transit Company in equipping and operating the New York subway may tend in some degree to convince hostile critics of that company that its work has been well done; that it has spared no expense in its efforts to comply with and even surpass the requirements of the Rapid Transit Commission, under whose specifications the subway was built and equipped, and that the men who equipped and are now operating this property deserve the thanks of the New York public and not its censure.

With a view to determining accurately the results attained in practical operation of the subway in respect especially of speed and power consumption, the directors of the company authorized the purchase and equipment of an expensive and elaborate outfit of testing instruments to be assembled in a test car and used for such purposes as the company's engineers might deem advisable. This action was taken before the subway was operated, and following the inauguration of its service a series of tests was undertaken under the immediate direction of my associate, H. S. Putnam.

Two main objects were sought in these tests. One was to determine the actual speed of both local and express trains between stations and between terminals during rush and non-rush hours; the other was to determine the power consumption under different conditions of speed, load and station stops.

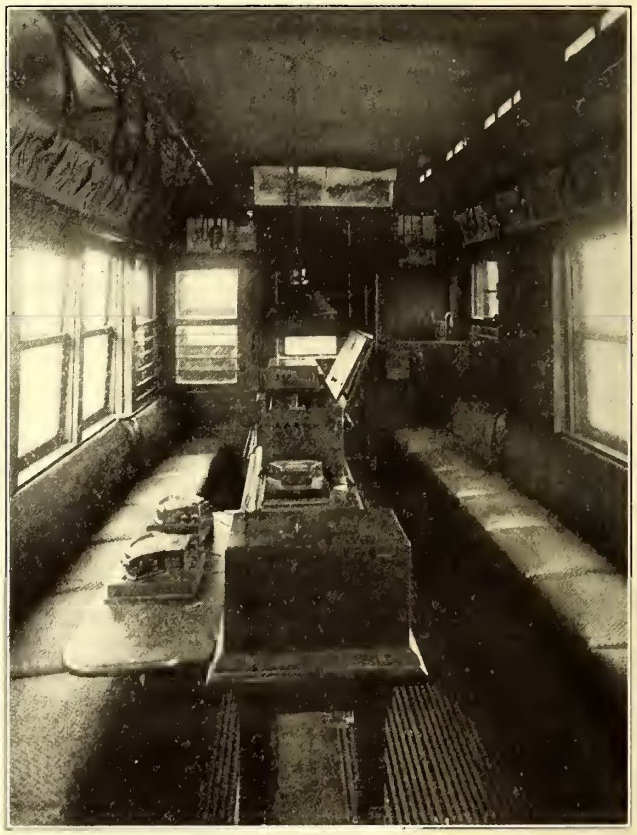
The tests were exhaustive, the results were worked out in great detail, and those relating to power consumption constitute valuable data on the resistance of trains in subway or tunnel service. The figures show also the fact that while during rush hours the schedule speed of express trains sometimes falls below 25 m.p.h., it is in no way due to defect in the electric equipment or error in the calculations of the company's engineers, the falling off in speed being due to the increase in length of station stops beyond the anticipated average of 25 seconds per stop in express service, to interchange of traffic at express stations, and to delays between stations. The tests show that with the equipment used, it would be easily possible with 25-second stops to maintain a schedule of 25 m.p.h. during rush hours in the direction of maximum traffic. They also show that no material improvement in the speed of express trains in the operation of maximum traffic during rush hours could be effected by any practicable increase in the power equipment of the trains. In other words, they show that the factors which limit the schedule between terminals in express service are the length of station stop and the limiting safe speed on curves.

Tests were conducted upon the Subway Division on April 17 and 19, 1905, and upon the Manhattan Elevated Division on May 15 and June 9 of the same year. The data sought were:

(1) Speeds.
(2) Stops and delays.
(3) Passenger loads.
(4) Interchange of passengers.
(5) Train weights.
(6) Train resistance.
(7) Power consumption.
(8) Rates of acceleration.
(9) Rates of braking.
(10) Voltage drops.
(11) Manipulation of trains.

DESCRIPTION OF TEST CAR

The test car was one of the motor cars of the regular



New York Subway—Interior of Test Car

type, which was equipped by the engineers with all necessary apparatus and instruments, and was then substituted for one of the motor cars of the train. Passengers were allowed to board the train as usual, but were excluded from the test car, which was loaded with rails to give it a weight approximately that of the average load of passengers carried by the other cars of the train. This test train was operated during rush hours and during periods of light traffic, so as to obtain information from all conditions of service.

A general view of the interior of the test car with its equipment of instruments is shown on this page. The equipment consisted of the following:

A General Electric recording ammeter with time attachment and a Weston ammeter for check.

A General Electric recording voltmeter with time attachment and Weston voltmeter for check.

A revolution counter, designed by Mr. Putnam for determining the speed and distance values, the revolutions being recorded on the voltmeter time record.

A stop watch was used to check the records of elapsed time as shown directly in five-second marks on the voltmeter and ammeter records.

A gage for showing the pressure in the brake cylinder.

A Bristol voltmeter was provided for recording the line voltage.

Provision was also made for counting all passengers received and discharged by each car at each and every station.

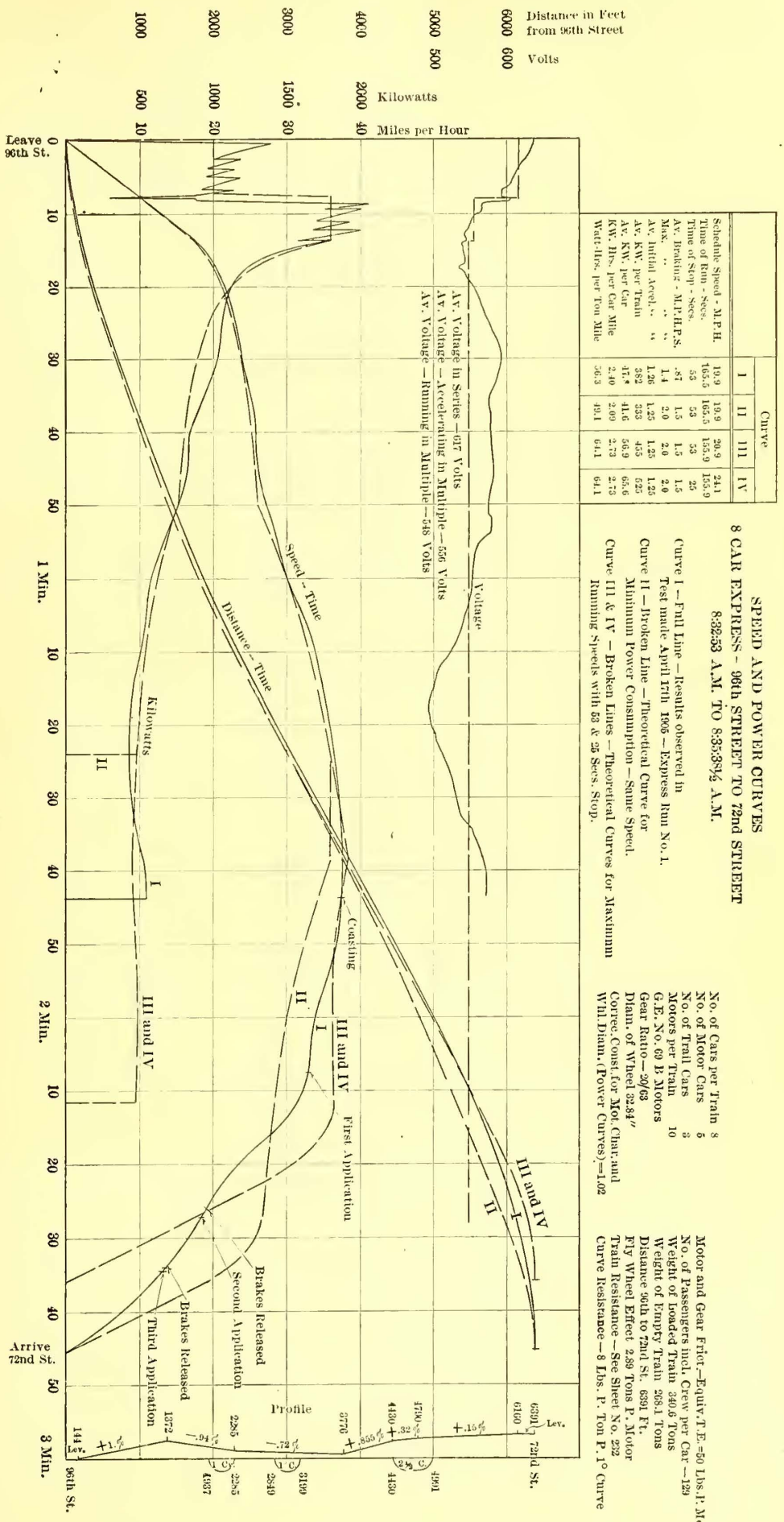
The voltage at substations was read every 5 seconds during runs Nos. 1 and 9.

The voltage at the power house was also read at the same intervals during the same runs.

All ampere and voltage measurements were made on motor No. 2 on the test car and represent the energy consumed by but one motor on the train. Previous to making the test, however, the train was calibrated by placing ammeters in circuit with each motor on the train. The current readings on each motor were compared with simultaneous readings on motor No. 2, at various current values, during series and multiple operation. From these readings a ratio was obtained between the energy consumption of the motor under observation and the total for the train. This method eliminated variations introduced by differences in wheel diameters and motor characteristics.

Each motor car of the subway type was equipped with two GE 69-B motors with a gear ratio of 20:63 and a wheel diameter, when new, of 33.25 in.

On cars of the subway type the automatic accelerating relay in use was adjusted, as in practice, to obtain an acceleration of 1.5 miles per hour per



second with an empty train composed of three motor and two trail cars, corresponding to the train used in the regular local service on the subway division.

Test trains were run in regular service as follows:

SUBWAY DIVISION

Express service, 145th Street and Lenox Avenue to Fulton Street and return.

Run No. 1, April 17, 8 cars, 8:19 to 9:29 a. m. (10 motors)
Run No. 2, April 17, 8 cars, 9:58 to 11:00 a. m. (10 motors)
Run No. 3, April 17, 8 cars, 4:37 to 5:46 p. m. (10 motors)
Run No. 4, April 17, 5 cars, 9:15 to 10:13 p. m. (6 motors)

Local service, 145th Street and Lenox Avenue to City Hall and return.

Run No. 5, April 19, 5 cars, 8:18 to 9:47 a. m. (6 motors)
Run No. 6, April 19, 5 cars, 10:45 to 12:03 p. m. (6 motors)
Run No. 7, April 19, 5 cars, 4:22 to 5:45 p. m. (6 motors)
Run No. 8, April 19, 3 cars, 9:04 to 10:20 p. m. (4 motors)

Position in train.	Car No.	Type of car.	Weight empty.
3	3582	steel motor	77,225 lb.
4	3545	steel motor	76,295 lb.
5	2138	wood trailer	50,851 lb.
6	3615	steel motor	76,436 lb.
7	3159	wood trailer	50,891 lb.
8 (north)	3492	steel motor	76,780 lb.

Total, 268.15 tons

In addition to passengers the train also carried:

Excess weight of iron and instruments on test car.....8367 lb.
29 men in test crew, at 152.5 lb.....4422 lb.
8 men in regular crew, at 150 lb.....1200 lb.

Total .....14,000 lb.

This is equivalent to 100 passengers at 140 lb. each.

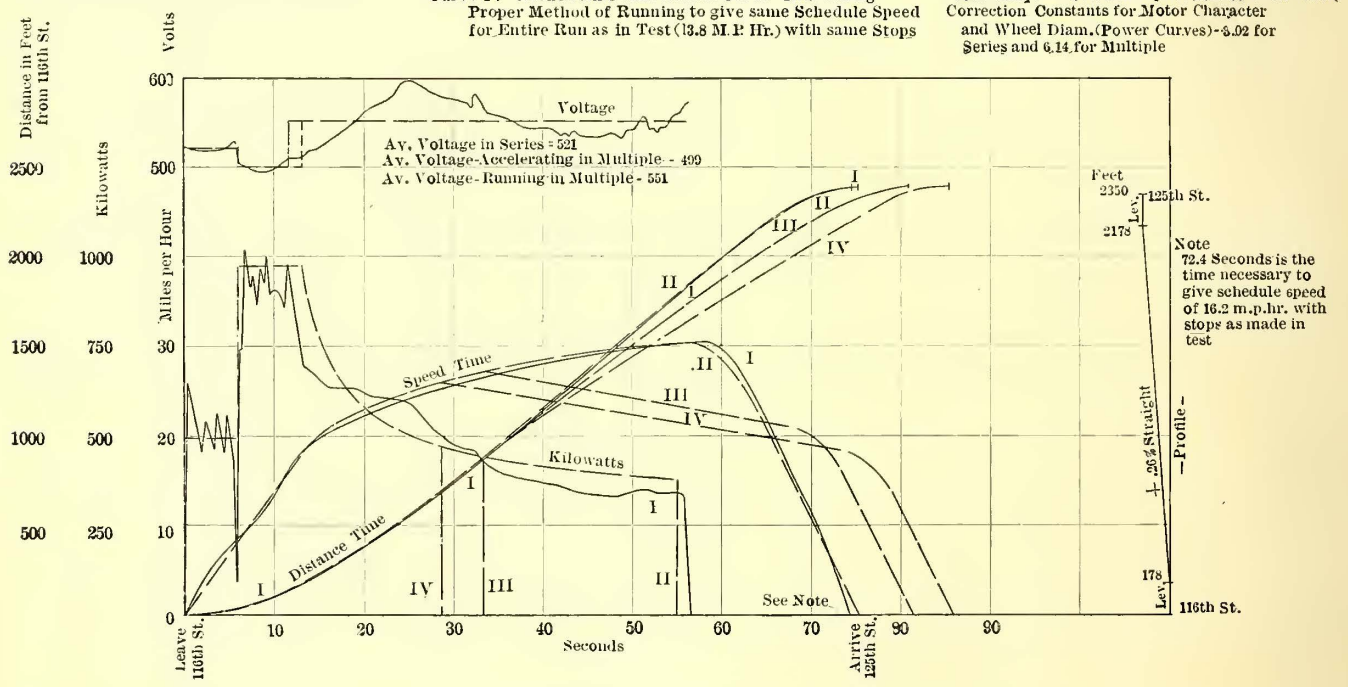
The flywheel effect on the motor cars was estimated at

	Curve			
	I	II	III	IV
Schedule Speed-M.P.H.	17.0	16.9	16.6	15.2
Time of Run - Secs.	74.4	75.3	81.4	85.8
Time of Stop "	19.7	19.7	15.0	19.7
Av. Braking-M.P.H.P.S.	1.89	1.5	1.5	1.5
Max. " "	2.6	2.0	2.0	2.0
Av. Initial Accel. "	1.41	1.39	1.39	1.39
Av. KW. P. Train	307	3.14	219	180
Av. KW. P. Car	61.4	62.8	43.9	36.0
KW. Hrs. P. Car Mile	3.61	3.73	2.64	2.37
Watt Hrs. P. Ton Mile	98.2	101.3	71.9	64.6

SPEED AND POWER CURVES
5 CAR LOCAL - 116TH ST. TO 125TH ST.
5:38:09"P.M. TO 5:39:43"P.M.

Curve I - Full Line - Results observed in Test made April 19, 1905 - Local Run No. 7
Curve II - Broken Line - Theoretical Curves for Maximum Running Speeds with Average Braking of 1½ Miles P.H.P.S.
Curve III - Broken Line - Theoretical Curves to give Scheduled Speed of 16.2 M.P. Hr. with 15 Secs. Stop
Curve IV Broken Line - Theoretical Curve Illustrating Proper Method of Running to give same Schedule Speed for Entire Run as in Test (13.8 M.P. Hr.) with same Stops

No. of Cars per Train —5
No. of Motor Cars 3
No. of Trail Cars 2
Motors per Train 6
G.E. #69 B Motors
Gear Ratio - 29/63
Diam. of Wheel - 32.84"
No. of Passengers Incl. Crew P. Car - 51"
Weight of Loaded Train 138.6 Tons
Weight of Empty Train 165.7 Tons
Distance 116th St. to 125th St. - 2350 Ft.
Fly-Wheel Effect-2.89 Tons P. Motor
Motor and Gear Friction-Equiv. T.E.-50 Lbs. P. Mot.
Correction Constants for Motor Character and Wheel Diam. (Power Curves) - 5.92 for Series and 6.14 for Multiple



Between Prospect and Simpson Streets on the Westchester branch coasting tests at low speeds were made of the eight, five and three-car trains of the subway type which were operated on the elevated structure, and of the seven, six and three-car trains of the Manhattan type.

SUMMARY OF SUBWAY EXPRESS RUNS IN RUSH HOURS

Run No. 1 was made April 17, 1905, with an eight-car express train starting from 145th Street and Lenox Avenue at 8:19 a. m., reaching Fulton Street and returning to the starting point, which it reached at 9:29 a. m. The train ran express between Ninety-Sixth Street and Brooklyn Bridge and local for the balance of the run. It was made up as follows:

Position in train.	Car No.	Type of car.	Weight empty.
1 (south)	3282	wood motor	76,685 lb.
2	3124	wood trailer	51,133 lb.

9650 lb. and of the trail cars at 3175 lb., making a total for the train of 28.89 tons.

It is not proposed to give here all of the figures secured during this test, but the principal data are given in Table I. The summaries are given in Tables II and III.

Tables IV to VI give the corresponding figures for the round trip run made between the same points in slack hours. The train was the same as in the preceding case and ran over the same route. It left the station at 145th Street and Lenox Avenue at 9:57 a. m. and on the return trip reached the station at 10:59 a. m.

In addition to the two runs mentioned, two additional round trip runs were made, one during the afternoon rush hours of April 17, 1905, and one about 10 p. m. of the same day. The results will not be given in detail here because, so far as power consumption is concerned, they did not show variations of any extent over those already quoted.

TABLE I—EXPRESS RUN IN RUSH HOURS

STATION	DISTANCE IN FEET	TIME SECONDS						SPEED M. P. H. R.			POWER					PASSENGERS NUMBER						WEIGHT		
		Total	Current Applied	Coasting	Braking	Interm. Stops	Station Stops	Average Speed Including Stops	Rate Accel. M. P. H. P. S.	Rate Braking M. P. H. P. S.	AV'G. KW. Per Train	AV'G. KW. Per Car	KW. HOURS Per Train	KW. HOURS Per Car Mile	Watt H. Per Ton Mile	Passengers Received	Passengers Discharged	Pass. Exch'd Per Sec. Per Car	Net Load	Equiv't. Test Crew & Test Wt.	Total Load	Passenger Tons	Total Tons	Total Ton Miles
South-Local																								
145—135	2638	156.8	62.3	4.5	29.5		60.5	11.48		.78	326.5	40.81	14.22	3.56	99.6	35			35	100	135	19.4	287.5	143.
135—125	2638	139.2	55.	2.8	31.7		49.7	12.9	1.49	1.214	411.8	51.47	15.92	3.98	110.6	149		.35	184	100	284	19.9	288.	144.
125—116	2397	154.6	45.9	6.5	27.6		74.6	10.58	1.42	1.01	243.1	30.39	10.44	2.88	77.5	165	2	.48	347	100	447	31.3	299.4	135.
116—110	1383	111.8	29.4	5.8	22.6		54.	11.2	1.32	1.27	326.7	40.84	9.91	4.72	117.5	339	2	.65	684	100	784	54.9	323.	84.5
110—96	6953	310.8	154.5	64.5	25.1		66.7	15.3	1.215	1.34	405.2	50.65	34.99	3.32	79.8	208	9	.57	883	100	983	68.9	337.	441.
Express																								
96—72	6389	216.4	103.1	25.7	34.8		52.8	20.1	1.38	1.04	337.5	42.19	20.29	2.09	49.2	63	10	.16	936	100	1036	72.5	340.6	412.
72—Gr'd C't.	10794	360.9	160.4	57.3	38.6		104.6	20.4	1.16	1.14	366.1	45.76	36.7	2.24	52.2	57	29	.23	964	100	1064	74.5	342.6	702.
Gr'd. Ct. —14	7518	282.3	132.3	19.	34.8		96.2	18.15		1.02	306.1	38.26	24.	2.19	48.8	195	173	.38	986	100	1086	76.	344.1	492.
14—B.B.	9241	288.9	164.9	21.3	45.7		57.	21.8	1.21	1.41	474.3	59.29	38.07	2.72	67.8	147	451	.89	682	100	782	54.8	322.9	562.
Local																								
B.B.—Fulton	1539	215.6	26.1	51.7	14.7		123.1	4.86		.632	28.65	3.58	1.72	.735	19.3	35	251	.72	466	100	566	39.6	307.7	89.2
North Fulton—B. B	1539	192.	40.4	46.9	23.4	28.8	52.5	5.46		.835	82.94	10.37	4.42	1.895	54.7	51	16* 450	.58	51	100	151	10.6	278.7	80.8
Express																								
B. B.—14	9135	431.6	163.2	117.3	49.1	69.9	38.1	14.2		.985	242.4	30.30	29.47	2.15	59.2	117	7	.34	161	100	261	18.3	286.4	498.
14—Gr'd. Ct.	7587	243.2	130.8	44.3	28.1		40.	21.3		.86	367.6	45.95	24.84	2.16	61.4	36	80	.44	117	100	217	15.2	283.3	405.
Grd. Ct.—72	10831	281.1	187.8	31.	45.3		17.	27.3	1.73	1.04	470.4	58.80	36.73	2.235	63.5	37	45	.29	109	100	209	14.6	282.7	579.
72—96	6414	179.8	102.3	11.1	44.9		21.5	24.35	1.7	.78	446.2	55.78	22.29	2.295	65.2	8	13	.18	104	100	204	14.3	282.4	342.
Local																								
96—110	6928	252.4	94.8	93.4	48.		16.2	18.7		.84	190.8	23.85	13.38	1.278	36.7	2	60	.41	46	100	146	10.2	278.3	365.
110—116	1383	68.4	24.4	7.2	20.		16.8	13.8	1.67	1.53	404.1	50.51	7.68	3.66	106.5	1	10	.097	37	100	137	9.6	277.7	72.
116—125	2397	94.	43.4	13.5	20.6		16.5	17.4	1.63	1.38	78.91	9.86	12.06	3.32	96.		11	.093	26	100	126	8.8	276.9	125.9
125—135	2638	101.	46.5	8.1	25.4		21.	17.8	1.65	1.305	453.	56.62	12.70	3.18	98.4		19	.17	7	100	107	7.5	275.6	137.4
135—145	2638	136.7	50.5	21.8	39.7	24.7		13.7		1.68	418.9	52.36	16.01	3.24	110.5	1	13	.095	—5*	100	100	7.	275.1	137.2
Total Local	35071	1933.3	673.2	326.7	328.3	53.5	551.6	12.42	1.47	1.145	286.	35.7	153.4	2.89	78.6	986	843	.431	277	100	377	26.4	294.5	1955.
Tot. Express	67909	2290.2	1144.8	327.	321.3	69.9	427.2	20.21	1.43	1.033	366.	45.7	232.4	2.26	58.2	660	808	.414	506	100	606	42.42	310.87	3992.

* Net error in passenger count. NOTE: Passengers "Received" and "Discharged" apply to the station first named under "Station."

TABLE II — SUMMARY OF EXPRESS RUN IN RUSH HOURS

	TIME						KILOWATT HOURS						Average Voltage Entire Run
	EXPRESS		LOCAL		ENTIRE RUN		EXPRESS		LOCAL		ENTIRE RUN		
	Sec's	%	Sec's	%	Sec's	%	Kw. H.	%	Kw. H.	%	Kw. H.	%	
Total Round Trip	2290.2	100.	1933.3	100.	4223.5	100.	232.4	100.	153.4	100.	385.8	100.	594
Series Acceleration	66.9	2.92	90.	4.68	156.9	3.72	16.3	7.0	22.3	14.5	38.8	10.08	580
Series Running	111.9	4.88	186.5	9.69	298.4	7.08	12.9	5.6	16.4	10.7	29.4	7.61	616
Multiple Acceleration	34.8	1.52	40.3	2.06	75.1	1.78	14.4	6.2	15.1	9.8	29.4	7.61	541
Multiple Running	931.2	40.64	356.4	18.45	1287.6	30.56	188.8	81.2	99.6	65.	288.2	74.7	577
Rheostat Losses							11.7	5.04	15.1	9.84	26.8	6.95	
Current Applied	1144.8	49.96	673.2	34.88	1818.	43.14							582
Coasting	327.	14.28	326.7	16.85	653.7	15.45							604
Braking	321.3	14.03	328.3	16.98	649.6	15.35							
Intermediate Stops	69.9	3.03	53.5	2.8	123.4	2.91							
Station Stops	427.2	18.7	551.6	28.5	978.8	23.15							

To determine the exact effect of length of station stops on speed of train in miles per hour, Tables VII, VIII and IX were then compiled. They show respectively the speed in miles per hour between Brooklyn Bridge and Ninety-Sixth Street with the stops actually made, with the stops deducted and with 25-second stops as originally specified. In these tables the stops at Brooklyn Bridge and Ninety-sixth Street are deducted from the time measurements, but the intermediate stops are included.

Considerable attention was given to obtaining the length of station stops under varying conditions, but this subject will not be considered here, as the figures depend entirely upon the design of the car, which has lately been modified, and the time permitted for stops, on which a limit has now been set, with the consent of the Public Service Commission.

Of greater interest, however, is the investigation which was made to determine the best possible speed time between different express stations. The results of the study of the run between Ninety-sixth Street and Seventy-second Street is shown on page 7. In this diagram the full line in

TABLE III—SUMMARY OF EXPRESS RUN IN RUSH HOURS

	Express	Local	Entire Run
Average Speed M. P. H.	20.21	12.42	16.78
Average Speed Exc. Stop	24.84	17.8	21.85
Average Length of Stop	53.4	50.1	51.5
Average Accel. M. P. H. P. S.	1.43	1.47	1.46
Average Braking M. P. H. P. S.	1.03	1.14	1.101
Average Weight of Train T.	310.57	294.5	305.36
Total Ton Miles	3992.	1955.	5947.
Passenger Ton Miles	545.1	175.3	720.4
% Passenger to Car T. Ms	15.8	9.86	13.8
Total Passengers Carried	1777.	1195.	1846.
Average Passengers Pr. Car	75.7	48.2	66.6
Average Ride Pr. Passenger, Miles	4.13	1.85	5.07
Av. Pass. Exch'd Pr. Car Pr. Sec. Stp.	.414	.431	.424
Kw. H. Per Train M.	18.08	23.12	19.8
Kw. H. Per Car Mile	2.26	2.89	2.47
Watt H. Pr. Ton Mile	58.2	78.6	64.9
W. H. Pr. Pass. Ton M	424.	874.	535.
Av. Kw. Pr. Train	366.	286.	329.
Av. Kw. Pr. Car	45.7	35.7	41.1
Av. Kw. Pr. Ton	1.178	.968	1.076
Av. Kw. Pr. T. Pass	8.64	10.85	8.92

Curve I gives the curve of actual results obtained from test run No. 1, mentioned above, and Curve II the theoretical

TABLE IV—Express Run in Slack Hours

Station	Distance in Feet	Time (seconds): Total	Current Applied	Coasting	Braking	Interm. Stops	Station Stops	Speed (M. P. Hr.): Average Speed Including Stops	Rate Accel. M. P. H. P. S.	Rate Braking M. P. H. P. S.	Power: Av'g. Kilow. Per Train	Av'g. Kilow. Per Car	Kw. Hours Per Train	Kw. Hours Per Car Mile	Watt Hours Per Ton Mile	Passengers: Number Received	Discharged	Passengers Ex. P. Sec. P. Car	Net Load	Equiv't. Test Crew & Test Wt.	Total Load	Weight: Passenger Tons	Total Tons	Total Ton Miles
South—Local																								
145—135	2638	101.	53.2	11.5	22.5		13.8	17.8	1.29	1.24	451.	56.4	12.66	3.17	91.2	2	0		2	100	102	7.14	275.29	137.5
135—125	2638	111.	50.3	7.	24.1		29.6	16.2	1.33	1.59	442.	55.3	13.62	3.41	98.5	34	0	.35	36	100	136	9.52	277.67	138.5
125—116	2397	100.2	46.2	4.6	24.9		24.5	16.2	1.32	1.65	414.	51.7	11.51	3.20	90.4	54	3	.29	87	100	187	13.09	281.24	127.4
116—110	1383	70.8	26.4	12.1	15.7		16.6	13.2	1.42	1.79	409.	51.1	8.04	3.86	107.5	55	0	.32	142	100	242	16.94	285.09	74.6
110—96	6953	324.5	144.7	98.4	52.9	14.8	13.7	14.5	1.36	.62	316.5	39.6	28.51	2.72	75.5	27	0	.23	169	100	269	18.83	286.98	378.2
Express																								
96—72	6389	170.5	93.2	29.6	31.8		15.9	25.6	1.34	1.08	450.	56.3	21.31	2.20	61.3	17	6	.24	180	100	280	19.6	287.75	348.
72—Gr'd. Ct.	10794	290.	162.7	53.3	49.		25.	25.4	1.32	1.15	378.	47.3	30.41	1.86	51.6	23	3	.23	200	100	300	21.0	289.15	591.
Gr'd. Ct.—14	7518	232.	133.5	26.6	46.3		25.6	22.2	1.07	.91	289.5	36.2	18.67	1.63	45.5	39	40	.45	199	100	299	20.93	289.08	411.
14—B.B.	9241	254.	136.4	51.1	42.		24.5	24.7	1.29	.90	384.	48.	27.12	1.95	54.4	22	94	.65	127	100	227	15.89	284.04	498.
Local																								
B B.—Fulton	1539	364.	34.9	68.7	30.5	96.9	133.	2.9	1.10	.64	73.8	9.2	7.46	3.22	91.7	1	72	.43	56	100	156	10.92	279.07	81.4
North																			*—5					
Fulton—B B.	1539	101.5	49.9	10.1	18.2		23.3	10.3	1.29	1.24	218.5	27.3	6.16	2.66	75.7	63	61	.13	63	100	163	11.41	279.56	81.4
Express																								
B. B.—14	9135	247.5	142.8	50.3	34.4		20.	25.3	1.16	1.66	410.	51.2	28.21	2.02	57.6	56	2	.36	117	100	217	15.19	283.34	490.
14—Gr'd. C't.	7587	203.5	120.4	35.6	28.		19.5	25.3	1.53	1.10	435.	54.4	24.63	2.15	60.5	38	30	.49	125	100	225	15.75	283.9	407.
Gr'd. C't.—72	10831	297.5	171.3	63.4	50.4		12.4	24.8	1.36	1.12	453.5	56.7	37.42	2.28	64.5	22	37	.43	110	100	210	14.7	282.85	581.
72—96	6414	196.5	100.	22.8	32.		41.7	22.2	1.41	.90	376.	47.	20.54	2.12	59.9	5	13	.21	102	100	202	14.14	282.29	343.
Local																								
96—110	6928	200.5	81.2	65.2	39.9		14.2	23.5	1.42	1.38	338.	42.3	18.85	1.80	51.1	14	31	.15	85	100	185	12.95	281.1	369.
110—116	1383	67.	21.9	19.6	13.9		11.6	14.	1.25	1.30	341.	42.6	6.34	3.05	86.4	1	5	.06	81	100	181	12.67	280.82	73.4
116—125	2397	86.5	46.5	3.2	24.4		12.4	18.7	1.55	1.54	532.	66.5	12.77	3.55	100.8	0	18	.22	63	100	163	11.41	279.56	126.6
125—135	2638	91.	46.5	8.9	20.		15.6	19.8	1.43	2.03	495.	61.8	12.50	3.13	89.8	1	22	.26	42	100	142	10.94	279.09	139.2
135—145	2638	210.	55.5	43.9	31.9	78.7	0	8.6	1.45	0	120.5	15.1	7.04	1.76	50.9	1	13	.13	30	100	130	9.1	277.25	138.2
Tot. Local	35071	1828.0	657.2	353.2	318.9	190.4	308.3	13.07	1.35	1.37	286.5	35.8	145.46	2.74	78.1	253	255	.21	83	100	183	12.78	280.9	1865.4
Tot. Express	67909	1891.5	1060.3	332.7	313.9	0	184.6	24.47	1.30	1.10	396.4	49.6	208.3	2.02	56.8	222	225	.38	145	100	245	17.15	285.3	3669.0

* Net Error in Passenger Count. Note: Passengers "Received" and "Discharged" apply to the station first named under "Station."

TABLE V — Summary of Express Run in Slack Hours

	Time: Express Sec's	Express %	Local Sec's	Local %	Entire Run Sec's	Entire Run %	Kilowatt Hours: Express Kw. H.	Express %	Local Kw. H.	Local %	Entire Run Kw. H.	Entire Run %	Average Voltage Entire Run
Total Round Trip	1891.5	100.00	1828.0	100.00	3719.5	100.00	208.3	100.0	145.5	100.00	353.8	100.00	603
Series Acceleration	60.3	3.19	90.5	4.95	150.8	4.05	12.6	6.06	22.4	15.40	53.0	9.90	581
Series Running	92.4	4.89	177.7	9.72	270.1	7.24	7.1	3.39	21.4	14.71	28.5	8.06	602
Multiple Acceleration	40.3	2.14	39.0	2.13	79.3	2.13	17.2	8.27	17.3	11.78	34.5	9.76	546
Multiple Running	861.3	45.80	350.0	19.15	1217.3	32.74	171.4	82.28	84.4	58.11	255.8	72.28	586
Rheostat Losses													
Current Applied	1060.3	56.02	657.2	35.95	1717.5	46.16							586
Coasting	332.7	17.61	353.2	19.31	685.9	18.45							
Braking	313.9	16.60	318.9	17.46	632.8	17.02							
Intermediate Stops	0.0	0.00	190.4	10.41	190.4	5.12							617
Station Stops	184.6	9.77	308.3	16.87	492.9	13.25							

TABLE VI

Summary of Express Run in Slack Hours

Speed	Express	Local	Entire Run
Avg. Speed M.P.H.	24.47	13.07	18.88
Avg. Speed Exc. Stop	27.12	18.00	23.11
Avg. Length of Stop	23.1	28.1	26.0
Avg. Accel. M. P. H. P. S.	1.30	1.35	1.33
Avg Brak'g M. P. H.P. S.	1.10	1.37	1.19
WEIGHT			
Avg. Wt. of Train T.	285.3	280.9	283.8
Total Ton Miles	3662.0	1865.4	5534.4
Pass. Ton Miles	220.5	84.9	305.4
% Pass. To Car T. Ms.	6.40	4.77	5.84
PASSENGERS			
Total Passengers Carried	646.	579.	675.
Avg. Pass. Pr. Car	30.6	22.9	28.0
Av. Ride Pr. Pass. Miles	4.18	1.45	5.08
Av. Pass. Exch'd Pr. Car Pr. Sec. Stop	.38	.21	.27
POWER			
Kw. H. Pr. Train Mile	16.20	21.90	18.15
Kw. H. Pr. Car Mile	2.02	2.74	2.27
Watt Hr. Pr. Ton Mile	56.8	78.1	63.9
W. H. Pr. Pass. Ton Mile	945.	1715.	1157.
Avg. Kw. Pr. Train	396.	287.	342.
Avg. Kw. Pr. Car	49.6	35.8	42.8
Avg. Kw. Pr. Ton	1.390	1.020	1.207
Avg. Kw. Pr. T. Pass	23.11	22.42	21.87

TABLE VII

Express Speed—Between 96th Street and Brooklyn Bridge, M. P. H. Including Intermediate Stops

Speed—Actual, Including Stops	South	North	Average Both Directions
Theoretical calculations	25.7	25.0	25.3
Run No. 1	21.2	20.2	20.7
Run No. 2	25.9	25.6	20.8
Run No. 3	24.6	20.6	22.5
Run No. 4	24.8	24.6	24.7

TABLE VIII

Express Speed—Between 96th Street and Brooklyn Bridge Including Intermediate Stops

Speed—Excluding Stops	South	North	Average Both Directions
Theoretical calculations	28.1	27.2	27.6
Run No. 1	27.7	23.4	25.5
Run No. 2	28.1	27.2	27.6
Run No. 3	27.1	26.4	26.7
Run No. 4	26.6	26.7	26.6

curve for minimum power consumption between the two points. A comparison of the two curves shows that the actual application of current was theoretically very nearly correct, but was continued 20 seconds too long; that the coasting period was too short and that the brakes were applied too soon, requiring a subsequent release. The average rate of braking or deceleration in Curve I is but 0.87 mile per hour per second, whereas the braking portion of Curve II is based upon an assumed average of 1.5 and a maximum of 2 m.p.h.p.s. The kilowatt curves for the two runs are also given on the diagram, the current consumption for Curve II ending at 1 min. 24 sec., while that for Curve I ends at 1 min. 44 sec. The result was a difference of 0.31 kw-hour per car mile between the two curves.

TABLE IX—EXPRESS SPEED BETWEEN 96TH STREET AND BROOKLYN BRIDGE, M. P. H.
INCLUDING INTERMEDIATE STOPS

Speed—With 25 Sec. Stops Only	South	North	Average Both Directions
Theoretical calculations	25.7	25.0	25.3
Run No. 1	25.4	21.7	23.5
Run No. 2	25.7	25.0	25.3
Run No. 3	24.8	24.3	24.5
Run No. 4	24.5	24.6	24.5

Curves I and II are based on the same running time, 2 min. 45 sec., between stops. To determine the minimum running time possible with the equipment available, Curve III was drawn. In this run the average kilowatts per train are increased from 382 in Curve I to 455, with the same rate of acceleration (1.25 m.p.h.p.s.) as in Curve II. The current is kept on, however, up to 2 min. 11½ sec., when the brakes are applied with the same rate of braking, or 1.5 m.p.h.p.s. average and 2 m.p.h.p.s. maximum. The result is a saving of nine seconds over Curves I and II, or a total of 2 min. 36 sec. This figure, it might be stated, is five seconds less than that required to make a schedule speed of 25 miles per hour with 25-second station stops, notwithstanding the fact that the train weighed 340 tons, as against an average weight of 296 tons used in the preliminary calculations. The data on power consumption per car and per train in the table in the diagram for Curve III are based upon a station stop of 53 seconds. Curve IV is identical with Curve III, so far as the run between stations is concerned, but the power consumption as given in the table is estimated on a basis of 25-second station stops.

A similar set of curves for the run of a five-car local train between 116th Street and 125th Street is shown on page 8.

The results of the tests on the Manhattan Elevated Railway will be given in a subsequent article.

A new method of showing the destination of the street cars in San Francisco, by a system of numbering the different car lines, is being considered by the United Railroads, and will be introduced providing it meets with the approval of the supervisors. The usual printed names of the streets on which the cars run will be kept on the car, as has been the rule, but in conjunction with this will be the number that has been assigned to each particular line. The number will be well lighted at night and placed in a conspicuous place. For the benefit of those who may not become familiar with the significance of the numbers and for the use of strangers, printed schedules of the lines and their numbers will be posted in places where they can be readily consulted.

FIRST SINGLE-PHASE LOCOMOTIVE FOR PRUSSIAN STATE RAILWAYS

At the request of the Prussian State Railways the Allgemeine Elektricitäts Gesellschaft has furnished a single-phase locomotive for heavy work, to be used on the experimental line at Oranienburg, mentioned on page 728 in the STREET RAILWAY JOURNAL of May 2. The locomotive consists of two four-wheel sections with Winter-Eichberg motors on three of the axles, but provision is made for a motor on the fourth axle. Each motor has an hourly rating of 350 hp at 450 r.p.m. and a continuous rating of 250 hp at 500 r.p.m. The gear ratio is 1:4.21 and the driving wheels have a diameter of 1400 mm (55 in.). This gives a speed of 28.2 km (17.5 miles) per hour at the hourly rating and a tractive effort of 3350 kg (7383 lb.) on the circumference of each axle. At the continuous rating the speed is 31.3 km (19.4 miles) per hour and the tractive effort per axle 2160 kg (4761 lb.). Thus the locomotive is capable of giving continuously 750 hp with a tractive effort of 6480 kg (14,283 lb.) at a speed of 31.3 km (19.4 miles) per hour.

The maximum speed of the locomotive has been fixed at 50 km (31 miles) per hour, but the motors may speed up to attain 60 km (37.2 miles), in which case the armature speed is 955 r.p.m. The weights in metric tons on each axle are as follows: No. 1 driving axle, 14.110 tons; No. 2 running axle, 14,160; No. 3 driving axle, 15,900, and No. 4 driving axle, 15,300 tons. This makes a total locomotive weight of 59,470 tons.

The two pantograph collectors are mounted on one section of the locomotive and take current at 6000 volts, 25 cycles. The pressure on the trolley wire is about 4 kg (2.5 lb.). The collectors reverse automatically with the change in running and are raised and lowered either by compressed air or by hand. They can come into contact with the trolley wire only when the high-tension chamber is closed. This high-tension compartment mentioned contains all the high-tension protective apparatus, a current changer for the instruments and an air-cooled main transformer which steps down the trolley voltage to 1000 volts. This transformer has two low-tension terminals, each having seven steps through which the different potentials are allowed to reach the motors. The control regulating transformers and the other low-tension apparatus are mounted in another part of the locomotive, which also contains the ventilating fans driven by a 30-hp Winter-Eichberg motor. The louvres in the sides of this compartment are filled with granulated cork serving as air filters. The windows and doors of this compartment are always kept closed. This section also contains an air compressor driven by a 7-hp motor to supply air to the brakes, current collectors, sanders and signal pipes. Each end of the locomotive contains a compartment for the motorman, with two seats, the one on the left being for the locomotive engineer and the other, which is furnished with a desk, for the conductor. The master controller used has four starting and four running points as well as a reversing cylinder. An interesting feature is the auxiliary equipment employed for switching, this being a controller operative only for the first running position of the motors.

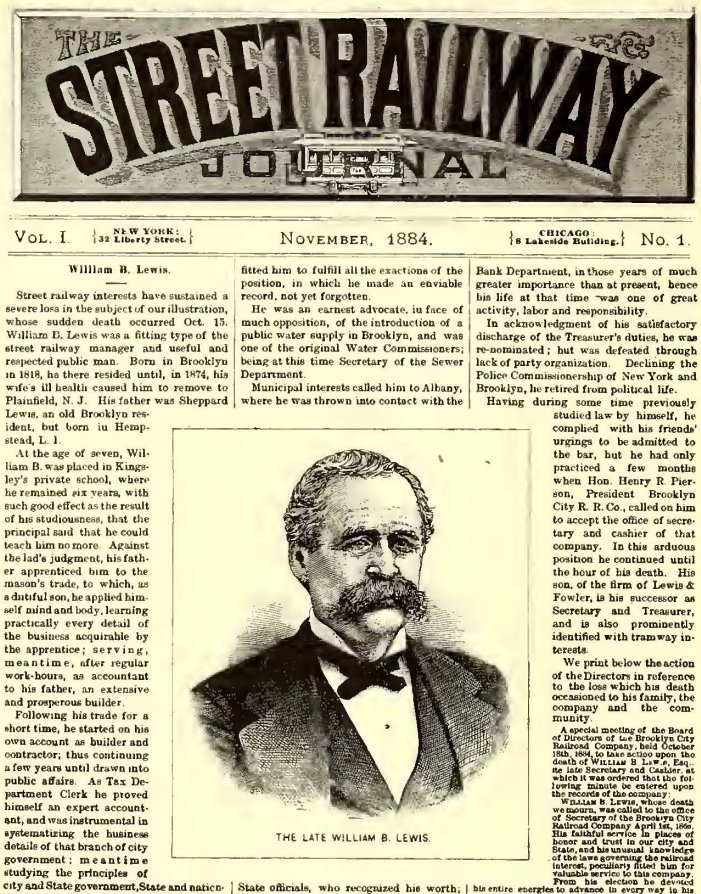
The three motors are arranged for operation in two independent groups, but it is also possible to cut out any single motor when desired. Choke coils are used for starting. The controller current is taken from the main transformer at 300 volts.

HISTORY OF THE JOURNAL AND THE REVIEW

The time when the *Street Railway Journal* and the *Electric Railway Review* are to disappear except as history, and the Electric Railway Journal will take their places, seems an appropriate one for a glance over the records of each. Both papers number many of their subscribers from their first issues, and to such a brief review of the development of each of the publications may not be without interest. To those who have entered the electric railway field later, an account of some of the problems and vicissitudes of the early days when the industry was very much smaller than it is now may prove instructive.

Progress in the street railway industry seems to be marked by decades. That from 1854 to 1864 was characterized by the organization of the early street railway companies in the larger cities, with the exception, of course, of the pioneer line from City Hall to Harlem, in New York, which had no counterpart for many years. From 1864 to 1874 was the period of inflation following the Civil War, when profitable investments were sought everywhere. The early street railways in New York, Philadelphia, Chicago and St. Louis and other cities had proved financially successful, and it was only natural that the 10 years following 1864 should see a tremendous extension of the industry. The charters of many of the companies in the cities of medium size date from this time. From 1874 to 1884 might be called the cable period. The first cable line in San Francisco, that on Clay Street, was put in operation in August, 1873, and its inauguration was followed by the adoption of the system in other cities. From 1884 to 1894 may be considered the period of the electric tramway, the modern power, just as the first year in this decade was marked by the establishment of the *Street Railway Journal*. Continuing the series briefly, 1894 to 1904 can properly be called the interurban period, while about 1904 the serious work in trunk-line operation commenced. Although not absolutely accurate in every respect, there has been a remarkable correspondence between the development of the industry and the periods of years in multiples of 10 which have been cited. The coincidence is introduced here to explain the condition of affairs at the beginning of what has been termed the electric era.

The circle of workers in the street railway field was much smaller in 1884 than in these days of electric power, and the attendants at the early street railway conventions consisted almost entirely of the managerial heads. Engineering, except so far as the few cable roads were concerned, held small place either in the programs of the association or in the columns of the few steam railroad and general engineering papers then published. Neither accounting nor car equipment had been reduced to standards. There were no interurban roads nor any interchange of rolling stock. The corporate conditions of the companies were also radically different from those at the present day. In the absence of power stations and repair shops there was little advantage in centralization. As a result there were several street railway companies in most of the larger cities. New York possessed 18, not including the elevated railway; Philadelphia had a dozen and Brooklyn, Pittsburg, St. Louis and Baltimore about the same number. Holding companies, like the tremendous power of electricity, lay in the future. Nevertheless, the managers of that day had their problems as they have at present, and they seemed and were as intense as those which are discussed at present. Upon their wise solution has rested in large part the success of those companies which have come after.



THE STREET RAILWAY JOURNAL

VOL. I. {NEW YORK: 32 Liberty Street.} NOVEMBER, 1884. {CHICAGO: 8 Lakeside Building.} No. 1.

William B. Lewis.

Street railway interests have sustained a severe loss in the subject of our illustration, whose sudden death occurred Oct. 15. William B. Lewis was a fitting type of the street railway manager and useful and respected public man. Born in Brooklyn in 1818, he there resided until, in 1874, his wife's ill health caused him to remove to Plainfield, N. J. His father was Sheppard Lewis, an old Brooklyn resident, but born in Hempstead, L. I.

At the age of seven, William B. was placed in Kingsley's private school, where he remained six years, with such good effect as the result of his studiousness, that the principal said that he could teach him no more. Against the lad's judgment, his father apprenticed him to the mason's trade, to which, as a dutiful son, he applied himself mind and body, learning practically every detail of the business acquirable by the apprentice; serving, meantime, after regular work-hours, as accountant to his father, an extensive and prosperous builder.

Following his trade for a short time, he started on his own account as builder and contractor; thus continuing a few years until drawn into public affairs. As Tax Department Clerk he proved himself an expert accountant, and was instrumental in systematizing the business details of that branch of city government; meantime studying the principles of city and State government, State and national law, history and parliamentary usage.

His activity and intelligence, and his information and interest in politics, attracting the attenting of his party, he was elected Comptroller of Brooklyn; serving when that city and Williamsburg were consolidated. His term was a busy one; but his early training with his father, his attention, study, and practice of accounts and finance, together with a stern decision of character fitted him to fulfill all the exactions of the position, in which he made an enviable record, not yet forgotten.

He was an earnest advocate, in face of much opposition, of the introduction of a public water supply in Brooklyn, and was one of the original Water Commissioners; being at this time Secretary of the Sewer Department.

Municipal interests called him to Albany, where he was thrown into contact with the State officials, who recognized his worth; and during his Comptrollership he was elected Treasurer of the State of New York. During his tenure of this important office he became the intimate friend of Gov. Horatio Seymour, who confided many things to him; the two advising mutually on many matters of State.

His office of State Treasurer made him a member of the Canal and School boards; and also gave him much to do with the Bank Department, in those years of much greater importance than at present, hence his life at that time was one of great activity, labor and responsibility.

In acknowledgment of his satisfactory discharge of the Treasurer's duties, he was re-nominated; but was defeated through lack of party organization. Declining the Police Commissionership of New York and Brooklyn, he retired from political life.

Having during some time previously studied law by himself, he complied with his friends' urgings to be admitted to the bar, but he had only practiced a few months when Hon. Henry R. Pierson, President Brooklyn City R. R. Co., called on him to accept the office of secretary and cashier of that company. In this arduous position he continued until the hour of his death. His son, of the firm of Lewis & Fowler, is his successor as Secretary and Treasurer, and is also prominently identified with tramway interests.

We print below the action of the Directors in reference to the loss which his death occasioned to his family, the company and the community.

A special meeting of the Board of Directors of the Brooklyn City Railroad Company, held October 18th, 1884, to take action upon the death of William B Lewis, Esq., the late Secretary and Cashier, at which it was ordered that the following minute be entered upon the records of the company:

William B. Lewis, whose death we mourn, was called to the office of Secretary of the Brooklyn City Railroad Company April 1st, 1860. His faithful service in places of honor and trust in our city and State, and his unusual knowledge of the laws governing the railroad interest, peculiarly fitted him for valuable service to this company. From his election he devoted his entire energies to advance in every way in his power the interest of the company.

While discharging with conscientious care and fidelity the special duties of his office, he gave at the same time most careful attention to its financial interest.

To the general management of the Road, also, he gave thought and was frequently consulted in regard to it.

His judicious counsel has been of great value to the Company. For the eighteen years and a half of most faithful service we here bear testimony, while we regret the death of a faithful officer, we also mourn the loss of an old and respected friend.

For the family of William B. Lewis, we would express our sincere sympathy in their great sorrow.

W. H. Hazard, President.

THE LATE WILLIAM B. LEWIS.

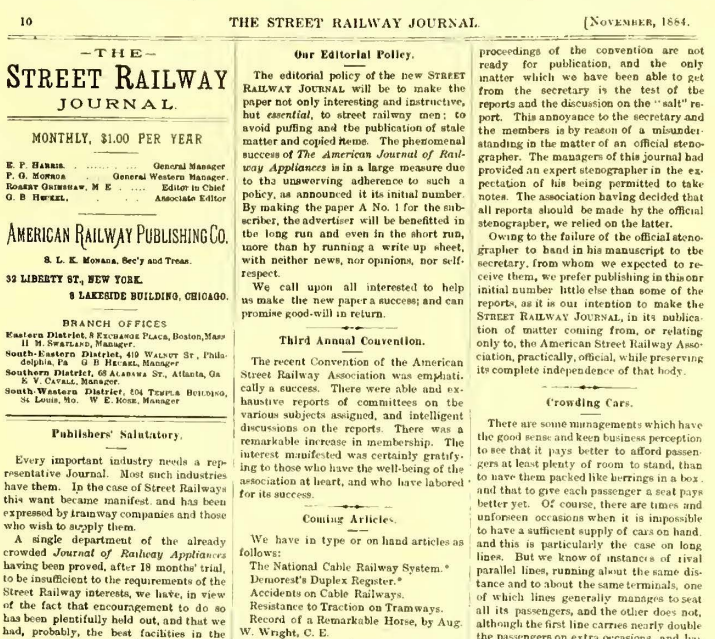
The First Page of the First Issue of the Street Railway Journal

It was amid the surroundings which have just been depicted that the *Street Railway Journal* was born. For some 18 months previous to November, 1884, the publishers of the *Street Railway Journal* had been endeavoring to cover the street railway field by printing a department of street railway news in a monthly steam railroad paper issued by them and entitled the *Journal of Railway Appliances*. Experience soon showed them, however, as it has shown others since that time, that the problems in the two classes of transportation had many points of divergence, and that the street railway industry could not be made an adjunct to steam railroad operation.

It was evident that the field was ripe for a paper which would chronicle the news of the industry and the improvements made in construction and operating practice. The art had reached that stage in its development when an interchange of ideas was to prove helpful. Managers were seeking to advance the interests of and improve their properties, but had slight opportunity of learning what others were doing except by occasional visits and at the annual meetings of the American Street Railway Association, which had been established only two years previously.

Even then the need existed, which every industry feels in proportion to its size and complexity, of a medium through which accounts of improved methods and progress in any direction could become available.

The first issue of the *Street Railway Journal* was published in November, 1884, and comprised 24 pages. Included in its contents were a report of the New York convention of the American Street Railway Association, a biographical sketch of William B. Lewis, who had been secretary of the Brooklyn City Railroad; The Cracking of Varnish; The Power Required to Operate Cable Railways; and The Derivation of the Word "Tramway." The editorial page announced that the policy of the new publication would be "to make the paper not only interesting and instructive, but *essential* to street railway men; to avoid puffing and the publication of stale matter and copied items"; this policy has ever since been followed. Of the other editorials, that on "Convention Proceedings," which appears on the accompanying page, indicates that the editors in those days, as later, had their troubles even when they had taken every precaution to avoid mishap, while that on "Crowding Cars" shows the readiness to criticize faults as well as to award praise. The advertisements in the first issue of the *Street Railway Journal* were 23 in number. Many of them were devoted naturally to horse-car operation, but they included the following: J. G. Brill Company, John Stephenson Company, Valentine & Company's Varnishes, F. W. DeVoe & Company, Tom L. Johnson's improved fare box.



10 THE STREET RAILWAY JOURNAL. [NOVEMBER, 1884.

—THE—
STREET RAILWAY
JOURNAL.

MONTHLY, $1.00 PER YEAR

E. P. HARRIS. . . . . General Manager
P. O. MORROW . . . General Western Manager.
ROBERT GRIMSHAW, M. E. . . . . Editor in Chief
G. B. HEXEL. . . . . Associate Editor

AMERICAN RAILWAY PUBLISHING CO.

S. L. K. MORROW, Sec'y and Treas.

32 LIBERTY ST., NEW YORK.
8 LAKESIDE BUILDING, CHICAGO.

BRANCH OFFICES

Eastern District, 8 EXCHANGE PLACE, Boston, Mass. H. M. SWARLAND, Manager.
South-Eastern District, 410 WALNUT ST., Philadelphia, Pa. G. B. HEXEL, Manager.
Southern District, 68 ALABAMA ST., Atlanta, Ga. E. V. CAVALE, Manager.
South-Western District, 204 TEMPLE BUILDING, St. Louis, Mo. W. E. ROSE, Manager.

Publishers' Salutatory.

Every important industry needs a representative Journal. Most such industries have them. In the case of Street Railways this want became manifest, and has been expressed by tramway companies and those who wish to supply them.

A single department of the already crowded *Journal of Railway Appliances* having been proved, after 18 months' trial, to be insufficient to the requirements of the Street Railway interests, we have, in view of the fact that encouragement to do so has been plentifully held out, and that we had, probably, the best facilities in the country for doing so, resolved to issue this special trade and technical monthly.

The Street Railway Journal.

At the recent street railway convention, a number of leading men expressed the wish that there should be a journal devoted exclusively to street railway interests. Representatives of the AMERICAN RAILWAY PUBLISHING CO. became aware that this need was felt not only by the street railway managers and employees, as a source of information, and a means of exchange of ideas, but by those selling to them, as a medium of direct communication with their customers.

Seeing this, a careful canvass was made as to the probability of a special street railway journal being supported by readers and advertisers.

The promptness and enterprise of those in the supply trade, in this matter, as shown by our advertising pages, certainly proves a willingness on their part to do their full share towards making a first-class paper. With a similar response on the part of street railways, in the way of subscriptions, the encouragement will be all that we could ask, to make a journal in every way creditable to the street railways of America.

Our Editorial Policy.

The editorial policy of the new STREET RAILWAY JOURNAL will be to make the paper not only interesting and instructive, but *essential*, to street railway men; to avoid puffing and the publication of stale matter and copied items. The phenomenal success of *The American Journal of Railway Appliances* is in a large measure due to the unswerving adherence to such a policy, as announced it its initial number. By making the paper A No. 1 for the subscriber, the advertiser will be benefitted in the long run and even in the short run, more than by running a write up sheet, with neither news, nor opinions, nor self-respect.

We call upon all interested to help us make the new paper a success; and can promise good-will in return.

Third Annual Convention.

The recent Convention of the American Street Railway Association was emphatically a success. There were able and exhaustive reports of committees on the various subjects assigned, and intelligent discussions on the reports. There was a remarkable increase in membership. The interest manifested was certainly gratifying to those who have the well-being of the association at heart, and who have labored for its success.

Coming Articles.

We have in type or on hand articles as follows:

The National Cable Railway System.*
Demorest's Duplex Register.*
Accidents on Cable Railways.
Resistance to Traction on Tramways.
Record of a Remarkable Horse, by Aug. W. Wright, C. E.
Street Railway Joints, by Aug. W. Wright, C. E.
Mr. I. Watson, President of the Buffalo St. R. R. Co., has kindly promised articles on Salt or no Salt.
Heating Cars (negative).
Interchangeability of Tickets (i. e., all Street Rw. tickets good in any town).
Mr. Wm. J. Richardson, Sec'y A. S. Rw. Association, is good enough to promise a communication on Fare Collecting.
Mr. W. W. Hanscom of San Francisco, will have some practical things to say about Cable Railways, and we have good hopes that Mr. Jas. K. Lake, Supt. Western Div. R. R., Chicago, will give us "points" enough to make some very interesting articles.

*Illustrated

Our Contents.

The lack of variety of matter in this issue of the STREET RAILWAY JOURNAL is due to the large amount of space given to the very interesting reports presented, of the Convention

Convention Proceedings.

We regret that up to the moment of going to press, the oral discussions of papers and the complete minutes of proceedings of the convention are not ready for publication, and the only matter which we have been able to get from the secretary is the text of the reports and the discussion on the "salt" report. This annoyance to the secretary and the members is by reason of a misunderstanding in the matter of an official stenographer. The managers of this journal had provided an expert stenographer in the expectation of his being permitted to take notes. The association having decided that all reports should be made by the official stenographer, we relied on the latter.

Owing to the failure of the official stenographer to hand in his manuscript to the secretary, from whom we expected to receive them, we prefer publishing in this our initial number little else than some of the reports, as it is our intention to make the STREET RAILWAY JOURNAL, in its publication of matter coming from, or relating only to, the American Street Railway Association, practically, official, while preserving its complete independence of that body.

Crowding Cars.

There are some managements which have the good sense and keen business perception to see that it pays better to afford passengers at least plenty of room to stand, than to have them packed like herrings in a box; and that to give each passenger a seat pays better yet. Of course, there are times and unforseen occasions when it is impossible to have a sufficient supply of cars on hand, and this is particularly the case on long lines. But we know of instances of rival parallel lines, running about the same distance and to about the same terminals, one of which lines generally manages to seat all its passengers, and the other does not, although the first line carries nearly double the passengers on extra occasions, and has about the same number of cars. The superintendent of the first line "watches the weather," and inspects the returns for the various hours of the day. He knows about how many people are out: when they will be likely to return in fair weather, and how fast they will crowd in if there is bad weather. His conductors have plenty of time and room to collect all the fares, and the road is made popular.

Choice of Stock.

We would suggest, as a good subject to discuss, the character of stock to be purchased; whether it pays best to buy heavy or light animals; young or old; compact or otherwise, etc.; there is certainly something worth thinking about when we consider the contrast between the magnificent Percheron stallions run by the Tramway and omnibus lines of Paris, or the fine stock between the shafts of the hansoms in London, and the "scrubs" which veterinary surgeons are expected to keep in perfect health and condition in many American street railways. It either pays, or it does not pay, to run good stock; whether it does or not is worth finding out by inspection of the records and comparison of notes and opinions through our columns, and if there are no records the notes and opinions will

Editorial Page of the First Issue of the Street Railway Journal

The second issue contains an article on cable railways in Chicago and San Francisco, the report at the New York convention on "Electricity as a Motor," a letter from Walter H. Knight descriptive of the conduit electric railway in East Cleveland, the convention report on A Uniform System of Accounts, and articles on the following subjects: Car Decoration, Which Side of a Tie Should Do Up? Colors vs. Oils, Dryers and Varnishes, Railroad Joints, and Rights of Street Car Passengers.

No attempt will be made to analyze the contents of the first few volumes of the *Street Railway Journal* except to say that the paper continued to grow in size and value. It soon gained the confidence and support of its readers, the most important asset which a paper can possess, and became the recognized medium through which every important invention and improvement was described as soon as the news of it became public. It should also be stated that within six months from November, 1884, the *Street Railway Journal* commenced the publication of a directory of all the street railways in the United States and Canada. It was bound with each copy of the paper and was the predecessor of the annual "Red Book," the first number of which was issued by the publishers of the *Street Railway Journal* in 1894.

The opening of the Bentley-Knight electric road in Cleveland in 1884, chronicled in the first issue of the *Street Railway Journal,* was an event whose importance was not realized at the time. The apparatus was crude and faulty, but the idea was there, and with such inventors at work as Van Depoele, Sprague, Daft and Henry, it is not surprising that electricity began soon to be considered as a formidable rival to the cable. By 1888 the battle royal between motive powers was on. The electrical companies then in active competition for street railway contracts included the Sprague Electric Railway & Motor Company, the Thomson-Houston Electric Company, the Daft Electric Light Company, the Brush Electric Company, S. H. Short & Company, the Bentley-Knight Electric Railway Company and the Detroit Electrical Works, all of which advocated the system of direct supply, and the Julien Electric Traction Company and the Electric Accumulator Company, both of which manufactured storage battery cars. The cable railway contractors at first treated the upstart, electricity, with scorn and the city authorities looked askance at the trolley wire, which was considered a disfigurement to the streets and charged with a death-dealing potentiality. Missionary work had to be done to remove this popular prejudice, and the *Street Railway Journal,* which by this time had grown to a paper publishing 350 reading pages annually, took no small part in this pioneer work. All through this controversy it strongly advocated electricity in place of the cable. The contract in Boston, which was followed not long after by others equally as large in many important cities, marked the period of decline of the cable railway and left the field clear for the development of electric transportation.

The '90's marked a continuous progress of the electric idea and a corresponding development in the *Street Railway Journal.* The first separate Souvenir Issue was pub-

lished in October, 1891, and was followed by another in the fall of 1892, issued immediately preceding the Cleveland convention of that year. Up to that time the electric systems were confined almost entirely to city limits, with Akron, Bedford & Cleveland were among the earliest of the interurban lines and the example set by their promoters was rapidly followed and has resulted in the interurban lines which link together city and village throughout the Eastern and Central States.

Commencing with 1901, the *Street Railway Journal* was changed from a monthly to a weekly paper. For some time previous it had published a weekly news bulletin which had chronicled the important street railway happenings week by week, but matters of technical interest were crowding on apace and the times demanded a regular weekly paper. During all of these later years no attempt has been made to confine the articles to matters relating purely to "street" railways. The publishers did not change the name of the paper, but it was a well recognized fact that nothing of importance in electric railroading, whether it referred to a city line or the electrified division of a trunk line railroad, was beyond its chosen scope. The result has been that ever since the opening of the Baltimore & Ohio Belt Line tunnel with electric power the paper has been the recognized medium through which the scientific and operating data in connection with this class of road were made public and put in permanent form.

THE STREET RAILWAY REVIEW

In January, 1891, when the *Street Railway Journal* was six years old, the first number of the *Street Railway Review* appeared. Like its predecessor, it was a monthly, but was issued on the fifteenth of the month, while the *Street Railway Journal* was published on the first of the month. At that time the number of street railways was constantly growing and the rapidly increasing interest in electric transportation led to the belief that the industry should receive its news more often than once every 30 days. The *Street Railway Review* began its career in the middle of the period that earlier in this article has been called "The Electric Tramway Decade" and soon was actively assisting in solving the problems which were confronting the street railway companies of the country.

At that time many of the smaller cities had been equipped with electric systems, but the larger centers were for the most part holding aloof from the new power. How crude these first electric roads were is well known to the men older in the field, the men whose greatest task was

Typical Advertisements Published in the Street Railway Journal During 1885

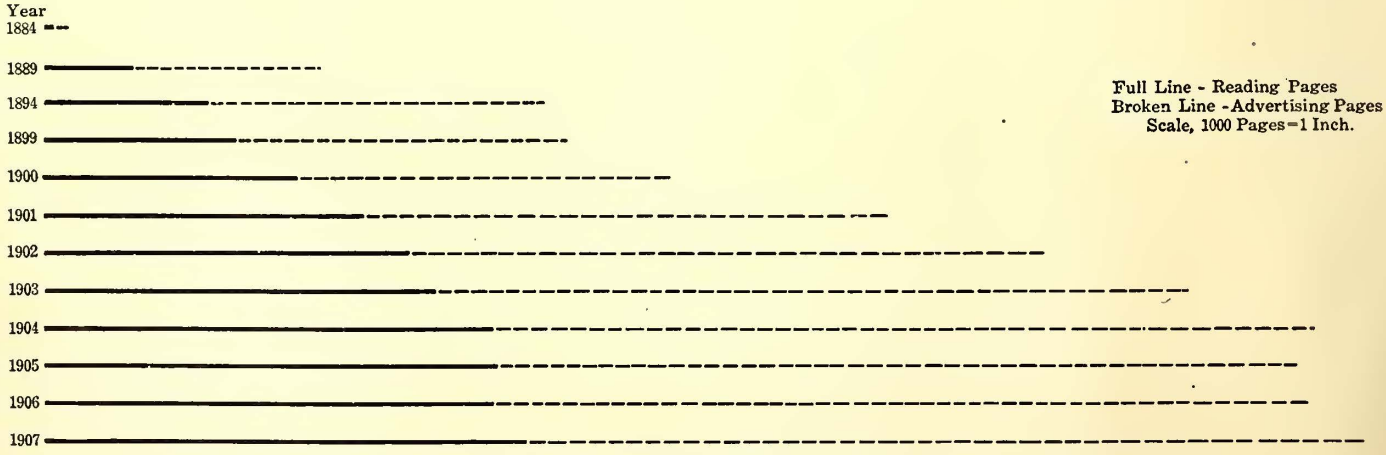


Diagram Showing the Number of Reading Pages Published Annually in the Street Railway Journal

occasional suburban extensions. The development of high-voltage transmission by three-phase systems in the early part of this decade made the interurban railway a possibility. The Toledo, Fremont & Norwalk and the to "keep the cars running." The publishers of the *Review* in the early days, however, did not confine their attention to electrical problems only. Other motive powers besides the cable were then candidates for popular favor, and

questions of track and car construction were as acute almost as whether electricity should be used. It is not surprising, then, to find in the early issues of the *Street Railway Review* articles on such subjects as the value of compressed-air motors, storage-battery cars, new cable appliances, bent posts for open cars, fare registers, parcel express, pivoted trucks, the right of eminent domain and "Palace Vestibule Cars." The latter was considered of extraordinary length for those times, being "25 ft. over all."

A very interesting feature of the early numbers of the *Street Railway Review* was the presentation in each issue of a full-page portrait of some important member of the street railway fraternity. Among those identified with the early development of the electric railway industry whose portraits were thus presented were John Stephenson, inventor and builder of the first street car; G. Hilton Scribner, president Central Park, North & East River Railroad Company, New York City; Elihu Thomson, one of the founders of the Thomson-Houston Company; Charles J. Van Depoele; John D. Crimmins; John B. Parsons, now president of the Philadelphia Rapid Transit Company and

A MONTHLY JOURNAL DEVOTED TO THE CONSTRUCTION AND ADVANCEMENT OF STREET RAILWAYS.

Vol. I. | CHICAGO: 334 Dearborn Street. | JANUARY, 1891. | SUBSCRIPTION: $1 per year. | No. 1.

CONTENTS.

PORTRAIT, C. B. HOLMES.

ADVERTISERS.

The Illinois Steel Co., of Chicago, have a full page, advertising their Girders and other types of rails for street railway work.
The United States Electric Railway Co., of New York, tell of their system for building and equipping railways.
The Electric Merchandise Co. advertise supplies for electric railways.
Gibbon Duplex Street Railway Works tell of the advantages in using their patent rail.
The International Okonite Co. use a page in showing electric railway men their patent wires.
Smith, of New York, has a very attractive page, showing many goods that they manufacture.
The Standard Index & Register Co., of New York, speak of the many advantages in their patent register.
The Railway Register Manufacturing Co. use a page describing their many different styles of street car registers.
Russell Street Carette Co. show their trackless street-car, and speak of its advantages to be used on streets without rails.
The Ellis Car Co., of Amesbury, Mass., have a very attractive page showing their new type of open car.
The St. Louis Car Co. show a cut of their factory and speak of their facilities of turning out cars.
The Electric Supply Co. of Chicago take a half page to show some of the many lines they handle for the use of electric roads.
Schultz Building Co., of St. Louis, print testimonials from those having used their patent link belt.
The Meaker Mfg Co. show on a full page many designs of stationary and portable registers.
The Fulton Iron Works of St. Louis show a view of the new power plant built by them, for the Broadway cable line of that city.
Vogel Cable Construction Co. have a page in this number showing their patent grip.
Robert Poole Sons Co. advertise their wheels for cable work.
Bemmis Car Box Co., of Springfield, Mass., take a half page.
Geo. W. Wells Co., Worcester, Mass., tell of the advantages of their new rail chair.
Jno. Stephenson Co., Limited, advertise in this number.
Chas. E. Schleren & Co., New York speak of their belting.
Keffler Bros., St. Louis, use a quarter of a page.
Bethaway Alfred, Cleveland, use a half page.
Holmes, Booth & Haydens, New York, advertise their wires.
McGuire Mfg Co., Chicago, use a page showing their electric tracks.
Darnar & Dutton, of Cleveland, speak of their line for street railways.
The Baltimore Car Wheel Works take a page.
Walker Mfg Co., Cleveland, speak of their cable works.
The Griffin's, of Chicago and Buffalo, advertise their wheels.
Beacher, Schenck & Benedict, the Insurance Agents, have a page.
The Electric Co., of Cleveland, tell of the many lines they have equipped, and of the advantages of their system.
Lewis & Fowler Mfg Co., Brooklyn, use two pages in speaking of their extensive lines.

The Front Cover of the First Issue of the Street Railway Review

at that time manager of the West Chicago Street Railway Company; Dr. A. Everett; Charles T. Yerkes; D. F. Longstreet; George H. Wheeler; Henry C. Payne and William H. Sinclair.

The *Street Railway Review* from the beginning paid especial attention to accounting and financial matters and it was largely through its efforts that the Street Railway Accountants' Association was founded in 1897. This service was duly acknowledged in the official report of the first meeting issued by the association.

In October, 1899, when the American Street Railway Association held its convention at Chicago, the first daily issues of the *Street Railway Review* were published. Each year since the daily has grown and at the different con-

Electric Railway Review

FORMERLY THE STREET RAILWAY REVIEW — PUBLISHED BY THE WILSON COMPANY, CHICAGO

Subscription, Domestic ... $1 / Foreign ... $3 / Single Copies, 10 Cents

VOL. XVI — CHICAGO, JULY, 1906 — No. 7

1900 Monadnock Block, Chicago
150 Nassau Street, New York
510 Frick Building, Pittsburg

TABLE OF CONTENTS

Alphabetical List of Advertisers, Page 48. Advertisers' Classified Directory, Pages 54-56-58.

The Front Cover of the First Issue of the Electric Railway Review

vention cities from four to six daily issues of the *Review*, reporting each day discussions, social features and important events of the preceding day, have been printed. These daily issues have varied in amount of reading matter from a total of 94 pages published during the Chicago convention to 208 closely printed pages of reading matter in the issues published last fall at Atlantic City. The daily editions of the *Electric Railway Review* have been published in honor of the annual convention of the American Street & Interurban Railway Association and its allied associations for nine consecutive years.

THE ELECTRIC RAILWAY REVIEW

In June, 1906, contemporaneous with a change in ownership and management, the name of the publication was changed from *Street Railway Review* to its more comprehensive title, *Electric Railway Review*. With the change in ownership, the *Review* was enlarged so that each month there was presented about 80 pages of descriptive and news matter. The *Electric Railway Review* was changed, with the first issue in 1907, from a monthly to a weekly publication.

THE ELECTRIC RAILWAY JOURNAL

Much more could be told of the experiences of the past. The encouragement received from the active and leading

men in the field, the friendships formed, the trials encountered, the records made—all will remain as a treasured memory and incentive in the future. But changing conditions indicate greater usefulness in a combined paper than in two publications. Increased capital investments, accounting matters, questions of State and governmental regulation of public-service corporations, legal problems and discussions regarding advancements in construction and operating progress now call for editorial specialization undreamed of 10 years ago. This condition naturally has placed greater obligations on the publications devoted to the electric railway industry and has been the most important factor leading up to the consolidation of the *Street Railway Journal* and the *Electric Railway Review* into the Electric Railway Journal.

ELECTRIFICATION PLANS OF THE PRUSSIAN STATE RAILWAYS

For the last 10 years the Prussian State Railways management has been deeply interested in the possibilities of the equipment of some of its lines with electricity. Realizing as far as a decade ago that direct current at ordinary voltages would not suffice for heavy service, the Government inspired the Zossen trials of 1901-1903 in which three-phase current was used. These tests produced very valuable results as regards resistance to train motion at high speeds, but also indicated operating objections to two or three overhead conductors. The development soon after the Zossen trials of the single-phase system led to a termination of the three-phase experiments and a project was drawn up for a single-phase line between Hamburg and Berlin. This was abandoned on account of the high cost. At about the same time the Government railway officials inaugurated an elaborate series of experiments with Winter-Eichberg single-phase motors on the Niederschonweide-Spindlersfeld line. These were successful in every respect. Shortly afterward the Hamburg-Blankanese-Ohlsdorf single-phase line was built and placed in operation and plans were prepared by the management of the Berlin Stadtbahn and the suburban steam lines to adopt electricity. The investigation of this problem showed that single-phase current only could be considered, as it was found that even high-tension direct current would require an uneconomical number of substations.

The plans worked out by the Prussian State Railways' officials in Berlin gave particular attention to the electrification of those lines which could be operated at a great reduction if the change in motive power were made. Owing to the high price of good coal in Germany, it was considered advantageous to make all estimates on the basis of using gas-electric generating sets. There are large deposits of lignite in the Cologne district, and therefore it was proposed to equip with electricity one of the Government railways which extends from Cologne to Trier on which a great deal of freight is hauled over heavy grades. The subject was considered of such interest that in 1906 the Verein-Deutscher Maschineningenieure (Society of German Mechanical Engineers), of which several officials of the Prussian State Railways are members, called for a prize essay on the best method of electrifying a 200-km line operating in a mountainous country and requiring the movement of freight trains up to 600 tons weight. Four theses, of which three were given prizes, were entered in the competition. It is noteworthy that in all the four plans offered preference was expressed for single-phase current transmitted at 40 cycles, 60,000 volts and used at 10,000 to 20,000 volts on the trolley wire. One condition made by the society was that the power station should use gas engines for generation. Further particulars of these plans will be found in the article by Philip Dawson on page 639 of the Street Railway Journal for Oct. 12, 1907.

Although the feasibility of this project was shown by these four independent reports, the war department would not allow the electrification of this line, owing to its strategic importance from a military standpoint, since it is so near the French border, and the department held that in case of an invasion it would not be difficult for an enemy to blow up the power house and destroy the power transmission systems. Nevertheless, the Prussian State Railways asked the Allgemeine-Elektricitäts-Gesellschaft to build a single-phase freight locomotive for the Oranienburg experimental division. A note on this line was published on page 728 of the *Street Railway Journal* for May 2, 1908, and a description of the locomotive appears at the end of this article. The experiments with this locomotive have demonstrated that single-phase locomotives can successfully and economically cope with heavy weight traffic.

Recently the Government has been giving its attention to the proposed equipment of the Leipzig-Bitterfelde-Magdeburg and the Leipzig-Halle lines, both of which are operated from Halle. Between Halle and Leipzig there are extensive areas of coal which could satisfactorily be used for gas production. The preliminary investigations already have been completed by the railway management, but the officials at Halle have been requested to check the estimates before further steps are taken. It is planned to have the power station in the very center of the coal district so that the expense of fuel transportation will be very small. The total length of both divisions mentioned is 164.3 km (102 miles), the Leipzig-Bitterfelde-Magdeburg line being 128.1 km (79 miles) long and the Leipzig-Halle line 36.2 km (23 miles). It is proposed to use a trolley potential of 10,000 volts.

Although no final decision has been made in regard to this and other large electrification projects in Germany, it is interesting to note that the railway department has practically settled upon the single-phase system owing to its advantages in potential regulation and the possibility of high-voltage transmission over long railway divisions carrying heavy freight business.

LOS ANGELES & REDONDO IMPROVEMENTS

An electric locomotive has just been built for use on the Los Angeles & Redondo Railway in the company's shops at Redondo. It is 30 ft. long by 8 ft. 6 in. wide and has a center cab 8 ft. 6 in. square with four sliding doors, one at each corner. The plan is to use it for freight service and for switching chiefly about the yards and piers at Redondo. The Los Angeles & Redondo Railway runs one train through Inglewood and two trains through Gardena daily in each direction.

The whole line, except the old route via Sunnyside as far as Bridgedale, beyond Moneta, has been double-tracked and converted to broad gage. This policy is to be followed until the entire line is broad gage. The Redondo shops will soon turn out six new passenger cars and the company will then operate multiple unit trains. The new coaches will be 4 ft. longer and 6 in. wider than the old ones and will have seats for 52 passengers, 36 inside and 16 outside. The interior design of these new cars is very handsome. The finishings are of Spanish cedar, with the appearance of mahogany.

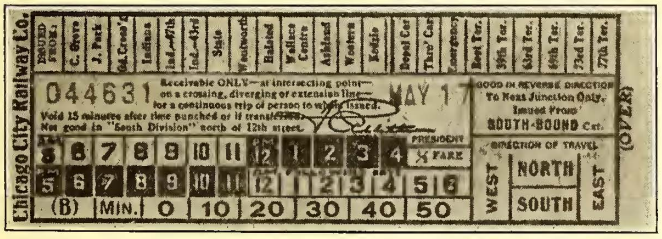
TRANSFER SYSTEM OF CHICAGO CITY RAILWAY

When the first of the through routes between the north and south sides of Chicago was put into operation on March 17 last, a new form of transfer was designed with spaces for indicating the general direction of travel. This form of transfer was shown in the STREET RAILWAY JOURNAL for March 21, 1908, page 464. On May 17 the Chicago City Railway placed in effect on all lines a system of transfers based on the principle of showing the general direction of travel. Under the new system a passenger paying cash fare is entitled to an original transfer and as many retransfers as he may desire to use provided he does not reverse the general direction; for example, north and west. A passenger may reverse his direction of travel at any junction point on a retransfer, but the retransfer is good in the reverse direction to the next junction point only. The form of the through route transfer has been changed slightly in order to make it uniform with the transfer issued on local cars. The accompanying engraving shows the form of transfer used on local cars.

When a passenger pays a cash fare and asks for a transfer, the conductor punches on the transfer the direction of travel of his car. This transfer is then good on any intersecting line. If the passenger, after boarding a car on an intersecting line, desires a retransfer, the conductor punches both the primary direction of travel indicated by the transfer collected and the direction in which his car is bound, completing the statement of general direction. As many subsequent retransfers can be made going in the general direction as the passenger may desire from the connecting lines.

To assure quick identification of direction of travel a color scheme is used. Transfers issued from south-bound cars are printed on manila paper; from north bound cars, on salmon colored paper; from east bound cars, on pink paper, and from west bound cars, on green paper. The instructions to conductors provide that when a transfer is offered with the direction space unpunched, it will be honored as a transfer issued on payment of a cash fare, and the direction of travel will be considered as corresponding with the direction indicated by the color of the transfer.

The transfer slip contains a small space for punching half fare for children under 12 years of age. The half-fare rate is 3 cents for one child and 5 cents for two children. Two transfers are issued when fares for two chil-



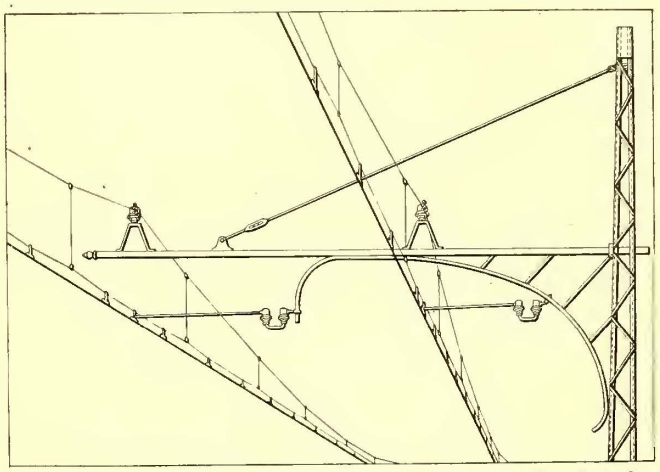
New Chicago City Railway Transfer

dren are paid with one 5-cent piece and registered as one full fare. Under the terms of the ordinance the company is not required to issue or receive transfers in the district bound by Twelfth Street on the south, and by the Chicago River on the north and west, except in cases of transfers issued from car to car in the event of a breakdown.

The following instructions are given to conductors: Conductors must be patient, civil and polite, remembering that the passenger is not always as thoroughly informed as the trainmen. Conductors as well as passengers may make mistakes and discretion in the matter of accepting transfers is always allowed conductors. When a passenger presents a transfer slip upon which the time has expired, or which is improperly punched, and insists upon the right to ride, the conductor may permit the passenger to ride without extra fare, provided the conductor believes that the trainman who issued the transfer made a mistake; but in such a case the transfer with a written report of the transaction must be forwarded promptly to the general office. In the event of long headway caused by blockades, accidents, schedules, etc., conductors are instructed to make proper allowance for the lost time and honor transfers accordingly.

ELECTRIC RAILWAY NOTES FROM EUROPE

A European engineer closely identified with electric railway developments on the Continent states that the stilt arrangement of the insulator which carries the main cable of the multiple catenary suspension used on the Blankenese-Ohlsdorf and other single-phase lines in Germany is to be



Double Catenary Construction with Top Cable Carried On Stilt Insulators

abandoned in future installations. This method has been illustrated in previous issues of the paper, but the accompanying sketch has been prepared to show the scheme in detail. It has been found that the iron strap which carries the insulator is a very disagreeable feature, as it is too weak to withstand the leverage due to the swaying of the messenger cable. Should the strap break or be pulled up, there is nothing to prevent the cable from falling on to the bracket. It is probable that hereafter the Germans will follow the American practice of placing the messenger cable insulator close to the supporting bracket and thereby minimize the leverage.

Although the 2000-volt d.c. locomotives for Maizéres in the Moselle district, France, were tried out successfully last year (as reported in the STREET RAILWAY JOURNAL of May 4, 1907) they are not yet in regular service owing to commercial reasons which have delayed the completion of the line. It is reported that when a generator is in circuit with the line, the attendants are rather wary of getting closer to it than 6 ft. owing to some painful experiences with flashes from this high-tension d.c. machine.

The Manchester (England) Corporation Tramways Committee reports that, while last year it estimated that there would be no profits from the parcels department, it has actually produced an income of $7,200.

THE BUFFALO, LOCKPORT & ROCHESTER RAILWAY

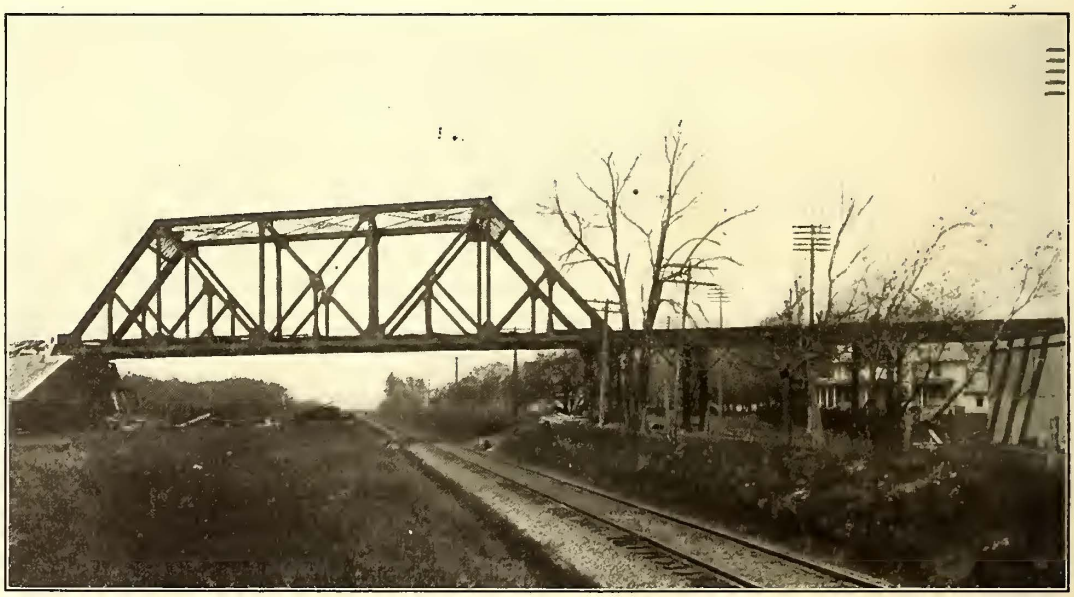
The most extensive electric railway undertaking in New York State nearing completion is the Buffalo, Lockport & Rochester Railway, which will form an important part of an all-electric, high-speed route between Buffalo and Albany, leaving only a 30-mile gap between the towns of

Buffalo, Lockport & Rochester—Electric Track Paralleling the New York Central Railroad

Little Falls and Fonda, N. Y. Several attempts have been made in the past to build electric railways through this prosperous fruit-growing region, but the early projects met with little success, owing to the strong opposition made by steam railroad interests and to the difficulty of raising funds. In 1905 the present company took over the Albion & Lockport Railway, the Albion & Rochester Railway and the Albion Electric Railway. The rights thus acquired were principally for franchises and right of way except in the case of the Albion Electric Railway, which had built about 1.7 miles of track in Albion. The line will be operated from the interurban railway terminal near the famous Four Corners in the heart of Rochester, over the direct double-track lines of the Rochester Railway Company to the city limits at Lyell Avenue, and thence over the company's own tracks to East Avenue, Lockport, where connection will be made with and cars operated over the track of the International Railway Company operating to Buffalo and Niagara Falls.

The railway, which is now being constructed and equipped by J. G. White & Company, Inc., of New York, will include 54 miles of single track and 4.4 miles of side track. Practically all of this is on private right of way, 66 ft. wide, with completed roadbed and bridges for two tracks, to permit double-track operation as soon as the growth of traffic demands it—probably within three years. There appears to be a good opportunity also to develop a profitable package express and carload freight business for transfer to various steam railways at both terminals, as the shipment of vegetables and fruit from this territory aggregates several millions of dollars per annum. In general the right of way either directly adjoins the Rochester-Niagara Falls branch of the New York Central Railroad or is within hailing distance, but the electric railway passes through the towns at more accessible locations. The construction is double tracked for one mile from the connection with the Rochester city system at Lyell Avenue to the car house of the new road. There are 17 sidings on the entire route.

As will appear from the description of the physical construction and equipment, this railway has everything in its favor to permit high-speed service with safety and comfort. The management plans to give an hourly express schedule the greater part of the day, running the 54 miles between Rochester and Lockport in 2 hours and 12 minutes, which is about the average time made by the steam trains between the same points. There are eight through steam trains a day on this division of the New York Central, and the electric railway will probably secure the bulk of the passenger business in this territory, besides developing other traffic to a large amount by the operation of local cars between the through trains. These locals, according to the calculated schedule, will make an average of one stop per mile and complete the trip in three hours. The fares will approximate those of the New York Central in this territory. The work has now advanced to such a point that operation between Rochester and Albion should begin about June 15, and provided injunction difficulties in Middleport are overcome by that time, the rest of the line should be ready by the early part of September. It might be added here that the completion of the work has been greatly delayed by franchise and other difficulties beyond the contractor's control.



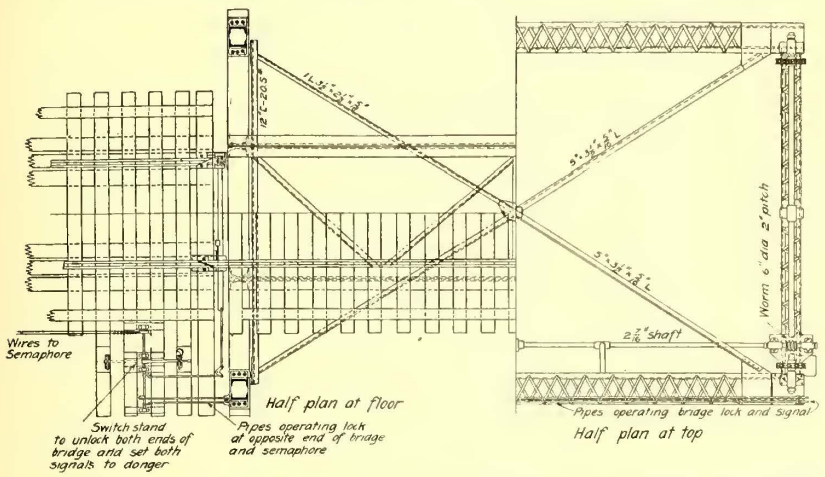
Buffalo, Lockport & Rochester—Middleport Over Crossing with New York Central

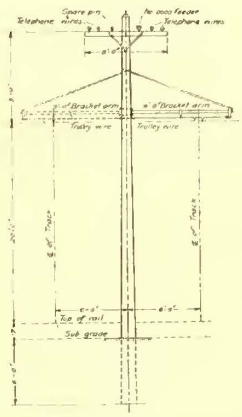
ROADWAY AND TRACK

As previously noted, practically all of the line is on a wide private right of way near or adjoining the Rochester-

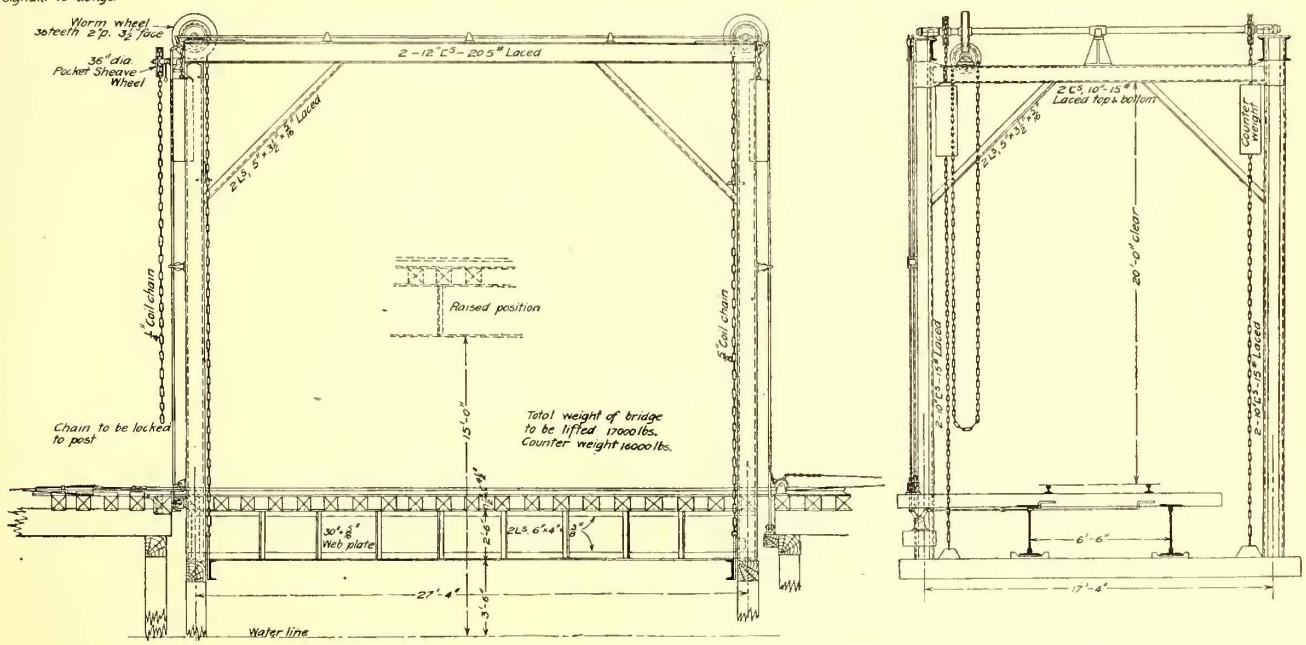
Niagara Falls division of the New York Central Railroad. The line has been laid out with such care that the maximum grade does not exceed 1½ per cent except for a 300-ft. or 400-ft. length of 4 per cent in the village of Spencerport. The alignment is particularly good, and not more than 4 per cent of the line is on curves. The construction of the new Erie barge canal in this territory required a 100,000-cu. yd. fill in Holley, where the railway runs along the south bank of the canal, and some 50,000 cu. yd. or 60,000 cu. yd. of earth were used for easy bridge approaches in Middleport. The completed system will have only three large bridges, all double-track structures. Two miles west of Middleport, a crossing over the New York Central track has a through truss span of 140 ft. with three deck-plate girder spans on steel bents and concrete abutments, as shown on page 18. The second bridge, built as an over-crossing for the Buffalo, Rochester & Pittsburg Railway, is of the through plate-girder type with a ballasted concrete floor on a center pier of concrete and end abutments of heavy stone masonry. The third bridge, which is already delivered ready for erection when the barge canal in this vicinity is completed, will be a riveted through-truss structure of 170 ft. span, placed 1½ miles west of the car house. At present the railway diverges slightly to the north pending the excavation of the new canal channel. The bridges were fabricated by the Fort Pitt Bridge Company and were erected by the J. G. Gray Company, of New York, sub-contractors.

At Holley is installed a hand-operated horizontal lift bridge across a stub end of the old Erie Canal, constructed as shown in the accompanying detail drawings. The bridge proper consists of a pair of ordinary deck-plate girders resting on foundation piles with cast-iron bearing plates. The main framing of the lift structure consists of a column at each corner made up of two 10-in. laced channels, 10-in. and 12-in. laced channels between the tops of the posts, a diagonal strut at the top and knee braces. The bridge proper is raised on two channels to which the lifting chains are attached. The lifting chains are operated from one end only and run over sheaves which actuate the lifting shaft through worm gearing, as shown in the half plan of the top. The actual lift is only 1000 lb., as the bridge has a counterweight of 16,000 lb. However, provision has been made to use a motor if necessary.





Details of Low-Tension Line

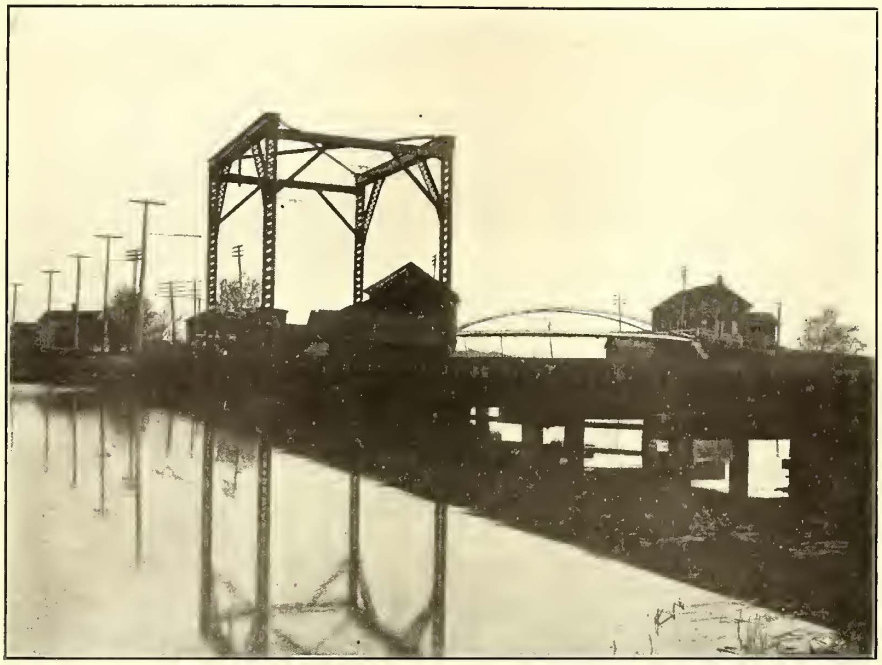


Buffalo, Lockport & Rochester—Plan and Elevations of Lift Bridge Over Canal at Holley

The signal arrangement in connection with this lift bridge requires a semaphore set back about 500 ft. from each end of the bridge. Each semaphore is operated from the same lever as the bridge lock. Through this interlock the bridge cannot be opened without pulling the semaphores up and blocking the track. After the semaphores are up the track cannot be cleared until the bridge is down and locked.

The standard rail used for the greater part of the sys-

tem is a 70-lb. A. S. C. E. T-rail laid in 33-ft. lengths except for an 86-lb. girder rail in the villages of Medina and Brockport. The track is laid on 6-in. x 8-in. x 8-ft. ties, placed 24-in. centers on tangents and 16-in. centers on curves, bridges and trestles. Oak ties are used on curves and longleaf yellow pine on tangents. The line is ballasted with about 2000 cu. yd. of crushed rock to the mile.



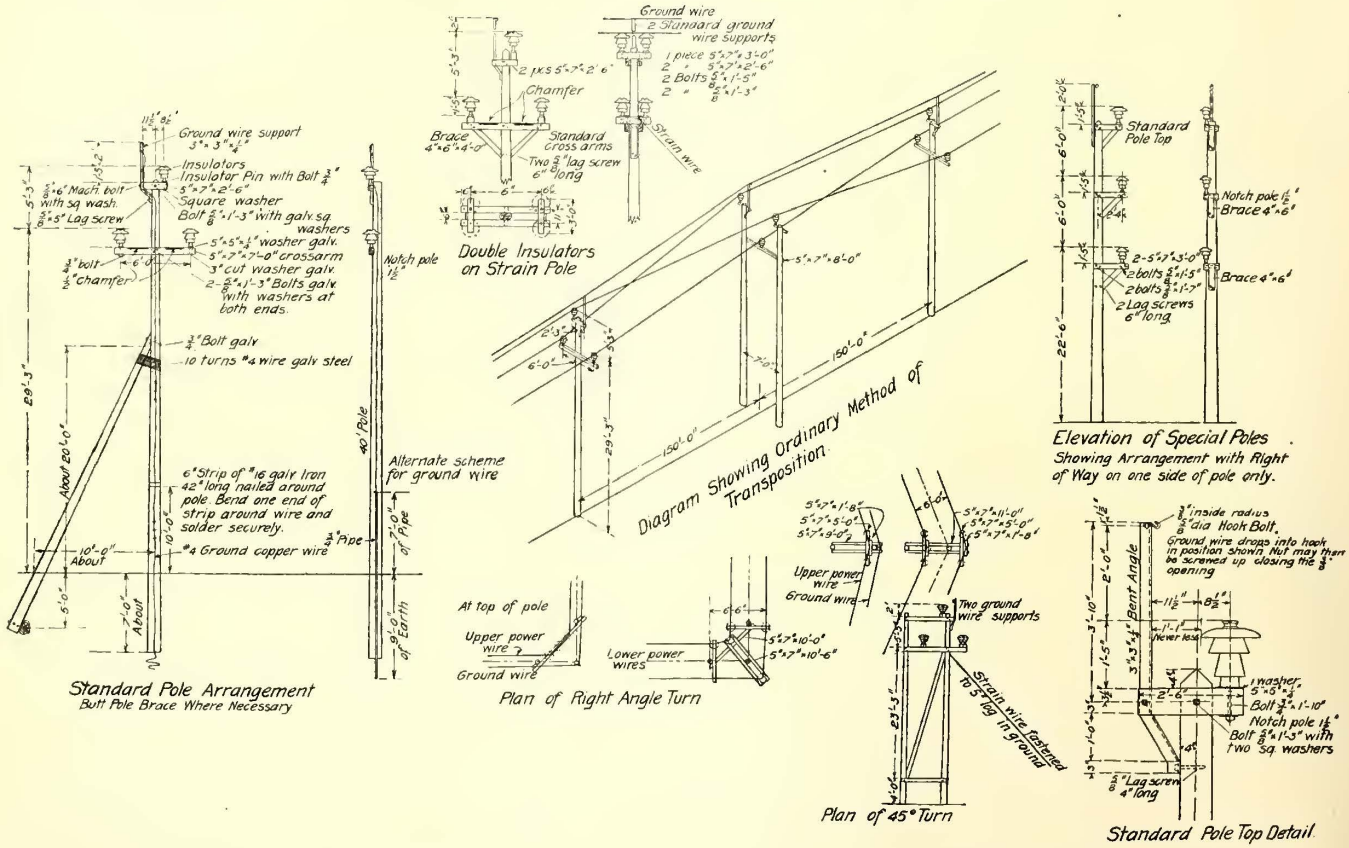
Buffalo, Lockport & Rochester—Lift Bridge at Holley

The rails, which were furnished by the Lackawanna Steel Company, have angle-bar, four-hole joints and Lord soldered foot bonds. No. 8 spring frogs and split switches are used at all sidings. There are only three crossing frogs on the line, one at the Albion quarry siding and two caused by spur connections with the New York Central; a "Y" is being installed near the Albion substation. All special work was furnished by the Ramapo Iron Works, of Hillburn, N. Y., and the Ernst Werner Company, of New York.

Every provision has been made for careful drainage. Concrete box culverts do not exceed 4 ft. x 4 ft.; generally spans from 4 ft. to 8 ft. are reinforced concrete arches; and open I-beam construction is used only for spans exceeding 8 ft., but where possible concrete arches are used in preference to open spans. Climax tile cattle guards are installed at all road crossings and there are several concrete cattle passes. The right of way is entirely fenced.

HIGH-TENSION TRANSMISSION

The Buffalo, Lockport & Rochester Railway will use power transmitted over cross-country lines at 60,000 volts, three-phase, 25-cycles from taps at Lockport and South Greece, on the lines of the Niagara, Lockport & Ontario Power Company. The South Greece connection, which will be the first used, is secured by a cross-country line from connecting at a point three miles south. Near the South Greece substation a switch house of steel frame reinforced

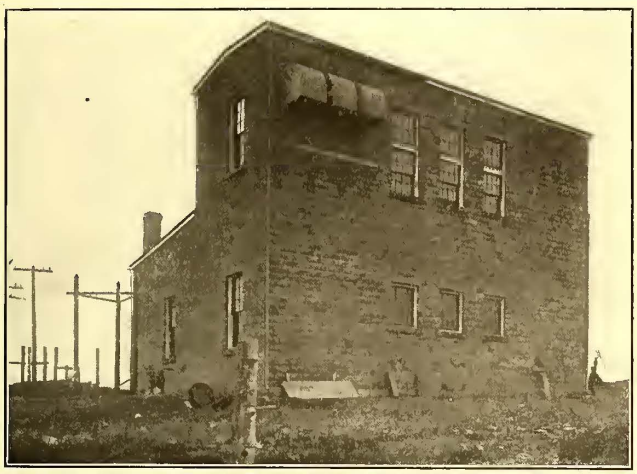


Buffalo, Lockport & Rochester—Various Construction Details of High-Tension Pole Line

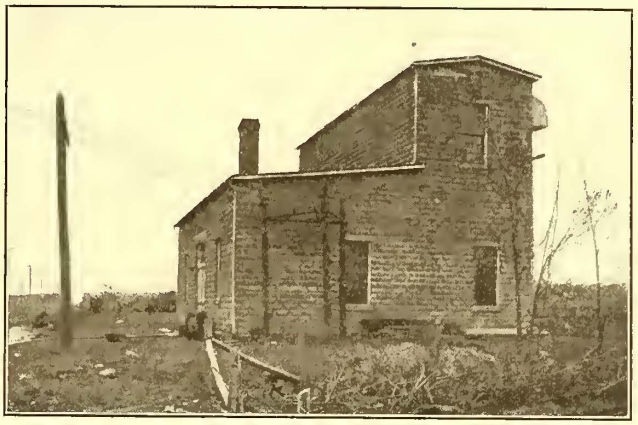
"Trussit" concrete has been erected to contain G.E. bomb-fuse circuit breakers, Westinghouse current and potential transformers and the necessary measuring instruments, such as integrating and graphic recording wattmeters. The line, just before entering the switch house, will be protected by G.E. electrolytic lightning arresters and in addition there will be on each circuit a single wide-gap, high-tension discharge horn arrester fused to ground with no resistance.

The railway company's high-tension wood-pole transmission line, 60 miles in length, carried on its right of way, with detours at all villages, presents several interesting features. The wires are carried over four-part Ohio Brass Company's insulators, tested to 150,000 volts for five minutes and to 60,000 volts on each section. These insulators are mounted on iron pins with a separable thimble cemented into the insulator to permit easy removal of the latter. The insulators are installed two and one on cross-arms, respectively, 7 ft. and 2 ft. long. Most of these cross-arms lack the customary braces, but instead the lower or longer arm is secured by two 5/8-in. through bolts and washers, and the upper or shorter arm by one 5/8-in. bolt and the lower portion of the bent angle which carries the aerial grounding wire. The latter is of the tough phono-electric material and is grounded every fourth pole. It will be seen from the detail of the upper part of the pole that this wire is carried about 20 in. to one side of the upper high-tension wire, so that there is little danger even if the grounding wire should break. At public crossings and similar places, where people might touch the high-tension poles, a 6-in. grounding strip of galvanized iron is placed on the pole about 10 ft. above the ground. The plan of the standard pole arrangement also shows the method of butt-bracing adopted instead of guying.

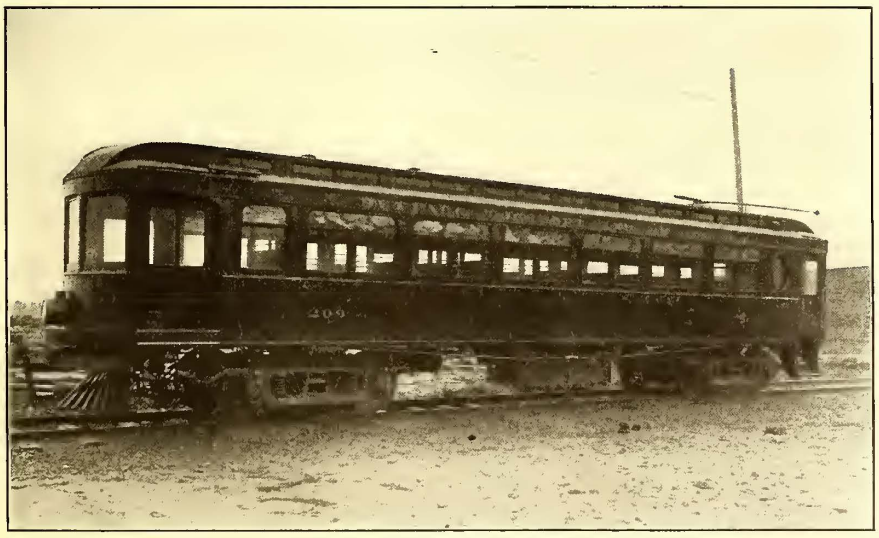
A novel variation in the pole construction was required where detours around towns had to be made along the border of one property without projecting over that of another. In this case each wire is carried on one side on separate wooden braced cross-arms, while the ground wire is carried on a straight angle iron screwed alongside the pole. To avoid disturbing the telephone circuits on the opposite pole line the high-tension wires are transposed a complete turn between each substation and the telephone wires are transposed every fourth pole, or 440 ft. Among the other features shown in the overhead detail drawing are elevations and plans of 90-deg. and 45-deg. turns.



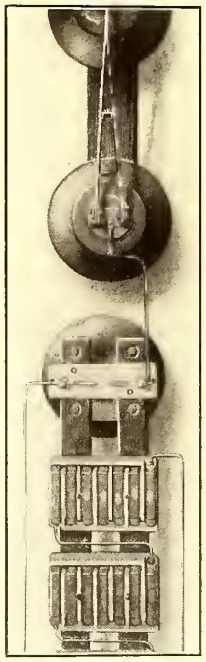
Buffalo, Lockport & Rochester—High-Tension Side of Substation



Buffalo, Lockport & Rochester—Low-Tension Side of Substation



Buffalo, Lockport & Rochester—Single-End Motor Car

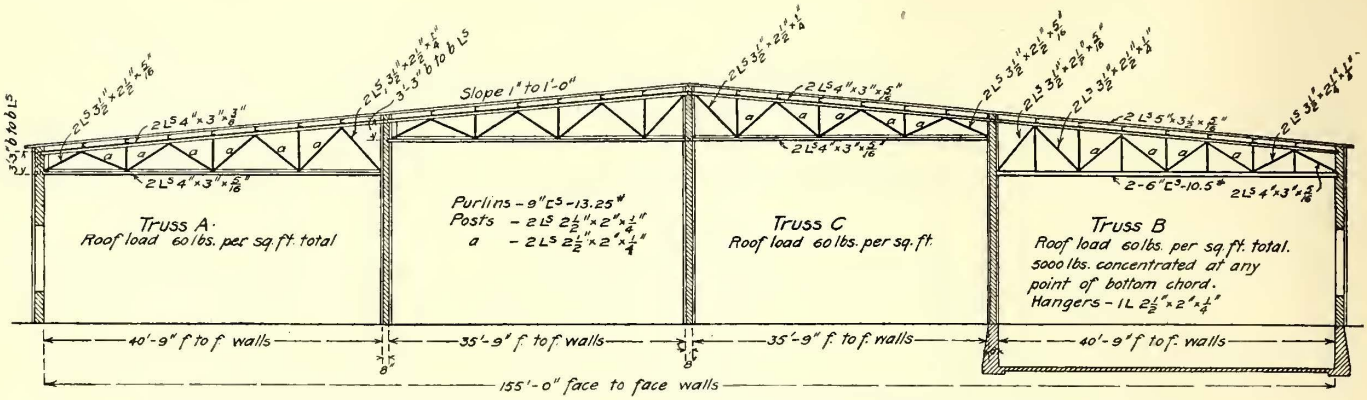


High-Tension Intake in Substations

SUBSTATIONS

The high-tension transmission wires are carried to five substations placed as follows: No. 1, Gasport, 8 miles from

Lockport; No. 2, Medina, 10 miles from Gasport; No. 3, Albion, 8 miles from Medina; No. 4, Brockport, 12 miles from Albion; No. 5, South Greece, 10 miles from Brockport, leaving about 6 miles to the Rochester city line. All of the stations are of uniform design and size, each being intended to house ultimately three 400-kw rotary converters with the usual appurtenances. The substation walls are built of concrete blocks, the floor is of concrete and the roof of yellow pine covered with Carey's magnesia flexible cement roofing. The machine room is one story high and is separated from the two-story, high-tension transmission chamber by a concrete wall. All the barriers of the high-tension chambers are also of concrete and the openings on the ground floor level are covered with removable asbestos boards. The high-tension circuits are brought into the station on Locke entrance insulators and where they enter the building are protected by multiplex lightning arresters. The transformers are of the water-cooled type, each station being provided with two motor-driven circulating pumps which take water from an outside concrete cooling basin. There is also a tank in the upper floor to give gravity cooling should the pumps break down. The oil switches are operated with current from a storage battery, which is charged from the trolley circuit. The machine equipment for each station is now as follows: Gasport, two 400-kw rotaries; Medina, one 400-kw; Albion, two 400-kw; Brockport, one 400-kw; South Greece, two 400-kw. All of the electrical equipment necessary for the substation installations was furnished by the General Electric Company.



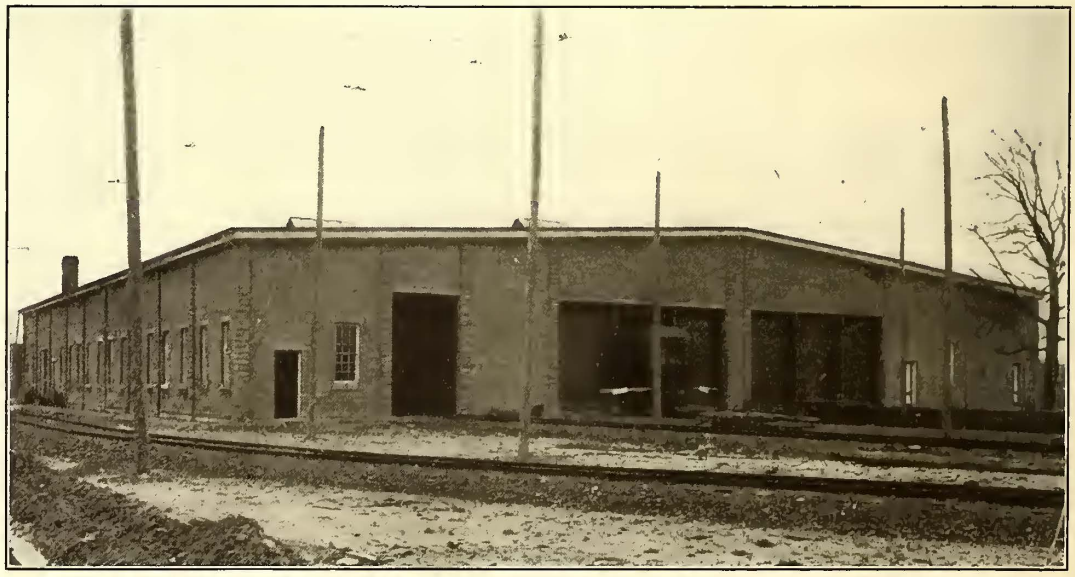
Buffalo, Lockport & Rochester—Cross-Section of Car House, Showing Details of Roof Framing

TROLLEY AND FEEDER SYSTEM

On the right of way the low-tension poles are of chestnut, 35 ft. high, and spaced 110 ft. on tangents, but steel poles are used at Brockport, Medina and Middleport. Center pole bracket construction is used throughout except for some span construction in the villages, at curves and at turnouts. The bracket is of 2-in. diameter tubing, 9 ft. long, and its outer end is supported by a ½-in. wrought-iron tie rod. To avoid overhead frogs and simplify the change to double-track operation, it was considered desirable to install two trolley wires from the beginning. These are suspended 20 ft. above the rail by the bow-string method. Both trolley wires are No. 0000 throughout and in addition an aluminum feeder equivalent to No. 0000 copper is carried on glass insulators for the entire route. There are about six feeder taps to the mile. The circuits are protected by Garton-Daniels lightning arresters placed about two to the mile.

ROLLING STOCK

The line will begin operation with 15 passenger motor cars and 2 express motor cars made by the Niles Manufacturing Company. The passenger cars, which weigh about 35 tons empty, are about 52 ft. over all, but only 8 ft. 4 in. wide, to permit operation over the curves of the Rochester Railway Company. The cars are designed for ultimate single-end operation, but as the line will first be operated only as far as Albion, it was decided to put on temporarily another controller and air-brake valve to give greater flexibility of operation until the entire line is opened.

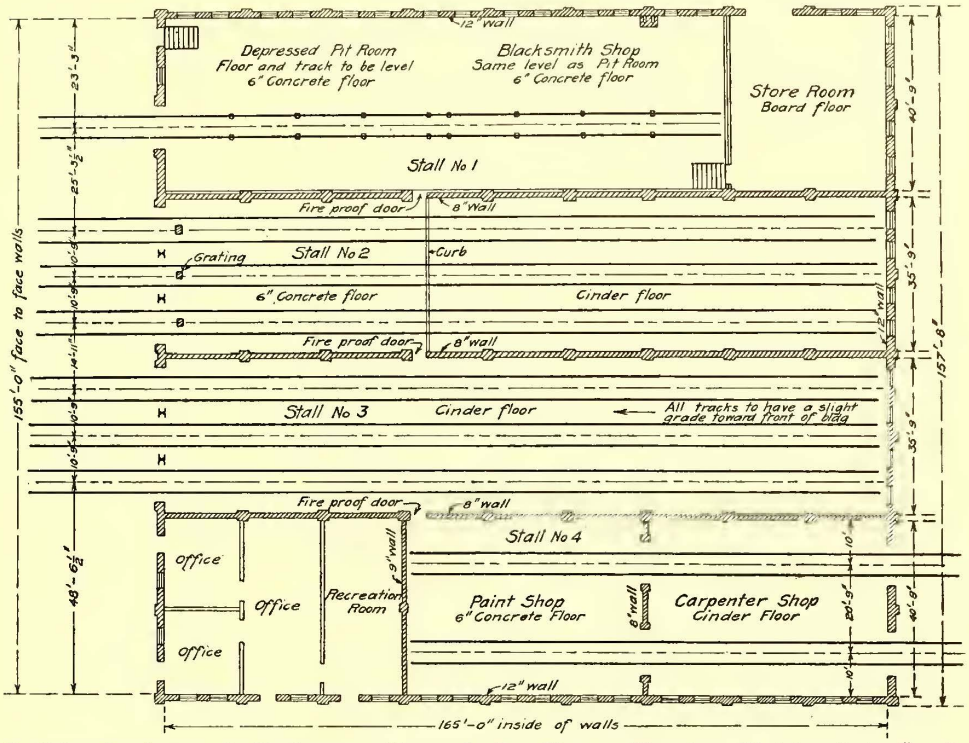


Buffalo, Lockport & Rochester—Car House, Repair Shop and Offices

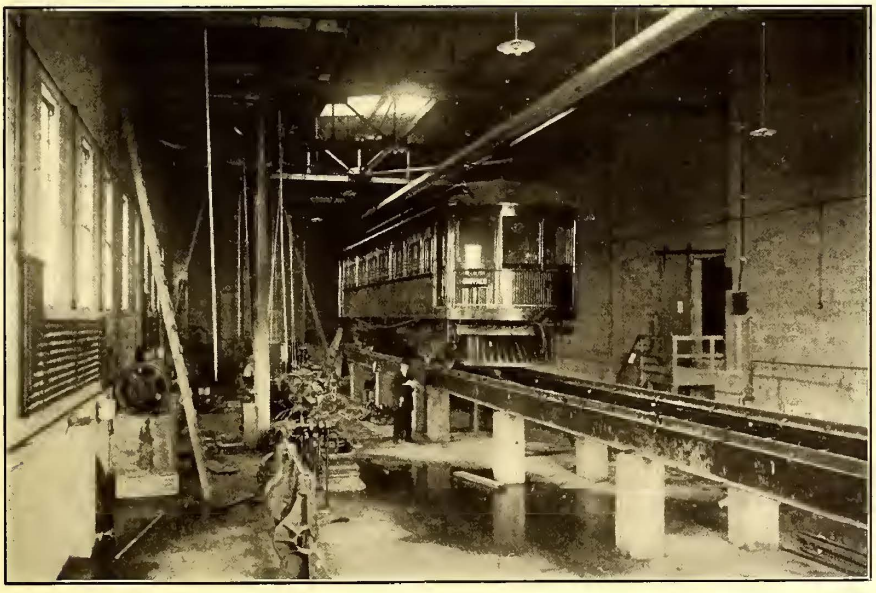
Each car has three compartments as follows: The front end for the motorman and the storage of express packages; the next compartment for smokers, and the third for the regular passengers. The front end is furnished with large

sliding outside doors, but hinged doors are used throughout the rest of the car. The cars, as shown in the accompanying view, are of very handsome design and are finished in the standard Pullman dark green. Each has Heywood Brothers & Wakefield non-reversible seats for 50 passengers; plush is used in the passenger compartment and leather in the smoker. The inside furnishings embrace all the regular conveniences of interurban cars, including toilets finished in enameled metal imitation of tiling. Illumination is provided by 16-cp lamps placed in frosted globes and arranged in arches of five across the car at intervals of about 6 ft. Two lamps are placed in a receptacle in the dash for illuminating a stenciled destination sign. The curtain fixtures are from the Curtain Supply Company. The registers are the International type for combined cash and transfer business, with two operating rods.

The car bodies are mounted on Baldwin trucks with Schoen solid steel wheels and Symington journal boxes. The electrical equipment consists of four GE-73 75-hp motors and type M control. Westinghouse automatic air brakes are installed in addition to a hand brake at one end. The cars also carry pneumatic sanders.



Buffalo, Lockport & Rochester—Plan of Car House, Showing Division Into Small Sections for Fire Protection



Buffalo, Lockport & Rochester—Depressed Shop Floor, Overhauling Track and Machine Shop Equipment

Kalamazoo track scrapers and Climax electric headlights.

The express cars have the same trucks and general operating equipment as the passenger cars, but are permanently arranged for double-end operation. All of the rolling stock was electrically equipped and wired by I. R. Nelson & Company, of Newark, N. J., in the shops of the Buffalo, Lockport & Rochester Railway. Owing to arrangement with the car builder in not permitting the space blocks to come even with the sills, it was possible to get all the wiring conduit under the car in position without any cutting whatever.

CAR HOUSE

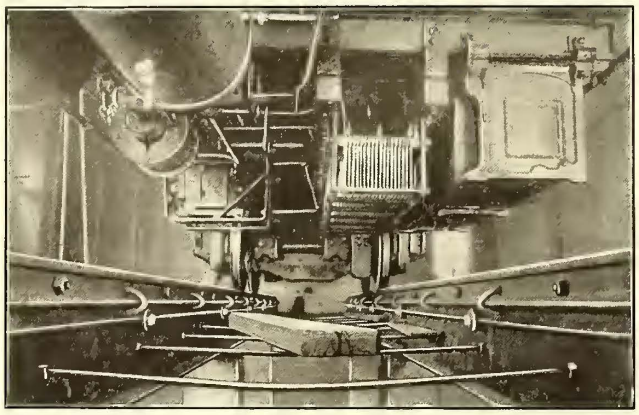
The car house of this railway is located about one mile from Lyell Avenue, Rochester. The walls are made of concrete blocks, the floors either of concrete or cinders and the roof of composition laid over yellow pine plank on steel purlins carried on steel trusses. The trusses over the truck-repair track are designed to carry 5000 lb. suspended from any point of the lower chord in addition to the regular roof loads. Abundant light is afforded throughout the building by the liberal skylight area. The overall dimensions of the structure are 155 ft. x 165 ft.

The car house is of particular interest from the fire protection standpoint. It is divided into four main sections, which are effectually separated from each other by 8-in. concrete walls with but one fire door opening per wall. At the same time there is no restriction of car movement, as the track arrangement outside the car house makes it easy to transfer cars from one section to another. Kinnear steel rolling doors are used for all car openings. Besides the precaution against fire taken in the design of the building, the usual standpipes, hose and fire pails are also installed. Danger from defective insulation has been eliminated by carrying all lighting circuits in pipe conduit.

The section marked Stall No. 1 on the plan of the car

house is used for truck and motor overhauling and also contains the machine shop, blacksmith shop and steam heating plant. Instead of having a pit, however, the entire room is depressed 5 ft. below the level of the yard. Cars coming in for repairs are brought in over an elevated track, which is carried on I-beam stringers set on concrete pedestals spaced 15-ft. centers. Each pedestal is capped by a wrought-iron plate, through which the I-beam stringers are bolted into the concrete. A section of the track, 5 ft. 2 in. long, can readily be removed to facilitate wheel changing. A narrow-gage line under this track has been provided to take care of a hydraulic jack. It is believed that the elevated repair track described will prove more convenient than the usual pit method because all the work can be done standing up; there is plenty of daylight, no fire danger from hidden rubbish and where work is done on the side of the trucks there are no devil strips to remove.

This depressed room also serves for the machine and blacksmith shops, the equipment being arranged in line be-



Buffalo, Lockport & Rochester—Under View of Car on Elevated Repair Track

tween repair track and outer wall of the building. The tools were furnished by the Prentiss Tool & Supply Company and consist of the following: Fay & Scott 45-in. engine lathe; Fay & Scott 12-in. back-geared engine lathe; Bickford drill press; grinders; Rochester wheel press; shaper and blacksmith forge equipment. All of the machine tools are operated from shafting driven by a 20-hp G.E. motor. The heating plant, which adjoins the blacksmith equipment, consists of a 25-hp Ideal steam heater with connections to 1½-in. steam pipes run along the walls. The section beyond the pit room, which is used for storage, is on the same level as the rest of the building.

Stalls Nos. 2 and 3 each contain three tracks, 165 ft. long, and are used for storage and inspection. The tracks in these sections open on the west end like that of the pit room. The fourth section of the building consists of the offices and trainmen's room on the west side and the paint shop and carpenter shop directly behind. It will be noticed from the plan that the tracks of this shop open on the east and are separated from the office section by an 8-in. wall.

TELEPHONE SYSTEM

All cars are to be dispatched by telephone from the car house. For this purpose telephones have been placed in all substations, booths at turnouts, etc. The telephone equipment was furnished by the Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N. Y., and consists of one cabinet equipped with 10 bridging drop lines, five pairs of cords and one operator's equipment, including night-bell contact. The instruments are not of the usual types for exterior stations, but consist of 25 telephones of the company's No. 110 type with five-bar generators, 1600-ohm ringers and a like number of substation protectors. This company also supplied a lineman's portable testing instrument. There are duplicate telephone circuits of four No. 12 B. & S. copper wires on the low-tension pole lines.

SIGNAL BELLS

In accordance with the steam railroad practice, the important highway crossings will be protected by crossing signs and automatic signal bells of the Union Switch & Signal Company, to indicate the approach of a car.

ENGINEERING, MANAGEMENT, ETC.

J. G. White & Company, Ltd., have done the engineering, surveys, securing of rights of way and the entire construction and equipment. The work was under the general direction of C. G. Young, construction manager for J. G. White & Company, and Joseph D. Evans was the local construction superintendent. The railway company was represented by Edmund Wragge, C.E., of Toronto, engineer for the construction committee financing the property, and Le Grand Brown, of Rochester, resident engineer. J. M. Campbell, of Kingston, Ont., has just been elected president of the Buffalo, Lockport & Rochester Railway, succeeding Charles B. Hill, attorney, of Buffalo. Mr. Campbell will also fill the position as manager and operate the property.

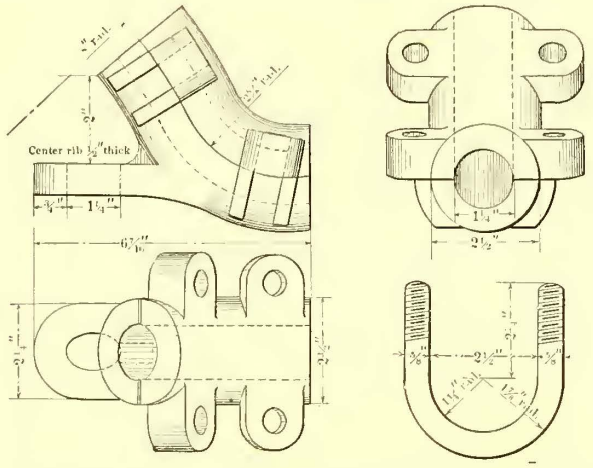
INDIANAPOLIS & LOUISVILLE LIMITED SERVICE

The Indianapolis, Columbus & Southern Traction Company, by means of a connection effected with the lines of the Indianapolis & Louisville Traction Company and the Louisville & Northern Railway & Lighting Company, is operating an electric Pullman limited service between Indianapolis and Louisville, 117 miles distant. The run is made in four hours. Trains are dispatched from Indianapolis at 9 a. m. and at 2 p. m. daily and arrive in Louisville at 1 p. m. and 6 p. m., respectively, and from Louisville at 8:30 a. m. and 1:30 p. m. and arrive at Indianapolis at 12:27 and 5:27 p. m., respectively. Practically the only changes made by the Indianapolis, Columbus & Southern on the introduction of the service were the elimination of a few short curves and the putting in of a few additional sidings. The spring switches were taken out and replaced with rigid throws and semaphore switch lamps showing green for main-line track position and red when siding is open were put in on all switch stands. These lamps are equipped with long-time burners purchased from the Adams & Westlake Company, using a small round wick and small inner globe. After experimenting with different grades of oil, the company found the lamps would burn for a week without refilling or retrimming, although as a matter of safety they are trimmed and filled every five days. The oil in use is purchased from the Galena Signal Oil Company. The Indianapolis, Columbus & Southern Traction Company's line extends from Indianapolis to Seymour, a distance of 62.22 miles, and the local cars make the one-way trip in two hours and forty minutes. The limited cars which run through to Louisville make the distance between Indianapolis and Seymour in two hours and thirteen minutes and stop at four important cities. The distance from Seymour to Louisville is 54.97 miles and the local service between these points is hourly, the local time being two hours, fourteen minutes. The time of limited cars between Indianapolis and Louisville is four hours, including delays at terminals. An additional fare of 10 cents is collected for any distance on the limited cars between Seymour and Indianapolis, but no extra fare is charged between Seymour and Louisville.

NOTES ON NEW ORLEANS METHODS OF FEEDER CONSTRUCTION

In the accompanying illustrations are shown an electric cable puller designed for use in construction work on the feeder system of the New Orleans Railway & Light Company. The apparatus is mounted on a flat-topped wagon about 13 ft. long x 4 ft. 6 in. wide, and it consists of a pair of drums with grooves in the circumferences driven by sprockets and a gear wheel propelled by a 500-volt direct current railway motor. The drums are each 3 ft. in diameter and 10 in. wide. Each drum is carried on a shaft 1 15/16 in. in diameter, which runs in a pair of standard pillow blocks bolted to the frame of the wagon. The latter is built with two main longitudinal timbers 8 in. x 12 in. x 11 in. in dimensions, carried about 30 in. above ground. The motor pinion is 4½ in. in diameter and meshes with a gear 22 in. in diameter, both pinion and gear being standard outfits.

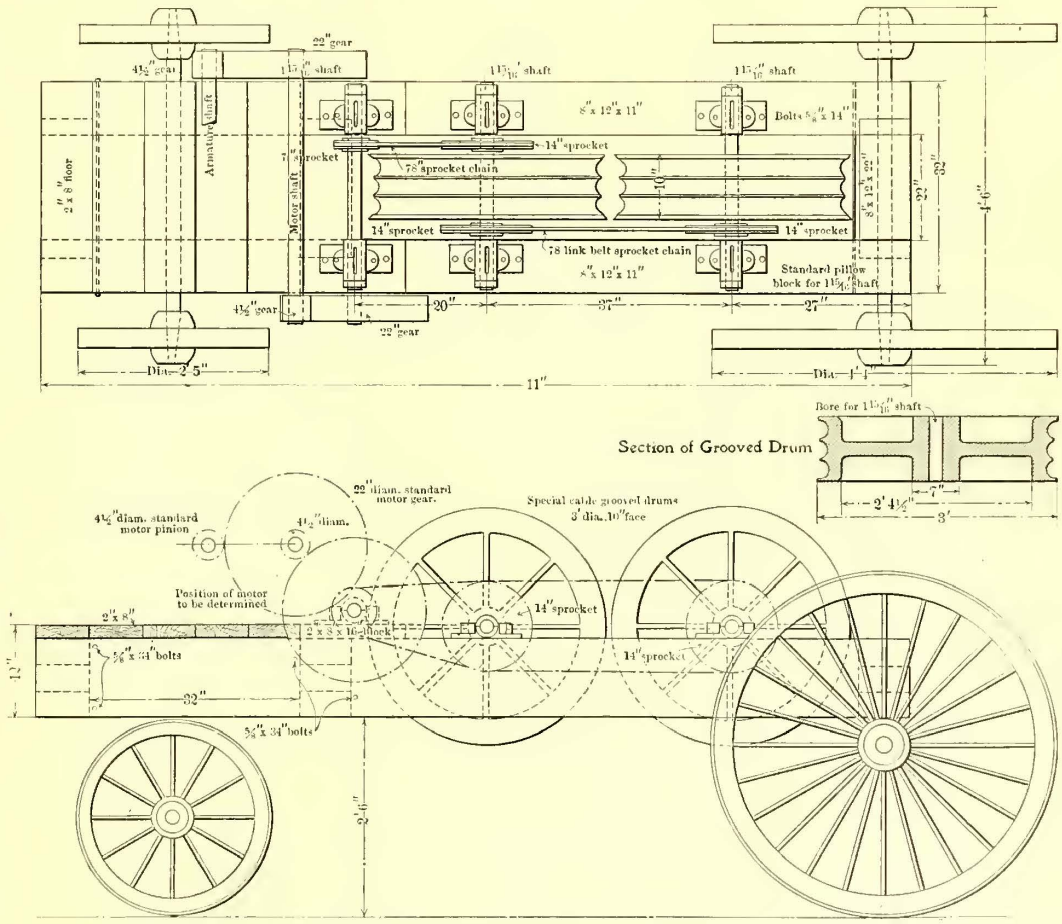
New Orleans Feeder Methods—Electric Cable Puller



New Orleans Feeder Methods—Brass End Connector for 1,000,000 Circ. Mil Cable

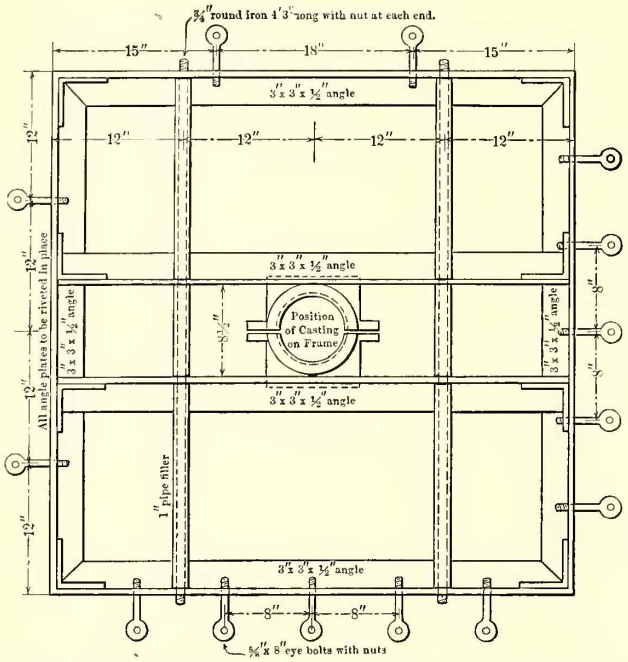
In operation the wagon is brought to the proper place by horses, and if cable is to be taken down a reel wagon is attached to the rear of the cable puller. The controller is located at the head end of the puller, so that the man who looks after the horses can also supervise the starting and stopping of the motor. As a cable is fed from the overhead line, it is passed around the two drums and then led to the reel. With this device a length of 4000 ft. of cable has been taken down in 15 minutes, whereas by the old hand methods the maximum length that could conveniently be handled was about 1000 ft., and to take this down required about an hour. The cable puller also enables the work to be done with the minimum time of obstruction in the street to other traffic and the cable is kept in much better shape than if it were allowed to drag on the street.

Special care has been taken in New Orleans to erect the overhead lines in as workmanlike a manner as possible. To enable large numbers of cables to be handled with as much ease as can be attained in a contracted space, the company uses an angle iron junction frame as shown in the accompanying drawing. Eye bolts are attached to the outside of the frame and to the bolts are fastened the strain insulators carrying the cables. The frame is made up of 3 in. x 3 in. x ½ in. angles, braced twice by ¾-in. round



New Orleans Feeder Methods—Plan and Elevation of Electric Cable Puller

iron bolts carried inside pipes 1 in. in diameter. Nuts at the ends of these pipes provide the proper take-up. The eye bolts are ⅝ in. in diameter and 8 in. long, with threads on the ends so that they can be properly tightened. They are installed 8 in. apart on centers. In pulling cable over the cross arm, the regular type of roller block is used. A drawing of a brass end connector for 1,000,000 cm cables



New Orleans Feeder Methods—Angle Iron Junction Frame

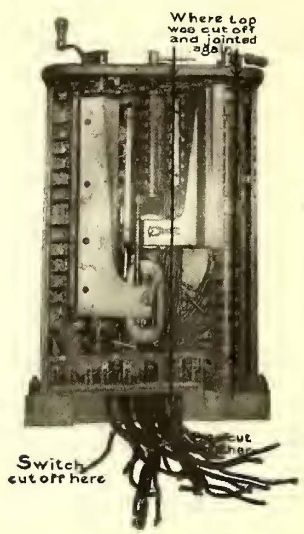
is also shown. This has been found particularly advantageous in enabling a corner to be turned with a heavy wire without cutting and with no harm to the insulation. The connector is divided into two parts which are clamped together by ⅝-in. U-bolts fitted with standard hexagonal nuts. For the size named, the diameter of the interior bushing is 1¼ in. At one end a lug with an oval hole takes the strain of the cable span when held up by the cross arm or frame to which the cable is fastened. Acknowledgment is due A. L. Black, engineer of the New Orleans Railway & Light Company, for the foregoing illustrative matter.

According to the report of the Deputy Minister and chief engineer of the Department of Railways and Canals of Canada street railway travel in that country is safer in Montreal than in any other Canadian city. Not a single person was killed there last year. The greater safety of Montreal's service is attributed to the use of the pay-as-you-enter car, which was in use on three routes. Below is given an extract from the annual report bearing upon this matter: "The killing of 71 persons and the injuring of 1736 others reveals the sacrifice which would appear to be inseparable from the operation of electric railways. The danger is manifestly in proportion to the number of cars run and the population served thereby, since out of 71 fatal accidents 22 took place in Montreal and 20 in Toronto. Singularly, however, not a single passenger was killed in Montreal. Of the 1736 non-fatal accidents, many of which were of a minor character, 490 occurred in Montreal and 696 in Toronto. Thus, while but one passenger in every 40,311,552 was killed in 1901, this proportion was reduced to 6,782,243 in 1905, and last year to 10,188,126. The average for the seven years was one in every 18,268,306."

SIMPLIFYING THE B-8 CONTROLLER BY ELIMINATING THE BRAKING FEATURE

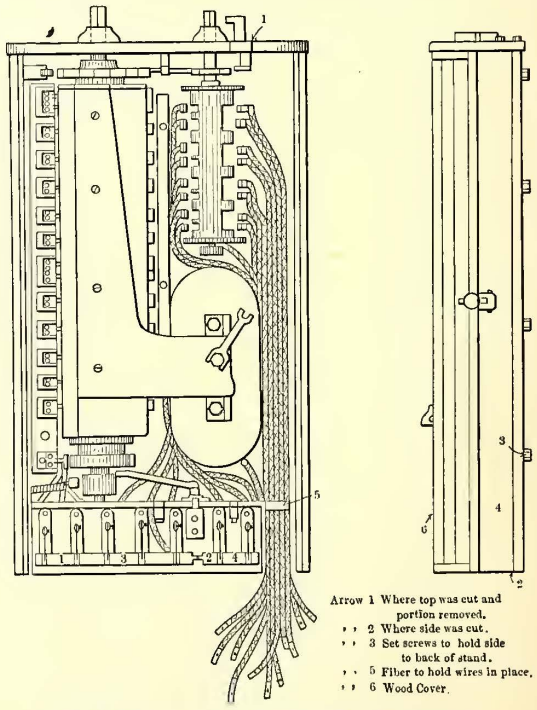
BY A. H. OSTERMAN

A couple of years ago when the writer was in charge of controller work for the Lake Shore Electric Railway, of Cleveland, he was requested to simplify the wiring and reduce the size of some GE B-8 controllers by eliminating the electric braking features The cars had been equipped with both air and hand brakes, so that the removal of the electric braking feature was more than balanced by a decrease in the width of the controller cylinder from 31 in. to 19½ in., thus giving more vestibule space and reducing the load on the sub sills.



Controller Case Open to Show Part Cut Off

The change was made by taking out the stand wiring, fingerboards and cylinders and then the cut-out switch box on the bottom was cut to measure 14½ in. and the back of the controller shell was placed in a planer to be cut off to the desired size. The controller cover was also reduced in width by cutting out a piece between the reverse and braking handles, after which the side and back were planed to fit as shown in the drawing, without requiring any new castings whatever.



G. E. B-8 Controller Braking Cylinder

In the transformer controller the running and reverse cylinders are in their original state, but owing to the change in the cut-out switch box, the last two blades to the right were removed to give the switch cut-out six knife blades instead of eight. Blades 1-3-4 and blades 5-6 were then connected with jumpers. All wires were led to the right side and securely fastened with a piece of fiber.

FREIGHT TRAFFIC ON THE ILLINOIS TRACTION SYSTEM

The Illinois Traction System, operating last year an average of 325 miles of interurban lines, had total gross earnings from freight traffic of $191,148. With the completion of about 110 miles of new interurban lines during the last six or eight months, the company now has through lines connecting East St. Louis, Ill., Springfield, Peoria, Bloomington, Decatur, Champaign and Danville. It is thus enabled to get its share of the large merchandise traffic distributed through Illinois by the wholesale houses in St. Louis and a good part of the distributing business of the smaller wholesale houses in the other large cities which it reaches. There are comparatively few manufacturing industries along its lines which contribute local traffic in any large amounts. A larger volume of business is obtained from the distilleries in Peoria than from almost any other single industry. The territory reached by the lines of the Illinois Traction System, however, includes besides the larger cities already mentioned several prosperous towns in the coal-mining districts south of Springfield and all the way between Springfield and Danville. As well as contributing local merchandise traffic, these coal-mining towns produced last year a traffic of about 150,000 tons of coal, which was handled in the traction company's own cars between the mines with which it has connections and the larger cities on the system.

In developing its freight traffic, the aim has been to solicit and accept every kind of shipment which could be handled and to make a special effort to give prompt delivery without in any way attempting to cut rates below the maximum allowed under the distance tariffs of the Illinois Railroad & Warehouse Commission for Class A roads. The company is prepared to handle bulk shipments of coal, sand, lumber and other similar freight, produce, general and perishable merchandise and package shipments.

FREIGHT FRANCHISES IN INTERVENING TOWNS

This railway has been handicapped in the development of through business by two conditions which it has been unable so far to overcome—the antagonistic attitude of the steam railroads in the territory it covers, which have constantly refused to interchange through business either in carload or less than carload lots, and the fact that under its franchises in Springfield and Decatur particularly, it is unable to haul freight cars in trains over tracks inside the city limits. This second difficulty can only be met by the construction of belt lines around the two cities, but work has already been begun on such a line around Decatur, and surveys have been made for a similar line around Springfield. When these belt lines are finished the company will be in a position to handle through trains of freight cars between Granite City, Ill., and Danville. Its franchises in all of the intermediate cities, with the exception of the two already noted, are liberal and permit hauling of freight cars under certain restrictions over the city streets during the early hours of the morning. It is now hauling trains of six coal cars and an electric locomotive through the streets of Urbana and Champaign and in Danville. This coal is obtained from a mine in the Danville district, which has no connection with the steam railroads, and its entire output is handled by the electric line. The company obtained the right to run such trains in these three cities largely because it promised a reduction in the price of coal delivered amounting to 50 cents a ton.

The largest originating point on the system is East St. Louis. Pending the completion of its own bridge across the Mississippi River and a direct entrance into St. Louis, the Illinois Traction Company has trackage rights over the East St. Louis & Suburban from Granite City into the passenger terminal of the East St. Louis & Suburban at the east end of the Eads Bridge. All freight to or from St. Louis is transferred across the river in wagons. In this respect the electric line handles its St. Louis freight business under the same disadvantages with which most of the steam roads entering St. Louis from the east have to contend. With the exception of the Wabash Railway, all of the steam roads entering St. Louis from the east have their freight terminals in East St. Louis, and all deliveries and receipts are transferred across the river either over the bridges or by ferry on heavy two and four-horse trucks. There are two transfer companies which handle the bulk of this business for the steam roads, having their own receiving and distributing warehouses in St. Louis. These are the St. Louis Transfer Company and the Columbia Transfer Company. When the Illinois Traction System began to operate into East St. Louis, it attempted to make a contract with both these companies, but like the steam railroads, which were their largest customers, they refused to handle the business of the electric road. A contract was, therefore, made with an independent transfer company—the East St. Louis & St. Louis Transfer Company—which was doing a small miscellaneous transfer business on both sides of the river. This company has a warehouse at 716 Morgan Street, St. Louis, where it receives all shipments consigned to the Illinois Traction Company. It loads consignments received at this freight house on its own trucks and hauls them across the river to the freight house of the Illinois Traction System on Collinsville Avenue, about three-fourths of a mile from the east end of the Eads Bridge. Its contract with the railway company provides for a transfer charge of an average of about 5 cents per 100 lb., based on the class of freight handled, but this charge is absorbed by the traction company in its published rates from St. Louis. From six to eight trucks are used, depending on the volume of freight to be handled. These trucks have a capacity of from 10,000 lb. to 15,000 lb. and are hauled by two, three or four horses.

The freight house in St. Louis is open for receiving consignments up to 6 o'clock in the evening, and as fast as a truckload accumulates on the platform it is loaded on the wagons of the transfer company and dispatched to the freight house in East St. Louis. At the end of the day a sufficient number of trucks are pressed into service to deliver promptly all freight received up to closing time to the other side of the river. Where single shipments from one consignor exceed 10,000 lb., the transfer company on notification will load one or more of its trucks direct from the consignor's warehouse and deliver the shipment to the freight house in East St. Louis without reloading and without any extra charge. Shippers and consignees in East St. Louis deliver and receive goods directly from the freight house, paying all delivery charges in addition to the regular freight rates.

FREIGHT HOUSES

When the new bridge of the Illinois Traction System across the Mississippi River at St. Louis is completed this company will have an entrance of its own into the heart of the wholesale district and will erect a freight and passenger terminal at the corner of Twelfth and Lucas Streets.

The company has freight houses in all of the other large cities which it reaches. In East St. Louis it leased an abandoned car house and remodeled it into a very satis-

factory freight depot which, however, is hardly large enough to handle the increasing volume of business. A loading platform, 25 ft. wide and about 125 ft. long, was built in the center of the house with a teaming space on one side and three storage tracks on the other side. By spotting cars so that the side doors come opposite each other, freight can be trucked from the platform through the intermediate car or cars to a car standing on either the second or third track away from the platform. The tracks are long enough to accommodate three cars each in the house and so extended in the rear about 150 ft. that stub-end storage space for six to eight more cars is provided. In Springfield the company has two freight houses. Others have been built in Decatur, Champaign, Danville, Peoria and Bloomington.

ROLLING STOCK

Most of the merchandise freight business is handled in standard express cars. The company has in service 15 motor express cars and 36 trailer cars with substantially the same design of body and having a capacity of 50,000 lb. In addition to this equipment, it has in service four refrigerator trail cars, built along the lines of standard steam railroad practice and having ice boxes in each end with icing doors on the sides. These cars are used for handling fresh meat, dairy produce, beer and ice. For the heavy bulk freight traffic the company owns 360 40,000-lb. and 50,000-lb. capacity gondola coal cars and 40 flat cars. These are equipped with air brakes and M.C.B. couplers and are regularly hauled over the road by 15 electric locomotives. These electric locomotives were described in the Street Railway Journal March 16, 1907. They weigh 40 tons, are mounted on two M.C.B. type swivel trucks and are equipped with four GE-55-H motors designed to give a tractive effort of 16,800 lb. They are used in construction work and in hauling company freight, such as power-house coal and material and supplies, when not required for handling revenue freight trains. Ordinarily six is the maximum number of cars hauled. The motor express cars are equipped for multiple unit control and usually handle from one to three trail cars when the volume of traffic demands that number.

BLANKS AND FORMS

The methods and forms of accounting for the freight delivered and received at each station are based in a general way on the standard freight accounting systems of steam roads, although they have been modified and simplified to a great extent. Some additional forms and reports are required from the East St. Louis office because of the fact that the company transfers a large part of its freight to the East St. Louis & St. Louis Express Company, which makes the actual deliveries and collections in St. Louis. Goods received for shipment at the St. Louis freight house of the transfer company are receipted for in good order usually on the duplex freight receipts made out by the shipper. Most of the large shippers in St. Louis have their own forms of these receipts. These are made out in duplicate and one copy signed and delivered to the driver, while the other copy is retained and used in making out the regular waybill. When a wagon load of shipments is ready to leave the St. Louis freight house it is checked on the wagon and a driver's report is made out showing the number of shipments, number of packages in each and the weight. At the bottom are spaces for the signature of the checker, the driver, the time of departure from St. Louis, the time of arrival at the East St. Louis freight house and the time unloaded. These reports are made out in duplicate. One is retained by the express company, while the other is used in checking the load and is then filed by the freight agent at the house. From these reports are made up the monthly settlements between the express company and the railway company for outbound shipment. Accompanying the driver's reports with each load are the shippers' delivery receipts from which waybills are made out. The way bills are numbered consecutively and are made out in triplicate on paper of three colors. The original is sent forward with the shipment; the second is sent to the consignor and the third copy is retained by the agent. At the end of each day the agent makes up an abstract of the freight forwarded and sends it to the general traffic manager's office at Springfield by the first car leaving the following morning. Where the shipment goes through over the company's lines beyond Staunton, the agent enters it on a daily report of through business, showing the destination, weight and charges. This report is turned in at the auditor's office and a division of revenue between the various branches is made in that office on a mileage basis. Similar daily abstracts of local express received and through express received are made out and sent in to the auditor's office, where they are checked against each other. The reports of freight forwarded are printed on yellow paper and the reports of freight received are printed on pink paper.

Agents are required to make cash settlements with the company once each week only. The statements sent to the main office show charges collected and amounts still due


ILLINOIS TRACTION SYSTEM

Express Service at Freight Rates.

.....190

.....

.....

PLEASE ROUTE OUR SHIPMENTS VIA

ILLINOIS TRACTION SYSTEM (Interurban Express)

Yours truly,

Route Card for General Distribution

and from whom. They are sent in after the close of business on the 7th, 14th, 21st and last day of each month with the total amount of cash due.

Inbound shipments to St. Louis are transferred from the East St. Louis freight house by the East St. Louis & St. Louis Express Company, which makes any collections due on delivery of the freight to the consignee.

Other blanks used include the car messenger's report of express over, short and damaged, and a similar report made out by station agents. These reports embody the information necessary in tracing a lost or damaged shipment and determining the cause and responsibility for the loss or damage. All transfers of shipments from car to car at junction points are also checked and reported.

ORGANIZATION OF FREIGHT DEPARTMENT

The organization of the traffic department is headed by the general traffic manager, B. R. Stephens, with offices at Springfield, Ill. District traffic managers are located at Champaign, Peoria, Bloomington, East St. Louis and two in Springfield. These district traffic managers have general supervision over the freight and passenger business in their respective territories and do soliciting as well. Freight solicitors who do nothing but cultivate the merchants and shippers along the line are also employed in each of the

district offices. The company has not only confined its efforts toward building up freight traffic to the shippers, but has inaugurated a campaign among the small merchants in the towns who buy in St. Louis and the other large cities. All employees of the traffic department and conductors on passenger cars are supplied with pads of small routing cards, so-called, which are shown herewith. These are distributed among the merchants with the request that in sending in their orders they attach one of these slips and insist that every shipment be made over the electric line as requested. This method has been productive of good results, although some of the wholesale houses who have not yet come to realize the advantages of the prompt service offered, or who are very closely in touch with the steam railroads, sometimes disregard the request of their customers and ship over the steam roads.

CLASSIFICATION

In St. Louis particularly the Illinois Traction System is competing with the steam roads for local business in Illinois on the basis of service alone and not on rates. Under the ruling of the Illinois Railroad and Warehouse Commission, the Illinois Traction System is included under the Class B roads and is entitled to charge rates uniformly 10 per cent higher than the Class A rates, which all of the competing steam roads are compelled to use. It has not, however, taken advantage of this 10 per cent increase, but charges the same rates as the Class A roads. Furthermore, its rates are based on the short line mileage of the steam roads or of its own lines, as the case may be, regardless of the fact that it is not interchanging freight with the steam roads. The company employs five standard classifications for less than car-load shipments, the rates being based on distance. The minimum short haul rate from East St. Louis is to Stallings, 9 miles, for which the first class rate is 17.5 cents per 100 lb. and the fifth class rate 8 cents. Car load shipments are accepted at the classifications and distance tariffs published by the Warehouse Commission.

STATISTICS OF TRAFFIC

The service out of East St. Louis has been steadily improved as the traffic warranted and on May 1 a new schedule was put into effect which gives a service excelling anything that the steam roads can offer. Under the new schedule freight received at the St. Louis warehouse of the transfer company up to 6 p. m. is delivered in Danville, Ill., 225 miles, and Peoria, 175 miles, at 7:30 a. m. the following morning. A special through express leaves East St. Louis at 9 p. m., arriving at Springfield at 12:40 p. m.; Decatur at 2:30 a. m.; Champaign at 6 a. m., and Danville at 7:30 a. m. In addition to this, a local express leaves East St. Louis at 2:30 a. m., arriving at Springfield at 9:30 a. m., making all stops between Staunton and Springfield. An afternoon express car leaves East St. Louis at 1 p. m., running through to Carlinville, where shipments to Springfield and intermediate points are transferred to a local passenger car leaving at 4:30 p. m. A United States Express Company local express car also leaves East St. Louis every morning at 9 o'clock, arriving at Danville at 9 p. m. the same day. A corresponding service is maintained in the opposite direction, the through express leaving Danville at 8 p. m. and arriving at East St. Louis at 6 a. m. the following morning.

The freight traffic of the Illinois Traction System is growing all the time. With an increase in mileage of about 30 per cent this year, it increased nearly 65 per cent over the corresponding months of last year. This growth has been maintained steadily ever since the cessation of business activity last fall and in spite of a complete shutdown during the last two months of the coal mines, which are the principal industry in a large part of the territory served. Special efforts have been made to develop freight traffic because it has been found to be very profitable. Last year the gross earnings from this source were $191,148 and the operating expenses, pro rated in accordance with the usual percentage charges, were $89,136, leaving net earnings of $102,012. This is only about 6 per cent of the total net earnings of the entire properties including the city lines operated, and is of course a much smaller percentage than is found on steam roads. The freight business is developing faster, however, than the passenger business, which, it may be said, has also shown a gratifying increase over last year, and it will only be a question of time until parts of the system at least will have to be double-tracked. On the St. Louis-Springfield division at the present time the passenger schedule calls for 15 limited trains each way per day, with additional local trains in between. The freight traffic is now largely handled during the night and the early hours of the morning, when there is little or no passenger traffic, but it will not long be possible to keep freight cars off of the line during the daytime.

This paper is indebted to B. R. Stephens, general traffic manager of the Illinois Traction System, for the information from which this article was prepared.

CENTRALIZING BOILER FEED PUMPS

In the expansion of power plants the feed pumps sometimes become separated through the lack of a preliminary design providing for symmetrical additions to the equipment, especially in the less developed sections of the country where power station apparatus is apt to exemplify mixed types of varying efficiency under a single roof. The chances are that the growth of the plant was not anticipated in the earlier days, and that the importance of consolidating equipment of the same kind in the same part of the station did not make itself felt. As a plant grows there is inevitably a tendency for the cost of attendance to increase at too rapid a rate, unless the machinery is installed according to a progressive plan. Boiler feed pumps occupy comparatively little space and can be piped for steam and water with comparative ease; they run without constant adjustment and require simple and inexpensive foundations. Nevertheless it is a policy of doubtful wisdom to locate feed pumps at any point in the boiler room or basement that happens to be convenient.

By grouping the pumps closely together the steam and water piping can be cross connected at the minimum expense. The most flexible piping can be installed in this way, each pump acting as a unit on the steam and water mains and being able to feed any boiler in the plant. Thus the effect of a shutdown on any pump or line becomes minimized, but the most important point is the improvement in the attendance. In a plant large enough to require three or four feed pumps one man can attend to the entire outfit if it is a centralized layout. If anything goes wrong the responsibility can be definitely fixed, and the quality of the service is sure to be improved. Scattered pump installations, on the other hand, are unfavorable to either economy in the piping installation, flexibility in reserve capacity or low cost of attendance.

The experimental railway at Orienburg, near Berlin, is now serving the purpose of testing electric locomotives and coaches before they are placed in actual service.

GRAPHICS AS APPLIED TO CAR MAINTENANCE

BY WILLIAM ARTHUR, LATE ASSISTANT RESIDENT ELECTRICAL ENGINEER, LIVERPOOL & SOUTHPORT ELECTRIC RAILWAY

The importance of keeping accurate records of the daily condition of those parts of the car equipment which require frequent attention is well recognized on both small and large roads. Various systems for accomplishing this result have been described in this paper, but many of them require so much detail as to make them too complicated for the small company. The object of the present article is to give an account of the writer's experience in this matter of car checking on the Liverpool & Southport Electric Railway, which was converted from steam to electricity some four or five years ago, and operates a frequent service of heavy passenger trains at a high schedule speed. The system described was evolved to meet the requirements of such a service, but it should be understood that, with suitable modifications and adaptations, the same general principle may be applied to any railway, either a city or an interurban system, and is especially useful where a large number of electric cars are operated during the greater part of the day, and, for a limited number of hours each day are housed where they can be inspected for running repairs and overhauling, and where, owing to the exigencies of traffic conditions, it is impossible to prophecy exactly at which of two or three possible points a car or train will eventually be housed. This is the usual problem which has to be faced.

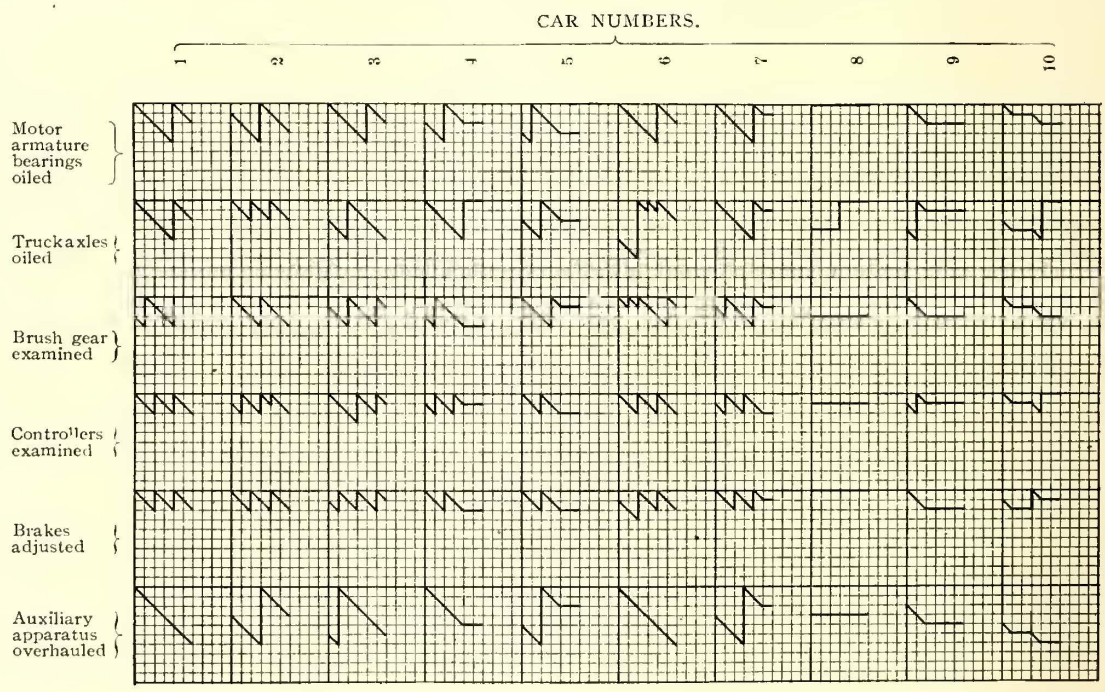
Let it be at once said that the system adopted and herein described was not the first one tried. It was the result of many attempts at this always knotty proposition, and survived only after many others had been tried and found to be either too cumbersome or inelastic, or costly in labor, to make it worth while using them. As time went on, and system after system was discarded, it began gradually to be perceived that only a graphic system, a plan whereby the condition of each item on each of many cars could be shown at once as a picture, would meet all the requirements, and this was eventually adopted. Now after two years' trial, during which gratifying results have been attained, the writer publishes the results in the hope that they may be of use to others.

Let us suppose, as an example, that it is the oiling of the armature bearings of which we wish to keep a record.

Take a piece of squared paper of suitable size as in the diagram, divided preferably into 1-in. squares with 10 subdivisions to each inch. Along the upper border write the numbers of the cars in order, beginning at the left upper corner with the lowest serial number as in the figure, allowing 1 in. square for each car. Along the border at the left side at each inch square write the items to be checked, beginning at the upper square with "Motor armature bearings oiled" and following down the column with other items as shown, "Truck axles oiled," "Main motor brush-gear examined," and so on.

Let us suppose that from the oiler's record it is possible for us to know that the armature bearings of car No. 1 were oiled, say, on the night of May 1, 1908, and further, that we have fixed the limit which an armature bearing must run without examination at four days.

On May 2 a reference to the oiler's report of cars examined discloses the fact that the car No. 1 has not had attention. Take a pen, and, beginning at the extreme left-hand upper corner, draw a line one small square downward and to the right, i. e., a diagonal across a small square as shown. The next day if again the car is not reported as having been oiled at the armature bearing, repeat the operation, and so on for four days, as shown. On the fourth day, looking at the line (and at the same time at all the lines along the same horizontal row) it will be seen by noting the number of squares down that the limit has been reached, and that this car needs attention. The oiler or oilers can then be notified that this car must be looked out for and attended to. It will now be seen that what has been done with this item of this particular car could have been done with each car for the same item providing a 1-in. square had been utilized for each car in service. For instance, a reference to the diagram will show that not only car No. 1, but cars Nos. 3, 6 and 7 are at the same time in the same condition, i. e., requiring oiling at this point, whereas on this date cars Nos. 2, 4 and 5 have been run only one, two and three days respectively. Car No. 8 is standing spare ready in every particular, and Nos. 9 and 10 have each run two days, and have stood spare two days. This can all be seen at a glance for the full number of cars on the sheet, and instead of a single car number, a list of all cars requiring oiling on this date can be given to the oilers.



Graphic Record of Car Inspection and Maintenance Work

The general principle will now be perceived, i. e., as the oil in the bearing is decreasing the corresponding line on the sheet is also coming down, and represents graphically the level of the oil in the bearing.

On the next day, i. e., May 4, the oilers report would contain the numbers 1, 3, 6 and 7, and so on, and the lines in the squares would be raised vertically to the original level, as shown, to proceed again as before. The chart has been reproduced when six days have expired since the commencement of the record.

What applies to "armature bearings" applies to other items of the car equipment, such as controllers, unit switches, brake gear, motor brush gear and all other items which require frequent and certain examination if minimum operating and maintenance costs are to be reached and maintained, it being understood that suitable limiting dates be set to correspond with each item; some items, for instance, requiring possible daily examination, and others running for weeks or months. The scale of the record sheet can, of course, be arranged to suit any local conditions.

Analysis of the diagram reveals several interesting points. Taking item (2) "Truck axles oiled," it will be seen that:

(a) Car No. 2 ran two days, was oiled, ran two days and was oiled again, i. e., it was oiled three times in six days, although the regular period is four days.

Evidently there is something amiss with this item; either the oilers know the bearing to be in bad condition and are giving it extra attention, or they are oiling it unnecessarily and so wasting time, oil and money; in either case the master mechanic has cause here for inquiry:

(b) Car No. 3 had run two days without oiling at the commencement of this chart. It ran two more, was oiled and is now, on the sixth day, due for oiling again.

(c) Car No. 6, by inattention, or due to some emergency, had been allowed to run six days, i. e., two days longer than the prescribed time; following this it was oiled three days in succession. Evidently the bearing had become scored or roughened due to the omission of the oiling at the regular period and gave trouble for several days after.

In a similar way other useful deductions may be made from certain of the remaining squares.

At the expiration of the ten days the final condition is transferred to a new chart, care being taken to start each item correctly as regards the time-spacing of the squares, etc.

Assuming that there are 50 motor cars to be kept track of, then without getting a cumbersome size of sheet it is clear from the explanation that we now have on one chart not only a graphic representation of the condition of each item of the 50 cars, but we have also a history of what has been done to each item on each car during the preceding 10 days and can trace items by referring to previous charts, as far back as may be desired.

Usually it will be found that not more than 50 cars can be conveniently negotiated on one sheet; 100 cars would take two similar sheets, and so on.

The advantage of such a system may now be enumerated:

(1) The rolling stock superintendent or master mechanic, by reference to the chart, can tell at a glance the condition of each item at any moment as regards the need for overhauling.

(2) A life history of the attention given to each item is shown, which is of inestimable value in tracing out the cause of breakdowns of any particular part of the equipment.

(3) Regularity of inspection and attention is assured with a corresponding decrease in the number and extent of those failures which take place, due to equipment being allowed to run because "Tom" was under the impression that "George" had done this, or "Harry" that.

(4) The charts required for, say, 200 cars, can be comfortably handled by one clerk, with but little training, in about three hours each day.

(5) The fact that each examiner, oiler, electrician, etc., receives each day a list of those cars needing his attention, lessens the need for personal checking and thought on his part, and has in other ways a salutary effect.

(6) As soon as the system has begun work with regularity the limitations of each part of the equipment becomes more clearly seen. Exactly how long a bearing or piece of electrical apparatus can be safely allowed to run without inspection becomes less a matter of conjecture.

Usually it is found that the intervals can be extended (in many cases considerably so) with a consequent saving in labor and material. Too often in railway work the case of the man is repeated who wound up his eight-day clock each day for 14 years, under the impression that the clock would run for 36 hours only.

The duplication of labor where two or more gangs of men are employed on similar work is avoided. It is very frequently found that two men have each given attention to the same piece of apparatus, each being unaware of the other's movements. Under a chart system each man receives definite instructions of what cars are needing attention, and by inference the numbers not mentioned are either not yet needing attention or are being dealt with by others.

The general result of a graphic system as outlined above should be: (a) fewer failures, (b) lower operating costs, (c) reduction of staff to a minimum, (d) a more comfortable feeling in the minds of those responsible owing to the consciousness that things are working with regularity and smoothness.

To those who desire still greater precision the principle may be developed on a mileage instead of on a daily basis. The need for this will largely depend upon local conditions; the writer's experience goes to prove that in most cases a record based upon the daily run of the cars will average out sufficiently well in practice, and at any rate will serve as an introduction to the more precise method, which can be adopted later as the needs of the case dictate.

In conclusion it may be stated that a close working acquaintance with such a chart system will from day to day reveal many other possibilities which cannot but be of great value to the master mechanic who wishes to have a "live" hold on his organization; to such a one it will be found that the chart offers a solution to many difficulties; he will gradually acquire the habit of referring to and analyzing it more and more frequently as time goes on with a corresponding increase in the efficiency of his department.

"CHICAGO AND INTERURBAN TROLLEY GUIDE"

A useful little book, "The Chicago and Interurban Trolley Guide," has just been issued. It tells Chicagoans just how to reach surrounding suburbs and towns by trolley or steamer, and gives the rate of fare. It also contains schedules of cities, towns, villages, suburbs and amusement and fishing resorts, alphabetically arranged, which are reached by trolley or steamers from Chicago and vicinity. Time-tables and mileage are also included.

TURBINE POWER STATION OF THE KOKOMO, MARION & WESTERN TRACTION COMPANY

The Kokomo, Marion & Western Traction Company has a 28-mile line extending from Kokomo, Ind., a city of about 18,000 population, to Marion, which has about 26,000 people. There are also several smaller towns along the route. The interurban railway was built by the owners of the Kokomo city railways, who found it necessary to erect a new power plant to serve the enlarged system, which combines railway, lighting and power loads. The new station is a brick building with concrete floors.

The boiler equipment consists of three batteries, two of which include four 235-hp Stirling boilers, and the third a 400-hp Atlas water-tube boiler. A main steam loop header 12 in. in diameter, located above the pump compartment in the steam turbine room, feeds each turbine through a 7-in. pipe. Crane gate valves are placed between each battery of boilers and between each turbine inlet. There is also a 4½-in. auxiliary header. A proper arrangement of valves enables any part of the plant to be supplied from any boiler at will.

The condensers and all of the other auxiliaries exhaust into a Cochrane heater with Sorge water purifier. Water

Kokomo, Marion & Western—Power House Interior

may be drawn from either the condenser suction or discharge pipes, from a deep well or from the city mains, and discharged into an elevated tank which feeds by gravity into the heater and from there by gravity into the boiler feed pumps; or the water may be by-passed directly to the boiler. Two Worthington pumps are used for supplying the tank over the heater and two Dean pumps for boiler feed. Either one of any of these two is, however, able to care for the water system of the entire plant. The former are now being displaced by a centrifugal pump with 2½-in. discharge, driven by an induction motor supplied from the main generator buses through a stepdown transformer; the steam pumps will be held in reserve.

The machine room contains two 1000-kw Allis-Chalmers horizontal steam turbines and generators, a 330-kw engine-driven alternator operated in parallel with them, the exciters for these units and substation apparatus, transformers, switchboard, etc.

Among the special features of the turbines are channel-shaped shrouds protecting the ends of the blading from injury; machine cut slots in the foundation rings insuring accurate spacing of the blades; a method of fastening the latter which effectually prevents them from working loose, and improved balance pistons. The turbines operate at 1800 r.p.m. at 140 lb. steam pressure and a vacuum of 28 in. of mercury referred to 30-in. barometer at the exhaust nozzle. The machines are frequently run six weeks at a time without taking the load off and then only to make inspection.

The condensers are of the jet type built by the Allis-Chalmers Company. Cycloidal air pumps, direct-connected to enclosed, self-oiling, high-speed engines, and duplex, double-acting circulating pumps are installed with this apparatus, as is also a third condenser to take the exhaust from the remainder of the plant.

The speed of each turbine is regulated within close limits by a governor driven from the shaft through cut gears working in an oil bath. The governors can be adjusted for speed while the turbines are running, thereby facilitating the synchronizing of the alternators and dividing the load as may be desired. To provide for accidental derangement of the main governing mechanism, there is a separate overspeed governor, driven directly by the turbine shaft without gearing. Should the turbine reach the predetermined speed above which the main governor is set, the safety governor will trip a valve, shutting off the steam and stopping the turbine.

The lubrication of the bearings is effected by oil supplied to the middle of each bearing by means of a small cycloidal pump driven from the turbine shaft, and allowing it to flow out at the ends. The oil is passed through a tubular cooler with water circulation, and pumped back to the bearings. It is not necessary to supply the bearings with oil under pressure, but only at a head sufficient to enable the oil to run to and through the bearings. No oil of any kind is used in the interior of these turbines, nor in the glands through which their shafts pass. Low oil alarms have been provided for the turbines.

The revolving field alternators driven by these turbines are of the turbine builder's standard type for high peripheral speeds. They are designed for two-phase, 2300 volts, which is stepped up to 11,000 volts for the three-phase transmission system. The exciters for these turbines are of 30 kw and 35 kw capacity respectively. Direct-current for the city railway system and 10 miles of the interurban line is supplied through 600-volt generators driven by 216-hp motors.

There is also a chloride accumulator battery of 288 cells, or 480 ampere-hour capacity, in another building 60 ft. from the power station.

The report of the Havana Electric Railway Company for year ended Dec. 31, 1907, shows gross earnings of the railway and stage properties as $2,143,122, an increase of $224,019. The total net earnings were $924,951, from which must be deducted fixed charges $558,877, leaving $366,074, and after paying dividends amounting to 5½ per cent on the preferred shares there remains a surplus of $91,074. The track mile earnings during the year were in excess of $36,000, indicating that the maximum earnings upon the present track mileage of the company is being approximated and that additional mileage will soon be required to properly handle the increased traffic incident to the normal growth of the city. In anticipation of this necessity the company has now pending before the proper authorities an application for the right to construct the additional trackage required, and favorable action upon this application is anticipated.

ELECTRIC RAILWAY TRAFFIC IN MEMPHIS

The system of the Memphis Street Railway Company covers about 100 miles of track and serves a population of some 150,000 people within the limits of its territory. Practically all the company's traffic is urban, there being one 12-mile suburban line to Raleigh Springs which is an exception to the other routes in the through character of its business. In the main the different routes are radial in character, centering on the commercial heart of the city and branching out into residential or manufacturing districts on the north, east and south. A map of the company's lines is shown in Fig. 1.

Thirteen separate routes are required to handle the business of the company. The rolling stock totals 270 cars and 20 double track trailers of the 13-bench open type. All single truck box cars are numbered from 100 to 299; these have 20-ft. bodies and are 32 ft. over all. Open single truck cars are numbered from 300 to 499, closed double truck cars from 500 to 699, the bodies being 30 ft. long and the cars 42 ft. 6 in. over all, and trailers, from 700 to 800. In case any car is delayed or injured in any way, the reporting of the number instantly conveys the type of car, and measures can be taken more quickly to provide relief in the best way than as though the number did not at once suggest the type of car which is held up.

There are 35 Brill semi-convertible double truck cars seating 40 passengers each, equipped with four GE 57 motors; 20 Brill cars of the same type, equipped with four GE 80 motors; 10 longitudinal seat box cars equipped with four GE 80 motors each, and seating 44 passengers; 96 single truck longitudinal seated cars operated by two GE 800 motors and seating 22 passengers each; 50 ten-bench open cars equipped with two GE 67 motors; 44 ten-bench single truck cars driven by two GE 800 motors, and 15 new double truck longitudinal seated semi-convertible cars with disappearing windows, with four GE 80 motors and a seating capacity of 40. The 20 trailers have already been mentioned.

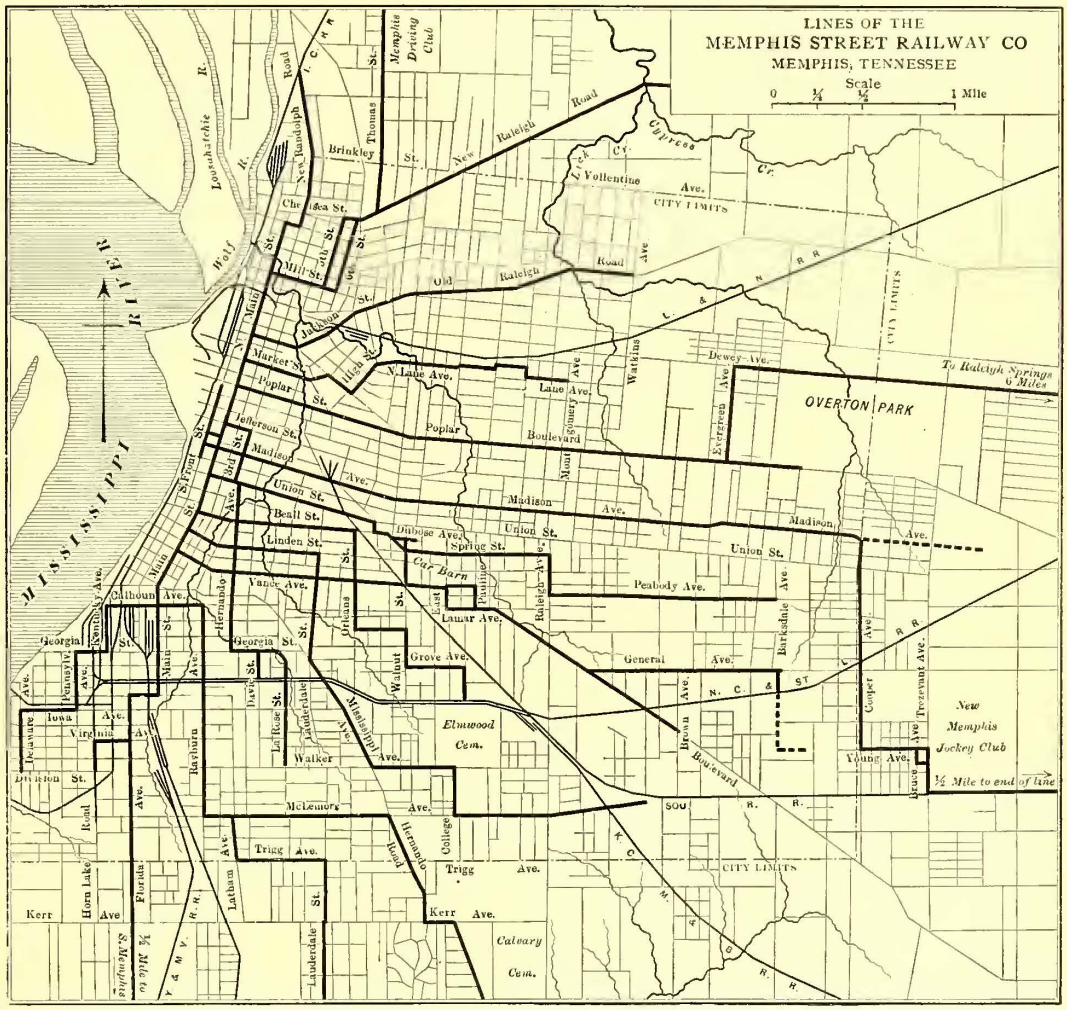


Fig. 1.—Memphis Street Railway, Map Showing City Lines

In general the principal routes are as follows:

Beale and Lane line: Starts at Overton Park on east side of city, reaches Main Street via Lane, High and Market Streets, passes southward through the business district for about a mile, traversing Main Street, the principal artery of traffic, and swings southeast to a terminus at Elmwood Cemetery.

Davie and North Second line: Starts at North Second Street Illinois Central Railroad crossing in extreme northwest of city, traverses Main Street southward to Union Avenue and thence runs south to Georgia Street via South Third Street.

East End line: Starts at the center of the business district, Main and Madison Streets, loops around a square and runs eastward across the city to the vicinity of the New Memphis Jockey Club.

Jackson Mound line: Starts at Union and Main Streets, loops the business center, passing southward on Main Street to Calhoun and terminating in the southwest quarter of the city at Delaware and Division Streets.

Kansas Avenue line: Starts at Union and Main Streets, loops the business center, passing southward on Main Street to Virginia Street, terminating near the end of the Jackson Mound line.

Linden and Johnson line: Starts at Old Raleigh Road and Watkins Street in the northeast side of the city, passes to Main Street via Jackson Avenue, runs southward on Main Street to Linden and thence to the southeastern side of the city via Mississippi Boulevard, terminating at Rayner Avenue near the city limits.

Main Street line: Starts at Main Street and Railroad Avenue, near Iowa Avenue, in the southern part of the city,

and passes northward through Main Street to Mill Street, and thence northeasterly to the end of the new Raleigh Road or to the Memphis Driving Club via Thomas Street. This is one of the most important lines in the city, although considerable Main Street service is handled by other lines passing through that thoroughfare.

Raleigh Springs line: Starts at Main and West Court Streets, loops a block in the business district and passes at Rozelle Street and the N. C. & St. Louis crossing.

Binghamton line: Starts at Main and West Court Streets, loops the business district and passes eastward to Binghamton via Poplar Avenue, Evergreen Street and the balance of the Raleigh Springs route as far as Binghamton.

On the above lines four parks are located. Two of these are maintained by the city, namely, Overton and Riverside. Overton Park contains a lake, the Memphis Zoo and special

Lv. Sta. No. 1	Lv.						Arv.	Lv.					Arv.
5.25	32	36	6	9	11	28	26	26	28	11	9	36	32
	.....	.....	.....	.....	.....	.....	.....	6.00	6.08	6.29	6.33	6.38	6.50
	6.50	7.02	7.13	7.17	7.21	7.32	7.40	7.40	7.48	7.59	8.03	8.18	8.30
	8.30	8.42	8.53	8.57	9.01	9.12	9.20	9.20	9.28	9.39	9.43	9.58	10.10
	10.10	10.22	10.33	10.37	10.41	10.52	11.00	11.00	11.08	11.19	11.23	11.38	11.50
	11.50	12.02	12.13	12.17	12.21	12.32	12.40	12.40	12.48	12.59	1.03	1.18	1.30
	1.30	1.42	1.53	1.57	2.01	2.12	2.20	2.20	2.28	2.39	2.43	2.58	3.10
	3.10	3.22	3.33	3.37	3.41	3.52	4.00	4.00	4.08	4.19	4.23	4.38	4.50
	4.50	5.02	5.13	6.17	5.21	5.32	5.40	5.40	5.58	5.59	6.03	6.18	6.30
	6.30	6.42	6.53	6.57	7.01	7.12	7.20	7.20	7.28	7.39	7.43	7.58	8.10
	8.10	8.22	8.33	8.37	8.41	8.52	9.00	9.00	9.08	9.19	9.23	9.38	9.50
Arv.....	9.50	10.02	10.13	10.17	10.21	10.32	10.40	10.40	10.48	10.59	11.03	11.18	11.30
Sta.....	11.33	11.45	11.56	12.00	12.04	12.15	12.23	12.23	12.31	12.42	12.46	.....	.....

No. 1, 12.55 A.M. run No. 4 Vance and Poplar Time Table No. 9 effective January 2d, 1907.
Relieved from 12.02 to 1.42 by P.M. crew No. 12. Day Crew off at 6.18 by P.M. Crew No. 4.

Fig. 2.—Memphis Street Railway, Timetable of Run No. 4 on Vance and Poplar Line

out of the city via Poplar Avenue and Binghamton to Raleigh Springs.

South Memphis line: Starts from Main Street and Union Avenue, loops the business center and passes southward via Main and Florida Streets to South Memphis.

Suburban line: Starts from Main and Madison Streets, loops a block in the business district and passes southward via Main Street, Rayburn Boulevard and then to South

floral attractions, and is about 375 acres in extent. Riverside Park, in the southwest part of the city, overlooks the Mississippi River and covers about 350 acres. Two privately owned amusement parks, East End and Fairyland, are located on the company's lines. Trailers are operated from March 15 to Nov. 1 on the East End and Raleigh Springs lines. This service is given afternoons and Sundays on the Raleigh Springs line to handle a large pleasure

THE MEMPHIS STREET RAILWAY COMPANY.

SUPERINTENDENT'S DAILY REPORT OF OPERATION.

Weather, A.M., P.M., Day of week, Date,

	Schedule Number	Miles Per Hour	Headway Minutes Reg.	Headway Minutes Peak	Regular Cars 200 Type	300 Type	500 Type	700 Type	Extra Cars 200 Type	300 Type	500 Type	700 Type	Changes G.E. 800	G.E. 67	G.E. 57	G.E. 80	Cause of Change
																	Brakes
													2				Motor
																	Misc. Trouble
Beal and Lane.....	5	8.64	7½	5	10	..	..	..	2	..	..	..	..	..	..	..	Change of Type
																	Brakes
																	Motor
																	Misc. Trouble
Davie and North Second	1	8.66	10	10	6	..	..	..	..	..	..	..	..	..	..	..	Change of Type
Totals.....																	

Report on Rolling Stock					Remarks:
Regular Cars in Service.....	At 6P.M.	66	0	56	0
Extra Cars in Service.....	" "	25	0	0	0
Cars in Shop for Minor Repairs.....	" "	0	0	0	0
Cars in Shop for Repairs.....	" "	3	0	4	0
Cars held in Barn, not used.....	" "	2	94	5	20
Total Cars.....	.....	96	94	65	20

Car Hours Today, 2,062.30

147 Cars.

Note—Minor Repairs are those that will be ready for service in 12 hours or less.

Part of Report with Totals of all Lines.

Fig. 3.—Memphis Street Railway, Copy of Superintendent's Daily Report of Car Operation

Memphis via Lauderdale Street or to Calvary Cemetery via Hernando Road.

Union Street line: Starts at Main and Union, loops the business section and passes easterly via Union, Spring and Peabody Avenue to South Barksdale Street in the east central part of the city.

Vance and Poplar line: Starts at Tucker Avenue and Poplar Boulevard, in the east central section of the city, passes westward to Main Street, southward to Vance Street and thence eastward via Vance Street to the terminals

traffic, and all day on the East End line every day in the week.

The routes carrying the heaviest traffic in Memphis are the Vance and Poplar line, the East End, Linden and Johnson, Main Street and Suburban lines. All cars in the city pass the corner of Main and Madison Streets, and the average headway between cars in this part of Main Street is about 42 seconds on each of the two tracks laid in that thoroughfare. In a second story office at Main and Madison Streets an inspector of traffic is located throughout all the

eighteen hours in which cars are operated. This work is handled by two men, who average nine hours' service each. Each car passing this central point is noted by its route number or car number if it is at night, and the time of passing is recorded on a log sheet. Telephone connection with the starter at the car house and with other points on the system enables the service to be handled quickly in case extra cars are needed. Irregularities in intervals are minimized, the maintenance of the schedule checked, and in case of disputes over the time of transfers issued, arrival of connecting cars, etc., the exact figures kept by the stationary inspector furnish the company with unquestioned data.

The number of cars operated for the month of December 1907 are as follows:

Line	Regular cars	Extra cars	Total number of cars.
East End	637 21 ?	0	637
Linden and Johnson	496 16 5	185	681
Vance and Poplar	465	90	555
Main Street	434	133	567
Suburban	424	137	561
Beale and Lane	310	45	355
Davie and North Second	186	0	186
Union Street	186	0	186
South Memphis	156	8	164
Jackson Mound	145	0	145
Raleigh Springs	124	4	128
Binghamton	62	26	88
Kansas Avenue	48	0	48
	3673	628	4301

Fig. 4.—Memphis Street Railway, December Car Record

A standard clock with Western Union hourly time is located at the corner of Main and Madison Streets for the convenience of trainmen. The route numbers of the different cars are attached in the form of tin tags, 4 ins. square, which are slotted on one side in such a way that they can be locked in position when hung upon a bolt extending outward from the vestibule near the hood of the car. It is probable that these tags will soon be replaced by similar slotted tags with black figures on a porcelain background.

To facilitate conductors' reports of trips run and to enable the accounting department to figure mileage more quickly a table of 91 numbers has been prepared, which is carried by each man in the car service department. These numbers are assigned to every important turning or turnback point on the system, beginning at the Walnut and Beale Street car house with one and including the most important street intersections in the city, passing track switches and ends of routes and beginnings of single track runs. By far the greater part of the company's lines is double tracked, which, of course, enables a much better service to be given the public than on lines where much single track abounds.

About a dozen different timetables are established on the company's books and these are operated as the conditions of service can be anticipated, as on Sundays and certain week days when the travel varies considerably from that on other days. When a timetable is assigned for a certain day, each car on the system is provided with a metal tag about 3 in. x 8½ in., upon which is mounted the schedule for the particular run the car is to make during its service. One of the run schedules is shown in the accompanying table, Fig. 2, illustrating Run 4 of the Vance and Poplar line on timetable No. 9. The first car leaves the car house, station 1, at 5:25 a. m. and runs on dead mileage to station 26, which is the end of Poplar Avenue. Its first revenue trip begins at 6 a. m., and the time the car is required to pass the various points en route is indicated in the table. Thus at 6:08 the car is due at station 28, Poplar and Bellevue Streets, at 6:19; station 11, Main and Poplar, at 6:23; station 9, Main and Madison; at 6:38, station 36, Vance and Walnut Streets, and at station 32, end of the line, Annesdale, the car is due at 6:50. The return trip begins at once without layover. To facilitate the reading of the table by motormen and conductors the schedules are all arranged to read from left to right. All the trips, reliefs, layovers and final housing of the car at night at station 1, 12:55 a. m., are shown, and the card goes with the car all day regardless of what crew is operating it.

Each day the superintendent of the company, E. W. Ford, submits a report of the operating conditions of the day before, to the president of the company, T. H. Tutwiler. One of these reports is shown in Fig. 3, the original being 10⅞ in. x 16⅞ in. Space is provided on these reports for the statistics of each line, the schedule speed for the day, the minimum and regular headway, number of regular and extra cars and changes in cars in service. On Thursday, Dec. 26, 1907, which was selected as a representative winter day, the schedule speeds on the different lines varied from 6.75 to 10.99 miles per hour. The slowest speeds were obtained either on the lines where the traffic was densest or on routes where there are a large number of curves. The regular headway varied from 5 to 30 minutes on the different lines. The peak headway shown applies to the afternoon only, as there is not any very extensive peak in the morning at Memphis.

The peak headways varied from 2.5 to 30 minutes. On the suburban line to Raleigh Springs and Binghamton, the Kansas Avenue, Davie and North Second lines, no increase in car service was necessary during the afternoon hours. It must be borne in mind in considering figures of this character that conditions obtaining on one day do not necessarily repeat themselves on another. In general, however, a long, sparsely settled suburban line, part of whose route is traversed by a shorter run city car service, does not require

	Total average passengers	Average daily cash fares	Average daily other fares	Average daily car miles	Average daily car hours	Average total per car mile	Daily passengers per car hour
Beale and Lane	9,539	8,086	1,453	1,356	184	6.2	51.9
Davie and North Second	5,362	4,260	1,099	858	101	6.25	53.
* East End	14,956	11,863	3,095	2,610	263	5.7	57.
Jackson Mound	3,756	3,045	711	559	81	6.8	46.3
Kansas Avenue	972	825	146	163	26	6.	37.4
* Linden and Johnson	13,569	11,112	2,457	2,428	285	5.5	47.5
* Main Street	13,383	10,937	2,447	2,144	253	5.5	52.9
Raleigh Springs	3,597	3,151	446	745	68	4.75	52.
South Memphis	4,850	4,029	821	701	84	6.9	57.8
* Suburban	12,404	10,269	2,135	1,997	236	6.2	52.5
Union Street	3,445	2,754	691	822	88	4.2	39.1
* Vance and Poplar	16,261	13,747	2,514	2,408	268	6.75	60.7
Binghamton	1,833	1,507	326	382	38	4.8	48.2
Miscellaneous	.....	.....	.....	21	3	.....	....
Total All Lines	104,266	85,592	18,677	17,373	1,980	6.0	52.6

Per Day.

*Heaviest Lines

Fig. 5.—Memphis Street Railway, General Report, Covering December, 1907

the decreased headway during rush hours if the latter service is flexibly maintained in response to the traffic variations. On the five lines of heaviest traffic the intervals were approximately cut in half during the afternoon peak. On the Vance and Poplar line the headway fell from 6 to 4 minutes; on the East End, from 5 to 2½ minutes; on the Linden and Johnson, from 6 to 3 minutes; on the Main Street, from 6 to 2½ minutes, and on the suburban, from 5 to 2½ minutes.

To handle the service on the day shown 66 single-truck box cars were required and 56 double-truck box cars for the regular schedule. The extra travel was handled by 25 cars of the single-truck box type. Thus, a total of 122 regular cars and 25 extras were required, making 147 cars on the system for the day as a whole. These ran 2062.30 car hours or an average of about 14 hours per car. The Vance and Poplar, East End, South Memphis and Raleigh Springs lines used only the double-truck cars and all the other lines used single-truck cars with the exception of the suburban, on which both types were employed. Fifteen changes in motor equipments were made during the day, two-thirds of these being on account of the GE-800 motors. The later motors showed much less need of shop treatment. On these sheets the designation "Minor Repairs" applied to those that enable the car to be placed back in service inside of 12 hours.

All the company's single-truck box cars except two were required in the run off of the schedule in force on Dec. 26, and all but 5 of the double-truck box cars were used. The trailers were not in service. Seven cars were in the shop for repairs. Causes of car changes in service are usually classified as due to brakes, motors, miscellaneous trouble or a change of type on account of a change in weather or traffic conditions.

In order to examine the volume of traffic handled on an average day, the figures for the different lines in the city were summarized for the month of December and divided by the number of days. Fig. 4 shows the average number of regular, extra and total cars used on each line per day during December, 1907.

Fig. 5 shows the total average daily passengers, average daily cash fares, average daily other fares, average daily car miles and car hours by lines for the month of December, 1907. The average total passengers per mile and per car hour have been included also. The average passengers per car mile for the system per day was 6, and per car hour 52.6. Revenue traffic was 82 per cent of the total and transfer and other fares 28 per cent. The highest density of traffic was not always on the lines carrying the largest number of passengers, but the heavy lines handled the maximum transfer traffic. The suburban line to Raleigh Springs showed a low passenger density per car mile, but a good figure per car hour. In general, the traffic density of the principal lines was quite evenly distributed.

The Philadelphia Rapid Transit Company has issued a program of the musical attractions at Willow Grove Park for the coming season. The park opened May 30 with Arthur Pryor and band, who continue until June 27. Victor Herbert follows, then Theodore Thomas and finally comes Sousa, by whom the season will be closed on Sept. 7. Music is one of the great features at Willow Grove, it not being unusual for 30,000 people to hear a concert. The railway company has reproduced the page from the Philadelphia *North American* of June 23, 1907, which contained a long illustrated article on Willow Grove by Walter R. Linn.

NATURAL AND MECHANICAL DRAFT

BY W. H. BOOTH

It is well known that the way to raise the temperature of a flame is to heat the air with which it is fed. The heating of the air has been the cause of very greatly increased brilliancy in gas lights. It appears, therefore, to be correct to heat the air which flows to any furnace. But such a proceeding has by no means always been a success. When air is heated it is expanded, and a very much greater volume will be required to supply the same weight, hence the velocity of flow must be greater. Since the molecular velocity of gases is inversely as the square root of their density, it follows that, if the volume of air be doubled by doubling its absolute temperature, its velocity of flow will be increased by only 41 per cent. It will not be doubled, and for the same draught power there will not flow into the furnace the same weight of air as formerly. The door is thus open for, or, may it not better be said, closed against, the proper flow of air. To take in the same air supply the flow must be of double the velocity, and, unless there is still a large margin of draft available, the requisite volume of hot air cannot be obtained.

In order that the same weight of air may flow into a furnace its velocity must be doubled, still figuring on the assumption of a doubled, absolute temperature, and if the velocity is double, the energy or $\frac{mv^2}{2g}$ will be quadrupled. The power required to give the same weight of air is thus also quadrupled, and ordinarily the chimney could not be so raised as to do this. Velocity of flow due to head varies with the square root of the head, and this seems to indicate a chimney four times higher than that for cold air supply. Unless, therefore, small volumes of air are needed, it looks as though heating a boiler "draft" could not be a success.

The chief resistance to the entry of air to a boiler furnace is the grate and the fuel on it, and there does not, on the face of it, seem much prospect for a hot draft under the grate. But for the air needed over the grate, entering by way of orifices not blocked with fuel, there is not much resistance to be overcome and, when burning bituminous coal, there is some prospect of success in the supply above the fire of hot air to burn the gases evolved from the fresh charges of coal. It is not to be supposed that the draft required for heated air can economically be produced by allowing the chimney to be hotter, for this would be throwing away probably more than could be got back in any case by the heating of the draft. The one thing that may be practicable is the production of draft by a fan. It is well known that a fan should work with a mere fraction of the heat that is needed to produce a chimney draft, and it may well be argued that, if there is anything of serious good in heated air supply, this must be forced into the furnace by a fan, and the fan must work upon the air either before it enters the heater or after it has passed all the heat-absorbing surfaces.

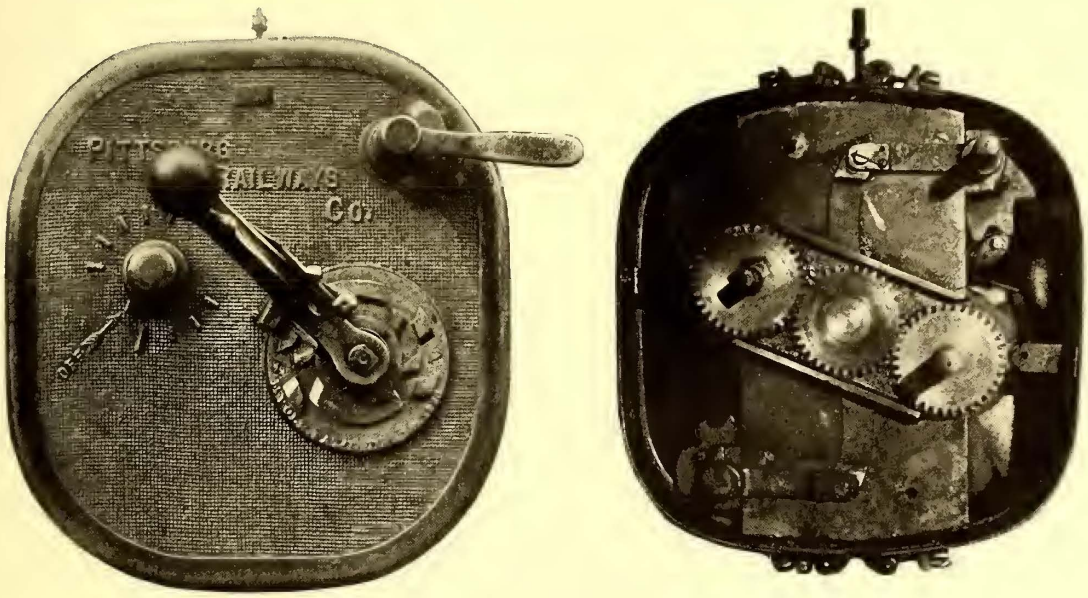
The difficulties of heated air and its disappointments are seen to be due to mechanical causes, and a recognition of such causes will serve perhaps to prevent indulgence in too sanguine hopes of air heating. Since, however, it is the grate and the fuel bed which constitute the greater part of the resistance to the flow of air to a furnace, the conclusions reached do not necessarily apply where liquid fuel is consumed. This, indeed, is well known to be the case. It also follows that with a given chimney and liquid fuel a heated air supply is likely to be more successfully applied

than with solid fuel, unless the solid fuel is supplied without grate resistance; that is to say, in the state of powder or fine dust. Hot air has always been a success when applied to gas firing, for again there is no serious resistance to its flow and, though failures have resulted from the application of hot draft to solid fuels, it is not the heat that is the true cause of failure, but the want of sufficient air that is indirectly brought about by the expansive effect of heat and the provision of only the same air passages.

DOUBLE CONTROLLER USED BY THE PITTSBURG RAILWAYS COMPANY

The Pittsburg Railways Company, instead of purchasing new four-motor capacity controllers, has adopted the novel expedient of backing its old two-motor controllers in pairs and turning their cylinders as one by using an intermediate idler which meshes with a gear on each cylinder. The company is applying this scheme to K-2, K-10 and K-11 controllers in connection with four 50-hp motor equipments, but the same thing can be done with any controllers of D form by using the proper size idler.

The controllers are bolted back to back on the car platform, with or without intermediate insulating fillers as judgment may indicate. The tops of the controllers are removed and replaced by a new cover which contains the mechanism for the two-fold control. This mechanism, as shown in one of the accompanying views, consists of a plate and three gears mounted. Two of these gears are attached to the controller spindles while the intermediate one acts as an idler. Consequently, by attaching the regular controller handle to either cylinders it is possible to turn the other at the same time. The notch for indicating the current steps remains the same as on the original K-type controllers. Reversing is effected with one of the original reversing handles, simultaneous action being secured by the underplate levers connecting the reversing cylinders as indicated in one of the illustrations.



Top of Double Controller With and Without Cover

As the idler gear is removable, one controller may be operated independently in case of trouble with the others. In general any desirable combination of motors is possible, but in Pittsburg one-half of the double controller serves for motors Nos. 1 and 2 and the other for motors 3 and 4. This method was designed and has been patented by P. N. Jones, electrical and mechanical engineer of the Pittsburg Railways Company.

PROTECTION FROM LIGHTNING

In the report of the committee on protection from lightning, read before the National Electric Light Association, Chicago, May 22, the following recommendations are made:

Each company should keep a simple record of the locations and causes of all lightning troubles and the amount of injury due to lightning. Some standard method should be used by all companies, and your committee would urge all the members who have adopted any form or method of keeping records to contribute their ideas to the committee so that the best form, or a combination of the better ones, may be recommended to the association as an aid to the various companies who desire to find out the results they are obtaining from their protective apparatus.

Station arresters should always be located where they can readily be inspected and cleaned. Regular weekly inspections should be made, and the arrester grounds should be inspected at regular intervals. Test papers should be left in the arrester gaps and examined after each storm.

In installing lightning arresters and other protective apparatus the conditions must be carefully studied, so as to obtain the very best protection. Lightning arresters are necessary on all circuits, and should be installed on distribution circuits where there is apparatus to be protected.

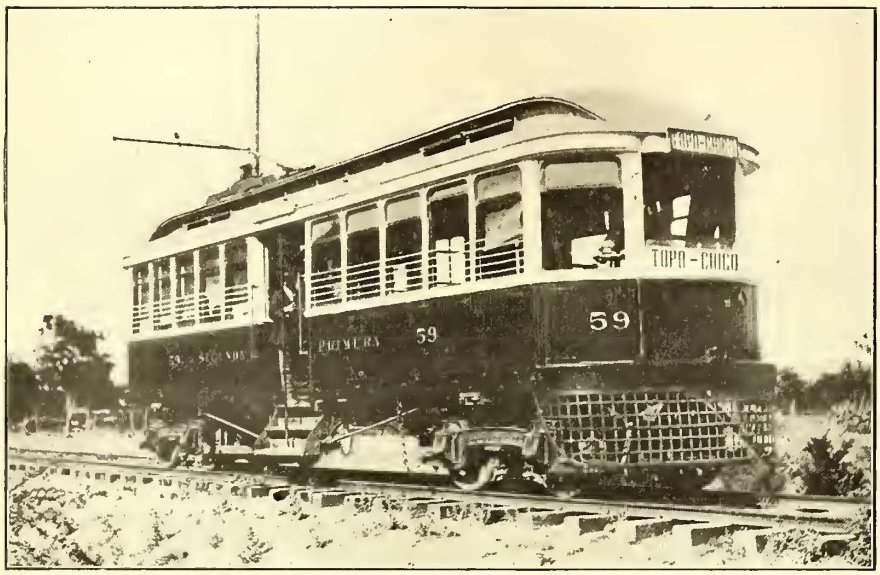
Choke coils have a definite value, but are not to be recommended for promiscuous use. Where experience or calculation indicates their use they should be installed. Used in the wrong place, they may do harm.

Grounds should be made as perfectly as possible. The committee on grounding of secondaries has considered this subject very carefully this year, and has proposed for the National Electrical Code a set of rules for the construction of grounds. A few feet of ½-in. pipe have been considered in many cases ample for driven pipe grounds. Such a ground would not be permanent even under ideal conditions. The proposed rules specify heavier pipe driven deep into the earth. The conductivity of grounds should be tested by blowing at 110 volts a 2-amp fuse connected to the ground wire whenever it is practicable to make such a test.

The London County Council is considering the advisability of street cars solely for women. The contention is that during working hours women stand a poor show of getting their rights as tramway passengers.

ELECTRIC RAILWAY SYSTEM OF MONTEREY, MEXICO

Although electric power for the operation of industrial and mining machinery has been applied on a large scale in Mexico, electrification of street railways has not taken place as rapidly as might be expected in view of the large number of populous towns in that country. An interesting fact in connection with the electrical development of Mexico is that Canadian people are in control of the two most extensive enterprises of that character, the one at Necaxa and the other at Monterey. These interests and projects, however, are entirely distinct and the towns themselves are situated several hundred miles apart.



Double-Truck Interurban Car

Monterey is an industrial center of more than 80,000 people and has long been considered an inviting field for an electric railway. Owing to its proximity to the United States it has a larger American population than any other city in Mexico. Several years ago some American promoters took hold of the project of electrification, but nothing came of the matter despite the encouragement of the government and municipal authorities. Two years ago, however, the two mule-car systems of the city were purchased by Wm. MacKenzie, of Toronto, on behalf of a Canadian syndicate, after which a concession was obtained for the electrification and extension of these lines. The mule systems, which were about 42 kilometers (26 miles) long and narrow gage, were consolidated and operated by animal traction until the work of electrification was completed. The latter work began in January, 1907, and was finished early in April of this year. The work of changing over presented a number of unusual difficulties, partly because of the decision to use standard-gage track in spite of the very narrow streets. The rail used is 72-lb. T-section, 6 in. high with all-wire bonds. On account of the narrow streets it was difficult to establish a standard system of curves and switch sets simple enough to be understood and executed by native labor. It was finally decided to adopt a system of compound curves, using an entrance radius of 100 ft. or 50 ft. and diminishing to a center radius in some instances of as low as 35 ft. The curves were designed to have chords of even foot lengths over the compound entrances to facilitate the proper curving in the bending yard. By so doing only two types of tongue switches were necessary, namely, those having 50-ft. radius and those having a 100-ft. radius. Derailing devices are installed at all crossings.

The overhead equipment, which is designed for standard 550-volt, d.c. operation, was furnished by the Ohio Brass Company. Bracket construction generally is used, as the track generally is located on one side of the street. The trolley poles are all steel with welded joints.

The power plant, which is situated in the city, consists of one 300-kw and one 400-kw generator, both of the General Electric Company's form S, direct-current type. These generators are direct connected to Harrisburg-Fleming cross-compound engines, the smaller units operating at 200 r.p.m. and the larger at 150 r.p.m. Both units have Bulkley condensers. The steam generating equipment consists of three 300-hp Atlas water-tube boilers with extra large grate surface for burning Mexican coal. The power house is a brick building with steel frame work and steel roof trusses. The roof over the engine room is of tiling and over the boiler house of corrugated iron.

Single-Truck Car for City Service

The passenger equipment now consists of 12 single-truck cars each equipped with two G. E.-800 motors; seven double-truck city cars mounted on maximum traction trucks and equipped with Westinghouse 93-A-2 motors; six interurban cars mounted on St. Louis Car Company's No. 47 trucks, driven by two 93-A motors. Only the double-truck cars have a first-class and second-class compartment. In addition to the regular traffic from the city's industries, the

company operates a 4-mile line to a suburban health and pleasure resort at Topo Chico, where there are some popular medicinal hot-water springs.

The motormen and conductors employed on the line are Mexicans, most of whom saw service on the mule cars. They have been carefully trained for the electric service and are proving quite proficient. The company has had some difficulty in making the lower-class native realize that the electric cars are traveling at somewhat greater speed than a mule canter, as many of them still have the habit of jumping off the moving car wherever they please.

The personal representative of the owners while the reconstruction was in progress was Lewis Lukes. F. H. Lancashire, now engineer and manager of the company, was the engineer in charge of construction. The other chief operating officers are: Samuel Irvine, superintendent, who came from Toronto to reorganize the mule service; E. R. Rust, comptroller; Frank Page, master mechanic, and Thomas Murray, power station engineer. The company has almost completed the electrification, in which it has received the encouragement and assistance of the municipal authorities and of Bernardo Reyes, Governor of the State of Nuevo Leon, of which Monterey is the capital.

ELECTRICAL ENGINEERING LABORATORY AT WORCESTER

An account was published in the STREET RAILWAY JOURNAL for Feb. 15, 1908, of the car-testing plant of the Worcester Polytechnic Institute. It forms part of the general electrical laboratory of the institute, which has recently been completed. An interior view is given herewith. The laboratory is 200 ft. in length and is served by a 100-ton electric traveling crane. With its galleries it has a floor area of 19,400 sq. ft.

The car-testing equipment occupies one end of the laboratory, the end in the engraving farthest from the observer. The rest of the equipment in the general

Test Car and Tracks to Laboratory

laboratory embraces over 50 generators and motors, including all the important types, 40 transformers of various types and sizes, over 200 instruments, two storage batteries, one of 160 cells and the other of 60 cells, and a large collection of special machinery and apparatus. This equipment is arranged with special standardized terminals and circuits so that any combination of circuits, instruments and apparatus is readily secured for experimental purposes.

The heavier machinery is placed upon the main floor, while the galleries are used for experimental work involving the lighter machinery, or for special work which it is desirable to remove slightly from the main floor and yet keep in close touch with its equipment. Smaller rooms for storage battery, telephone, photographic, photometric or other special work are conveniently located.

Electrical Laboratory of Worcester Polytechnic Institute

The power for the laboratory is supplied at 2200 volts by underground cables from the power laboratory of the institute, where are three service units in charge of the electrical engineering department.

WARSAW ELECTRIC RAILWAYS

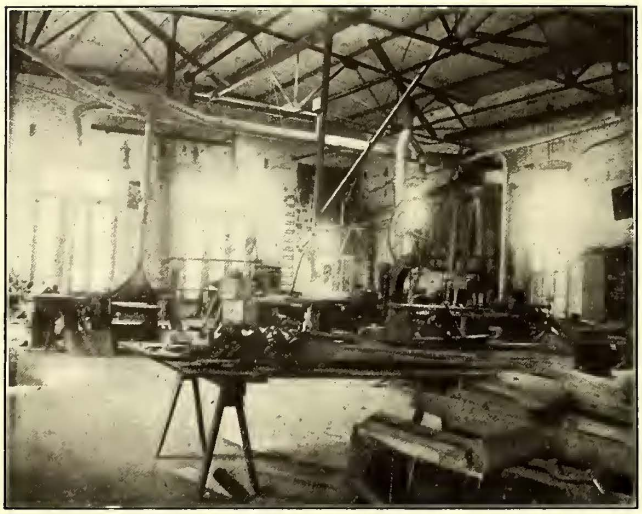
The electric railway opened in Warsaw, Russia, in April succeeds horse-drawn cars introduced in 1881 by a Belgian company, which in 1889 sold it to the city for an annual payment of $175,000 until the expiration of the concession, in 1916. Operating 304 cars and charging passengers 3.6 cents first class and 2.5 cents second class for not exceeding two miles, a gross revenue of $839,052 was secured in 1907. The daily hours of employees are from 7 a. m. to 11:30 p. m., with intervals for meals, for which drivers receive 62 to 67 cents; conductors, 62 to 83 cents. Inspectors receive $30.90 to $41.20 per month. The construction work was carried on through a building committee appointed by the Emperor. The principal private contractors were German electric companies. The system is to be managed by a syndicate, which has closed a contract with the city until 1922. The syndicate agrees to pay the city an annual sum of $207,030 and 5½ per cent on the invested capital of about $3,605,000. Out of these receipts the city will continue the payment of about $175,000 per annum to the Belgian Company up to the year 1916. After the expiration of this liability the income passes into the city treasury. Whatever surplus net profit remains after payment to the city of the sums agreed upon is to be divided into equal parts between the city and the syndicate.

The Lisbon Electric Tramway Company reports a net profit of £93,000 for the year 1907. This is very gratifying to the managers of the company, as Spain has suffered considerably from political unrest and financial depression the past year.

CAR REPAIR SHOPS IN MOBILE, ALABAMA

The Mobile Light & Railroad Company operates a system including about 52 miles of track and requiring about 107 cars to handle the traffic. Fourteen cars are double truck and the rest single truck. Of these cars 33 are of the single-truck open type used from May to November, and 36 semi-convertible, used the year round.

All cars are maintained at the new Monroe Park shops, which are provided with about 3000 ft. of track under cover. The company also has a car house located at Spring Hill Avenue and another at Royal Street. The former has a storage capacity of 18 cars and the latter of about 35 cars. Besides the shops and main car house at Monroe Park, the company owns at this point a four-track shed for storing trailers. During the warm season the company rents this shed to picnic parties and in rainy weather the arrangement has been of great value. The Monroe Park shop property is about 1000 ft. long and 600 ft. wide in its longest dimensions and has both loop and through tracks. The car house and machine-shop building is provided with nine through tracks and five additional parallel tracks with stub ends. This building is in the north central section of the property and has recently been enlarged by a four-track brick extension 45 ft. wide by 225 ft. long. The total length of the shops is now about 250 ft. and the maximum width 225 ft. The carpenter shop is east of the machine shops.



Mobile Repair Shops—Exhausters in the Mill Room

In the main shops tracks 1, 2, 3 and 4 are new and tracks 5 to 14, inclusive, are about nine years old. The shop arrangement, however, is largely new. Pits are provided in tracks 8, 9, 10, 11, 12, 13 and 14. A general view of the shop exterior is shown, the buildings being of brick, with composition tar and gravel roof on the old section and a reinforced concrete roof on the new part of the structure Ample skylight facilities and plenty of room for expansion in the future are provided. In operating the shops tracks 1 to 7, inclusive, are used for car storage, tracks 8 to 10, inclusive, for inspection and tracks 11 to 14 for repairs.

The machine shop has a blacksmith division, 22 ft. by 30 ft., with four forges and the usual tools. Forced draft for the forge equipment is provided by a 12-in. Buffalo blower. The fan exhausts into a 4-in. duct trunk line made of sewer pipe and from this 4-in. branches are taken to feed the individual forges. The machine shop tools are group driven by a single-phase, 5-hp, 110-volt G. E. motor located on top of the armature room, which is set off at one side of the shop. An overhead traveler connects the armature room with the rest of the shop. A 500-volt, d. c. motor is reserved to run the shop machinery should the alternating-current supply fail. In the near future S. M. Coffin, master mechanic and chief engineer, plans to install an inclined track in the machine shop to facilitate inspection and light adjustments required under the cars. It is probable that when this arrangement is effected a traveler will be installed so the wheels can be taken with minimum delay from the inclined track to the wheel press, the latter being located at the end of the shop nearest the proposed incline.

The armature room is provided with the usual equipment for this class of repairs. The armature rack shown consists of a hard pine frame with main members, 16 in. deep and 3 in. wide, braced at the top and bottom. The pins for supporting the armatures are composed of ordinary ¾-in. pipe sunk into the frame. This rack has a

Mobile Repair Shops—Repair and Construction Shop

home-made jib crane consisting of a 16-ft. mast set with 1¼-in. cold-rolled pins at the ends to enable the mast to swing around a vertical axis. The mast is provided with a ⅜-in. x 3½-in. curved bar iron bracket carrying a 1-ton differential hoist used to handle the armatures.

The carpenter shop tools are group driven by two 10-hp, 220-volt a. c. motors, but d. c. motors are available should there be an interruption in the a. c. circuit. One of the best features of the carpenter shop is the arrangement in

use for handling the sawdust and shavings from the different tools, shown in one of the views. The exhaust fan is operated by a 10-hp motor, both located on a platform, about 15 ft. above the floor. The fan, 36 in. in diam., is located at the outlet of a 14-in. main duct, which receives from appropriate branches all the sawdust and débris from the several wood-working tools. The discharge pipe from the fan is 12 in. x 16 in. in section, leading to a chamber outside the plant, where the sawdust is collected and later burned. The ducts leading from the different machines are brought into a trunk line varying in diameter from 6 in. to 14 in. on its way to the fan.

For the most part inspection and car cleaning are done at night. The blacksmith force includes four men, the paint shop three men, the carpenter shop eight men and two helpers, and two machinists handle most of the work in the machine shop. For pit work, wiring, motor and truck

Mobile Repair Shops—Armature Rack and Home-Made Chain Hoist

inspection and repairs six men and four helpers are required. In the armature room are three men, who also handle repairs of valves, governors, compressors and controllers. From 48 to 50 cars are operated by the company at any one time. The men in the different parts of the shop do not always confine themselves to one class of work, but the more delicate repairs are handled by the armature-room force.

Car windows are cleaned daily and other parts once every week or 10 days. The company does not use air in this cleaning, as it is considered objectionable in comparison with water. Arc headlights are inspected daily by the day men at Spring Hill Avenue barn, from which they all run. The daily motor inspection includes brushes, commutators, coils and bearings. The new track for the inspection of the under sides of cars will be raised on concrete foundations, 42 in. above the floor level, and will be about 60 ft. long. Armatures are changed with a pit jack, dropping the lower halves of the motors. Commutator segments are tested for grounds and short circuits by a 500-volt grounded light connection, adjacent segments being tested between segment and ground by the application of full line potential.

THE EXPANSION OF THE PAY-AS-YOU-ENTER PLAN

In view of the widespread consideration which lately has been shown the pay-as-you-enter plan of fare collection, it may be of interest at this time to review briefly the extent to which street railways have adopted this new design of car.

The pay-as-you-enter cars were first put in operation in Montreal in June, 1905. But few were at first tried. Within a year's time, however, the Montreal Street Railway Company had installed 125 pay-as-you-enter cars, and since has adopted the plan for its entire system. The type of car used in Montreal has frequently been described. Of this type, which has 9-ft. platforms and is designed for single-end operation, there are 300 now in successful use.

On Nov. 24 the Chicago City Railway Company began operating pay-as-you-enter cars on its Cottage Grove Avenue lines. This company has extended the use of these cars to its Indiana Avenue lines and to the State Street lines. There now are operated on the South Side lines in Chicago 300 double-end pay-as-you-enter cars, and at the Chicago City Railway shops 100 of the 1905 type of cars of this company are being reconstructed so that the pay-as-you-enter plan of fare collection may be used.

The International Railway Company, of Buffalo, N. Y., on Jan. 5, 1908, began operating on its city lines in Buffalo the first of 100 double-end pay-as-you-enter cars. The service was inaugurated without trouble and the company is at present altering 150 of its larger earlier type cars, so that the pay-as-you-enter methods may be used.

The New York City Railway Company began operating 155 double-end pay-as-you-enter cars on March 22, 1908, and is said to have under consideration the use of an additional 100 cars of a similar type. The New York cars will be provided with longitudinal seats while those in the other cities mentioned have cross seats in the center of the car and longitudinal seats at the ends.

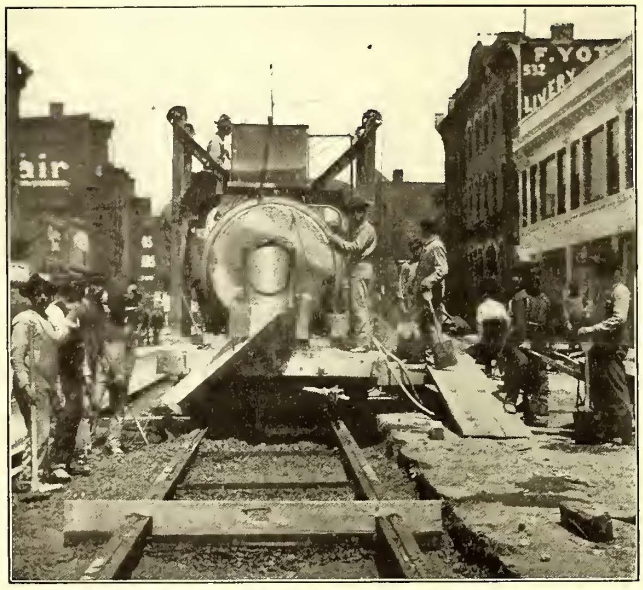
The fifth company to put pay-as-you-enter cars into service was the Public Service Corporation of New Jersey, which on April 15, 1908, began introducing 150 single-end cars into its regular schedules in Newark. This company is now considering the alteration of 400 of its large double-truck cars so that the pay-as-you-enter features may be used.

Immediately after the reorganization of the Chicago Union Traction Company its successor, the Chicago Railways Company, placed an order for 350 double-end pay-as-you-enter cars, 50 of which equipments will be constructed of steel. It is said that this company is also considering the immediate purchase of 300 more cars of the pay-as-you-enter type. It also has been announced that The Milwaukee Electric Railway & Light Company is altering a number of its city equipments so that they may be used as single-end pay-as-you-enter cars. The United Railways Company of St. Louis also is considering the reconstruction of some of its standard double-truck cars so that the benefits obtainable by the use of the pay-as-you-enter plan may be had.

No serious defects have been found in the service rendered by the new cars, and there practically has been no opposition to their use, either by the public or the railway employees.

TRACK CONSTRUCTION METHODS OF THE CHICAGO RAILWAYS COMPANY

When the Chicago Railways Company accepted the rehabilitation ordinance last February, preparations were made to begin at once on an extensive programme of track reconstruction on the north and west sides. Some reconstruction work was done by this company last year complying with the standards specified by the board of supervising engineers, in anticipation of the acceptance of the



Pouring End of Concrete Mixer

rehabilitation ordinance, but the programme for the year 1908 is much more extensive. It includes the reconstruction of both tracks on North Clark Street from Washington Street to Addison Street; on Van Buren Street, from Clinton Street to Kedzie Avenue; on Halsted Street, from Van Buren Street to Lake Street; on Milwaukee Avenue, from Desplaines Street to North Avenue, and on Blue Island Avenue, from Harrison Street to Seventeenth Street.

The Clark, Madison, Milwaukee and Blue Island Avenue lines were formerly operated by cable, and the track reconstruction includes the removal of the cable slot and rail yokes, and the construction in the cable trough of a multiple-tile conduit system in which feeder and return copper cables are to be laid.

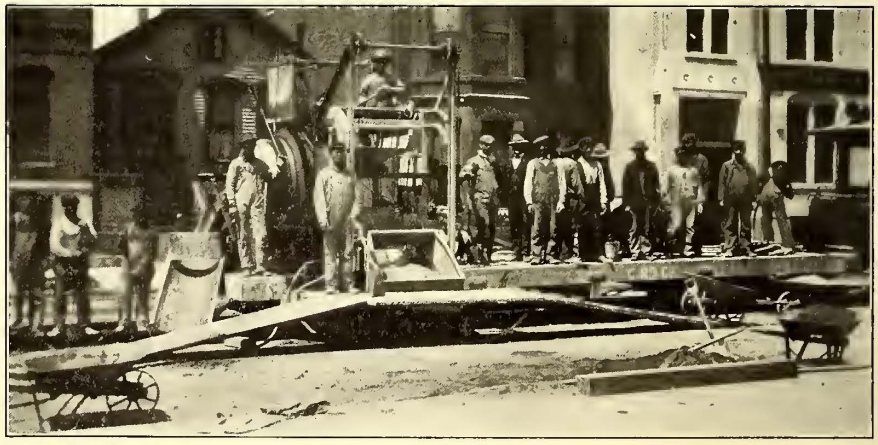
All of the track reconstruction outlined in this programme, except a short section at the west end of Van Buren Street, will be built after the design described as type No. 2 by the board of supervising engineers. This design calls for the standard grooved rail approved by the city, supported on wooden ties embedded in concrete. The western end of Van Buren Street is built on a fill on the prairie and for this reason No. 3 type of construction, using wooden ties on rolled broken stone ballast, will be employed.

In the Street Railway Journal Oct. 26, 1907, a description was given of the reconstruction methods of the Chicago City Railway Company, which last year rebuilt about 25 miles of track under the terms of its ordinance. The methods described at that time are being employed by the Chicago Railways Company in its track reconstruction of the present year, with some few modifications, particularly in the matter of mixing concrete.

So far traffic on the lines being rebuilt is handled by keeping one track open and diverting the normal traffic of the other track to a parallel line. The first step in the reconstruction is to tear up the paving and cut the tie rods and bolts holding the track rails to the cable slot yokes. The rail joints are then broken off and the rails and cable slot are dragged out of the trench with a team of horses or a motor car. The trench is excavated down to the concrete in which the cable slot yokes are embedded, and the concrete is broken away with picks on each side of the yokes. A piece of T-rail about 10 ft. long and having six fixed handles is used as a battering ram to break off the cast-iron yokes below the level of the bottom of the trench, no attempt being made to remove them entirely. The concrete surrounding the cable slot is cut away sufficiently to expose its full cross-section, and the base of the trough is then filled with gravel concrete as a bed on which single-duct tile conduits are laid. Splicing chambers of brick are built about every 500 ft.

After the tile conduit has been laid, the ties, spaced on 4-ft. centers, are placed in the trench and the space between the ties banked up in mounds about 6 in. high with spoil from the excavation, which is allowed to remain in the gutter of the street. These mounds are thoroughly tamped and rounded off and serve to displace an equal amount of concrete in the sub-base. Following this the rails are fastened to the ties with screw spikes and connected together with temporary two-bolt splice plates. The ties are then blocked up at each end and the track lined and surfaced. This completes the preparation for the concrete sub-base.

The concrete used is a mixture of 1 part cement, 3 parts sand and 6 parts stone, mixed wet and thoroughly tamped in place. Both hand and machine mixing are employed.



Loading End of Concrete Mixer

With hand mixing two boards are placed on top of the rails manned by six mixers each, and the concrete is scraped off the end of the boards uniformly across the width of the excavation. These two boards, working under favorable conditions, can lay 500 lineal feet a day. They begin in the morning about 250 ft. apart, and at the end of the day the rear board has been worked forward to the point where the forward board began.

Two machine mixers of a new design are now at work and give satisfactory results. They were designed and built especially for this purpose by the Chicago Concrete

Machinery Company. The mixer and skip bucket are mounted on one end of a low flat car which runs on the temporarily supported track in advance of the concreting and which is moved by a light single-truck motor car coupled to it. The machine consists of a standard No. 1 Chicago concrete mixer, having a swinging discharge spout, and skip buckets on each side for raising the batch after it has been unloaded from wheelbarrows and automatically depositing it in the feed spout. The mixer is driven by a 15-hp motor and the skip buckets are raised by the same motor through individual friction clutches on a chain-driven shaft.

The mixer has a capacity of 1/3 cu. yd. and the skip buckets are designed to hold 13 cu. ft., which is just the proper amount of unmixed aggregate for one batch. With a skip bucket and hoist on each side the machine can be worked on either track while the other is open for traffic. When the machine is working on one track and the other track is to be kept open for traffic, the inside skip bucket is removed so as to give proper clearance for passing cars. The skip buckets are fitted with guide rollers working in a track made of steel channels which form part of the framework supporting the feed spout of the mixer. As the bucket is hoisted by a cable working over a sheave on top of a frame, the run-way in which the guide rollers work automatically guides and tilts the bucket, discharging its contents into the feed spout. Each skip bucket has its individual hoist drum, friction clutches and brakes, so that it may be controlled independently of the other. A safety stop automatically disengages the hoist clutches when the skip buckets have reached their extreme height.

The discharge spout at the end of the car is made in two parts. The upper spout, which is pivoted to swing in a vertical plane, can be swung into the discharge opening of the mixer to catch the concrete as it falls from the mixer drum.

This upper spout discharges into the lower spout, which swings in a horizontal plane. The discharge can be directed at any point across the entire width of the trench, and very little spreading with shovels is required. Both spouts are inclined at a sharp angle so that the concrete flows freely over them.

The mixer is equipped with an automatic measuring water tank which supplies exactly the right amount of water to each batch. After the tank valve is once adjusted no skill is required on the part of the operator to keep the concrete at the right consistency.

In operating the machine a hoist operator and one discharge operator, who also handles the water tank, are required. The sand and stone are distributed in piles along the curb and are loaded into wheelbarrows by hand. The wheelbarrows are run up on an incline run-way mounted along the side of the car carrying the mixer and are unloaded into the skip bucket from a platform only 2 ft. above the level of the street. A run-way beyond the unloading platform permits the empty wheelbarrows to be run off without interfering with loaded barrows coming up.

The capacity of the machine is between 50 and 60 batches an hour; or, a total of about 150 cu. yd. of concrete per day of eight hours. As the amount of concrete required to be laid averages about 1650 cu. yd. per mile for each track, the machine can cover from 500 lin. ft. to 600 lin. ft. in eight hours. This equals the output of a continuous mixer of the same size.

The framework of the machine and bucket hoist is rigid and strong and all parts are designed for wear and hard usage. The height has been kept down to a minimum in order to enable the machine to be run under subways and other overhead structures, and with the skip buckets removed, the mixing equipment is no wider than a standard passenger car.

The concrete as it is delivered from the mixer is thoroughly tamped to a depth of 6 in. under the ties and spread across the entire width of the trench, about 8 ft. It is brought up to a level surface 6½ in. below the head of the rail, thus completely embedding the ties, the base of the rails and tie rods. At the rail joints the concrete is brought up only to the level of the top of the ties in order to permit the rails to be welded later without disturbing the concrete. After the concrete has been allowed to set for about two days a layer of sand, 1½ in. thick, is spread over the top and paving is begun. The space between the rails and outside of the rails is paved with 5-in. granite blocks laid with tar and gravel joints. The rail joints are spaced opposite each other and the paving is left open for about 5 ft. at each pair of joints until after the welding is completed.

Welding is not begun until after the concrete has been allowed to set seven days. This part of the work is being done with a regular outfit of the Lorain Steel Company consisting of a sand blast car, a welding car, a transformer car and a grinding car. The joints are welded with a 3½-in. x 1-in. bar on each side of the web. After the grinding car has finished the joints the paving is completed, but the finished track is not opened to traffic until 14 days after the completion of the concreting.

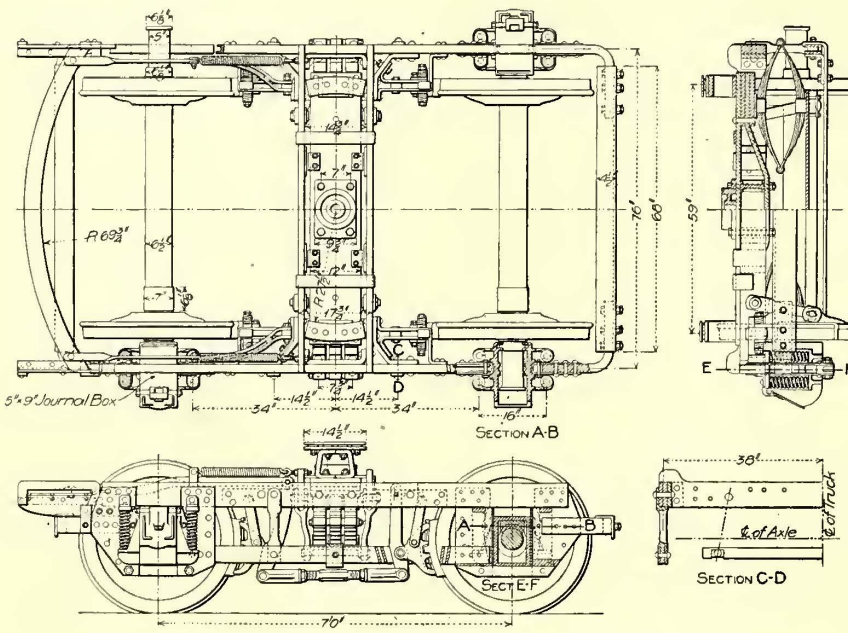
The same methods of supervising the track reconstruction by representatives of the board of supervising engineers, as were outlined in the description of the track reconstruction of the Chicago City Railway Company, earlier published in the STREET RAILWAY JOURNAL, are being followed on the work of the Chicago Railways Company. R. F. Kelker, Jr., is division engineer of the supervising board in charge of the general track reconstruction. J. H. Powers, division engineer, is in charge of the actual construction work under the direction of C. A. Caul, general roadmaster of the Chicago Railways Company.

The Louisville Railway is said to be considering a plan to equip several of its interurban lines with specially designed truck-garden cars to be used in supplanting to a large degree the wagons which bring the city's greenstuffs into the market during the early morning hours. The tentative plan is said to provide for this service on the Jeffersontown, Fern Creek, Orell and Okolona lines, which tap extensive and fertile garden spots. The cars would load out in the country from midnight until 3 o'clock in the morning and would be switched until unloaded after reaching the city at Haymarket Square and along Commission Row, which is in the neighborhood of Preston and Second and Jefferson and Green Streets. Here the garden products could be speedily unloaded and then distributed over the city by the produce merchants.

An amateur baseball league is being organized by the Eastern Railways Company, of Pottsville, Pa., to comprise the towns of Lansford, Coaldale, Tamaqua, Schuylkill Haven, Orwigsburg, Minersville and Pottsville. The company will put up a cash prize and a 15-ft. pennant for the winning club. The games will be played in Pottsville on the Tumbling Run grounds.

THE CURTIS HIGH-SPEED MOTOR TRUCK

The Curtis Truck Company, Decatur, Ill., has recently equipped three interurban cars of the Toledo Urban & Interurban Railway Company with forged steel motor trucks of a new and interesting design. These cars are in limited train service between Dayton and Toledo, Ohio, and run on a fast schedule. The distinguishing features of these trucks are the forged steel construction used throughout and the arrangement of spring supports to give easy riding qualities. With the exception of the journal boxes, center plate and brake heads and shoes, no castings of any kind are employed. The trucks have steel-tired wheels 36 in. in diameter with treads 4½ in. wide. They have axles with M. C. B. journals and carry two 75-hp motors.



Curtis Motor Truck—General Design

The side frames are built up of top and bottom wheel pieces, both being forged open-hearth steel bars. The upper wheel piece is a rectangular bar extending the length of the truck over the journal boxes and set on edge to utilize the full strength of the section. Below it is the lower wheel piece made up of two flat bars on edge and securely riveted at the ends to the bottom of the inside pedestal jaws. The upper and lower wheel pieces are separated by two forged steel posts or spreaders.

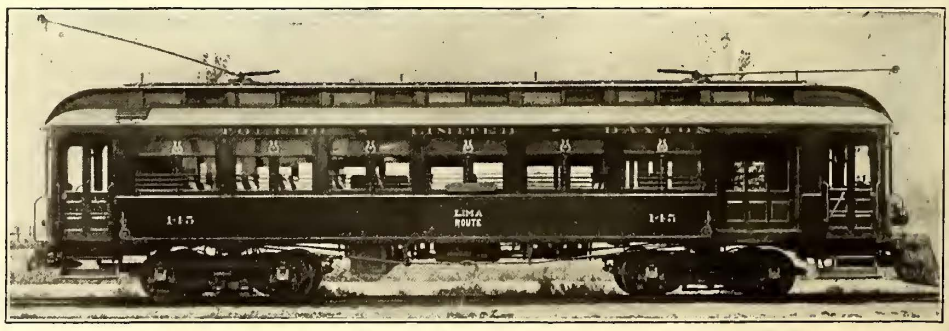
Each of the pedestal jaws is made of an open hearth steel plate bent double and riveted to the upper and lower wheel pieces. A forged spring bar passes through each jaw under the upper wheel piece and extends out far enough on each side to engage with the spring caps of the 3-in. spiral journal box springs. These springs rest on spring seats cast on the journal boxes and transmit the load direct from the upper wheel piece through the spring bars to the journal box. This relieves the pedestal jaws from any vertical load. There are four springs to each journal box, two outside and two inside the pedestals, making a total of 16 springs on each truck or 32 per car. They have a free height of 10½ in. and are compressed to 8½ in. by the weight of the car body. The upper wheel piece is carried far enough above the journal box so that the four springs will set solid before the wheel piece can strike the top of the box. The spring bars are designed to have a shearing strength of 375,000 lb. each to provide against any excessive shocks.

Both the journal boxes and the pedestal jaws are provided with removable chafing plates to take up wear. The journal boxes can be quickly removed by taking out a turned steel bolt at the bottom of each pedestal jaw and dropping the pedestal tie bolt.

The truck end sills are made of 5-in. x 4-in. x ½-in. steel angles, fastened to the curved truck corner piece at each end with three machine-fitted bolts. These corner pieces are bent with a 3-in. radius from a steel bar 4 in. x 2 in. and are carried along the upper wheel piece into the outer pedestal jaw where they are riveted up. This construction gives a strong corner connection, keeps the frame square and is less liable to fracture than a sharp square corner.

The transoms on each side of the bolster are 1½-in. x 6-in. steel bars set on edge and upset at each end to rest on top of the upper wheel pieces. They are fastened to the wheel pieces by 1-in. x 6-in. corner braces on the outside corners and a 1-in. x 6-in. U-shaped spreader passing around the end of the bolster. These braces are securely riveted to the transoms and wheel pieces. These rivets, however, are not depended upon to carry any of the load in shear; the ample bearing of the transom ending directly on top of the wheel pieces carries all the load.

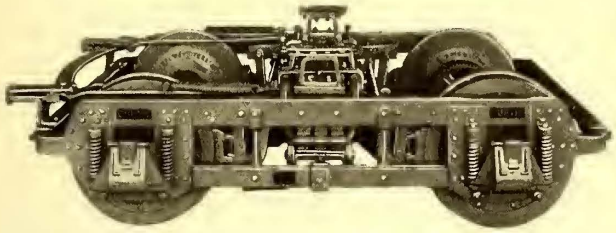
The bolster is built up of two plates with filler blocks between and rests at each end on 30-in. triple elliptic springs having a height between bands of 4 in. under car body load. These springs are carried on a 12-in. channel spring plank which in turn is hung from swing links pivoted from the transoms in the usual way. The bolster is made short so that it cannot swing sidewise and strike the wheel pieces. It has removable chafing plates engaging with similar plates on the transoms. All of these plates can be renewed without lifting the car body or removing the bolster.



Curtis Motor Truck—Limited Toledo-Dayton Car

The swing links are forged with jaws at the upper ends and all pin holes are case hardened. The pins are 1½ in. in diameter and are likewise case hardened, as are the bushings in the transoms. The point of suspension of the links is so located as to secure the greatest amount of resistance to side thrust.

The motors are inside hung with spring-supported nose bars carried by brackets riveted to the transom. The trucks are equipped with Curtis anti-friction, non-chattering brake rigging for inside-hung brakes. The principal advantages

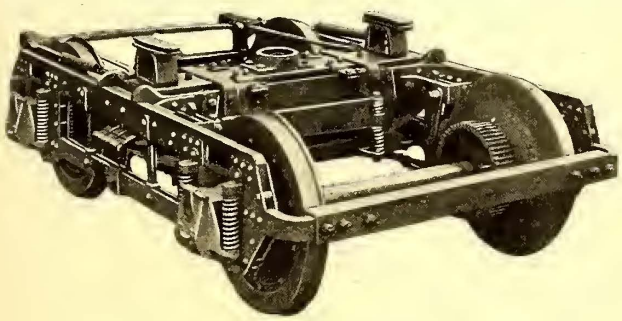


Curtis Motor Truck—Side View

claimed for this rigging are even wear of the brake shoes, straight brake levers requiring no brake beams and entire absence of chattering or rattling.

These trucks have been designed to withstand the hard usage of high-speed service with a minimum amount of repairs. The use of steel forgings throughout and provision for taking up wear reduce the maintenance cost to the smallest figure. One of these trucks which has been in high-speed interurban service for nearly a year, and which has made about 94,000 miles in that time, has only required repairs costing less than $2.

The principal advantages claimed for the design as a whole are easy riding qualities, great strength and simplicity of construction. The four small springs directly over each journal box absorb the shocks of each wheel as they occur without transmitting them to the truck as a whole and to the car body. Their vibration is short and quick and they respond faster than a single slow-moving spring of the same capacity. The height of these springs above the journal boxes also contributes to the easy riding qualities in reducing the effects of longitudinal surges of the trucks when stopping or starting. Lateral ease of rid-



Curtis Motor Truck—Three-Quarter View

ing is attained by locating the swing link supports at a point to give maximum resistance to side thrusts of the bolster.

All parts of the truck are made accurately to templates and are perfectly interchangeable. Bolts and bolt holes are reamed and machine fitted. Rivets are driven with a 70-ton riveting press. A noticeable feature of the design is that no rivets are subjected to shearing stresses of the car-body load.

Curtis trucks of older design are in use on the Boston Elevated, the Cleveland & Southwestern Traction Company, Illinois Traction System, Toledo & Western and on the Philadelphia Rapid Transit Company's lines. This latter company has 98 elevated cars and 375 double-truck surface cars equipped with them.

The Curtis Truck Company has recently been organized with ample capital to manufacture these new trucks under the direct supervision of Mr. Curtis. The officers of the company are: J. P. Drennan, president; W. N. Wood, vice-president; E. A. Curtis, designer and superintendent; R. D. Wood, engineer; J. D. Johnson, secretary and treasurer. A large new shop has been completed at Decatur, Ill., and is equipped with all necessary forging and machine tools, many of which are of special design, to produce the special parts of these trucks. All of the larger machine tools are electrically driven and a full line of air hammers, drills and other small tools used in assembling has also been installed.

DIRECT-CURRENT PORTABLE INSTRUMENTS

A new line of direct-current portable ammeters, voltmeters, mil-ammeters and milli-voltmeters with the necessary portable shunts known as type DP has been placed on the market by the General Electric Company. The instruments are designed especially for laboratory and general testing purposes and are constructed on the well-known D'Arsonval principle, the coil of wire carrying the current to be measured, or a shunted portion of it, being wound on a rectangular frame mounted on jeweled bearings, which is free to move in the annular space between a soft iron core and the pole pieces of a powerful permanent magnet.

The case is of drawn steel with a cast iron cover, thus thoroughly protecting the instrument from the influence of stray fields. The magnets are of high-grade magnet steel and their permanency is assured by improved processes of ageing and hardening. The scales are uniform throughout their entire range and are very legible. To eliminate errors due to parallax, the instruments are equipped with flat pointers viewed on edge and a mirror is placed under the scale.

New Portable Instrument

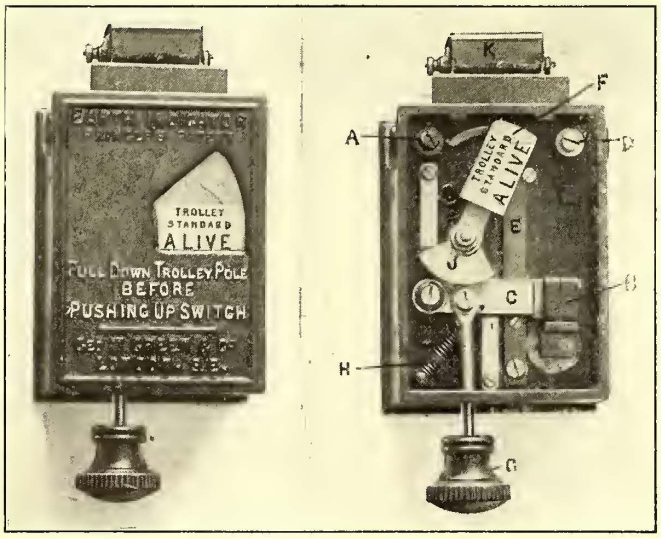
Ammeters are made self-contained in capacities up to and including 30 amp. For higher ranges up to 2000 amp. a milli-voltmeter with scale marked directly in amperes is used with a portable shunt. These shunts are designed to give a uniform drop of 200 milli-volts at full load rating and are interchangeable. The milli-voltmeters used with these shunts are also interchangeable. The portable shunts are mounted on a base of aluminum alloy and are protected by a perforated sheet metal casing. A DP milli-voltmeter can be furnished for use in connection with switchboard shunts, the instrument giving full scale deflection when subjected to a 60 milli-volt drop in potential, or a tap may be brought out at 60 milli-volts on the standard 200 milli-volt voltmeter, enabling it to be used with both portable and switchboard shunts. Where it is desirable to use one instrument to cover a wide range of current, a milli-voltmeter can be furnished for use with any combination of single, double or triple rated shunts, so selected that regardless of capacities chosen, the scale readings may be quickly determined. Voltmeters of the DP type are furnished self-contained in capacities up to and including 750 volts. Double scale or low reading instruments can be supplied if desired.

TROLLEY EARTHING DEVICE FOR DOUBLE-DECK CARS

A simple trolley standard earthing device is being supplied by the Consolidated Accessories Company, of London, Eng., for double-decked cars in which the standard must be kept at zero potential to avoid possibility of accident to passengers.

The standard is not connected to earth through lamps, or resistances shunted by fuses, but is earthed through a suitable connection of very low resistance, with signals in circuit that are both visible and audible and operate on a few amperes, the visible signal remaining after the removal of the earth. Furthermore, it is impossible with the device to reset the signals to safety without at the same time automatically removing the earth connection, but making it possible to remove the earth connection so that the car may be taken back to the depot under its own power. Interior and exterior views of the device are shown in the accompanying illustration.

The terminal *D* is in connection with the switch contact *B* and is coupled up directly to the trolley standard. The switch blade *C* is connected to the earth terminal *A* by means of a solenoid containing a comparatively small number of turns of copper tape, situated at the underside of the



Earthing Device with Cover On and Off

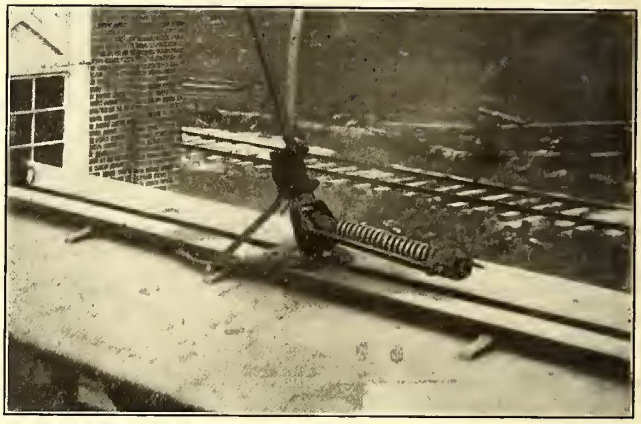
base, giving practically a dead earth connection. Any leakage current passing to earth through the solenoid from a few amperes upward is sufficient to attract the armature *E* and release the danger-indicating flag *F*, which then drops to the position shown in the exterior view, an alarm bell being rung at the same time.

In normal position the indicating flag is hidden behind the case and the segment-shaped piece *J* interlocks with the rod attached to the handle *G* and prevents the switch being opened. Pushing up the handle *G* opens the earth switch, and the blade interlocks with the indicating flag *F* and retains it in the position shown in the exterior view, making it impossible for either the switch or the flag to be tampered with. The opening of the earth switch causes the alarm bell to cease ringing, but leaves the danger signal visible. On the repairs being made, it is impossible for the indicating flag to be set to position of safety without automatically renewing the earth, as on moving the flag to its normal position the switch blade *C* is released and the spring immediately closes the switch. A buzzer is fixed in the top of the device, as shown in *K*. Normally the whole of the gear in the device is at earth potential, but on the earth being broken, only the terminal *D* and the switch contact *B* are in connection with the live standard. This enables the crew to determine promptly whether the standard is at line potential.

The device has been in service about two years on a number of English and Continental lines, among them the Birmingham Corporation Tramways, the lines of the City of Birmingham Tramway Company, the Hastings & District Tramway and the Wolverhampton District Tramways.

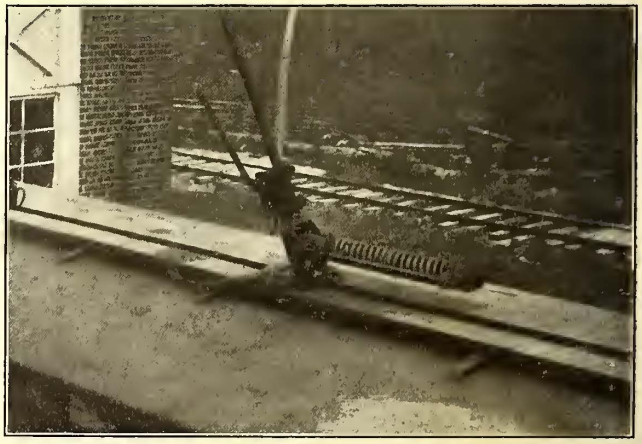
A TROLLEY POLE CLAMP

The Marion, Bluffton & Eastern Traction Company, of Bluffton, Ind., has been using for two years on its cars a



Pole Clamp Loose So That Pole May Be Removed

trolley clamp, the invention of C. W. Clark and Chas. E. Yingling, of the company, adapted to hold a trolley pole rigidly in position. It consists of a pair of clamping plates which surround the pole, connected to a supplemental plate which is operated by a cam by means of a lever for clamp-



Pole Clamp After Pole Is Replaced and Tightened Up Ready for Use

ing and locking the pole in place. It is said that with this clamp a pole can be changed in a few minutes without the aid of a hammer or wrench. The clamp can be placed on almost any base by simply changing the bolts of the clamp to fit the base. It is said that no cars have been brought into the Marion, Bluffton & Eastern Company's car house on the harp since the clamp has been in use on that road, it being so easy to change the pole.

THE DICK-KERR MULTIPLE UNIT CONTROL SYSTEM

A short account was published on page 187 of the STREET RAILWAY JOURNAL for Aug. 4, 1906, of the new multiple unit system being installed on the trains of the Liverpool & Southport Electric Railway in England by Dick, Kerr & Company, Ltd. This system of control has recently been perfected and possesses many novel and interesting features. It is applicable to any electric train using direct-current motors, and is a direct electro-magnetic system with series solenoids actuated by the negative or return current of the train motors.

A preliminary explanation of its action can best be given by a simple diagram, Fig. 1, which represents a control circuit for two motors. T is the trolley or third-rail shoe, M M are the motors with their armatures, fields and resistances. E and E_1 are ground connections. The first step is to establish a circuit between T and E_1. This is done by closing contacts c c and at the same time setting the two-way switch W to connect the motor circuit with E_1. The motors then start up and the current from them then flows through the contactor solenoids S S, thus energizing them and closing the main contacts C C. The contacts c c may now be opened without breaking any circuit, as they are duplicated by C C. On the other hand, if the switch W is moved to E the current flowing through the solenoids S will be diverted to ground at E, the magnets will become de-energized and the contacts C C will open. The circuit W S S E_1 can be paralleled by others, as shown by the dotted lines containing as many solenoids as are required for the control system, and the switch W is so constructed

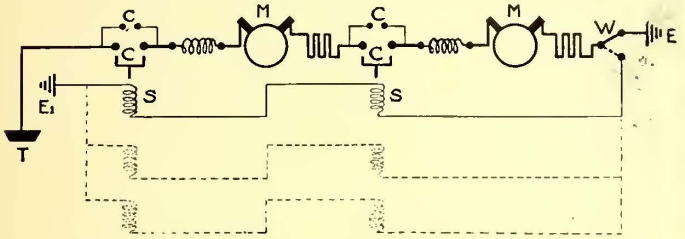


Fig. 1.—Diagram Illustrating Principle of System

as to cause these solenoids to be brought in or out of circuit at the proper time.

This explains as simply as possible the principle upon which the control is based.

The system comprises master controllers, one of which is located at each end of a motor car, reversers, series-parallel and resistance contactors, these being hung beneath the car in the usual manner.

The master controller is made up of three distinct parts: (1) the switch barrel, (2) the contactor barrel and (3) the reversing barrel. Fig. 2 shows the development of the master controller and a diagram of the wiring and connections for a two-motor equipment. The motor cutout switches are omitted to avoid complication. The heavy lines show the path of the current driving the motors and the light lines indicate the wiring of the system of control.

The switch barrel and the contactor barrel of the master controller are in the same vertical plane and are moved by the main operating handle, but the former travels independently of the latter through a certain arc, indicated on the diagram. After the switch barrel has turned through this arc, the contactor barrel turns with it, and both move together until the full speed position is reached. There are eight notches on the controller, and these are indicated and numbered on the diagram to facilitate tracing the various connections. The reverser barrel has three positions—forward, off, reverse. It is in two parts, with a drum for switching in either the forward or reverse set of contactors, and a drum for reversing the control circuit through both motors.

In Fig. 2 certain references to points in the simple diagram (Fig. 1) are made to facilitate comparison. The controller is shown in the "off" position, and it will be noticed that the ground sector of the switch barrel connects the end of R_6, or the negative end of the motor circuit, to ground E of Fig. 1. This has de-energized all the con-

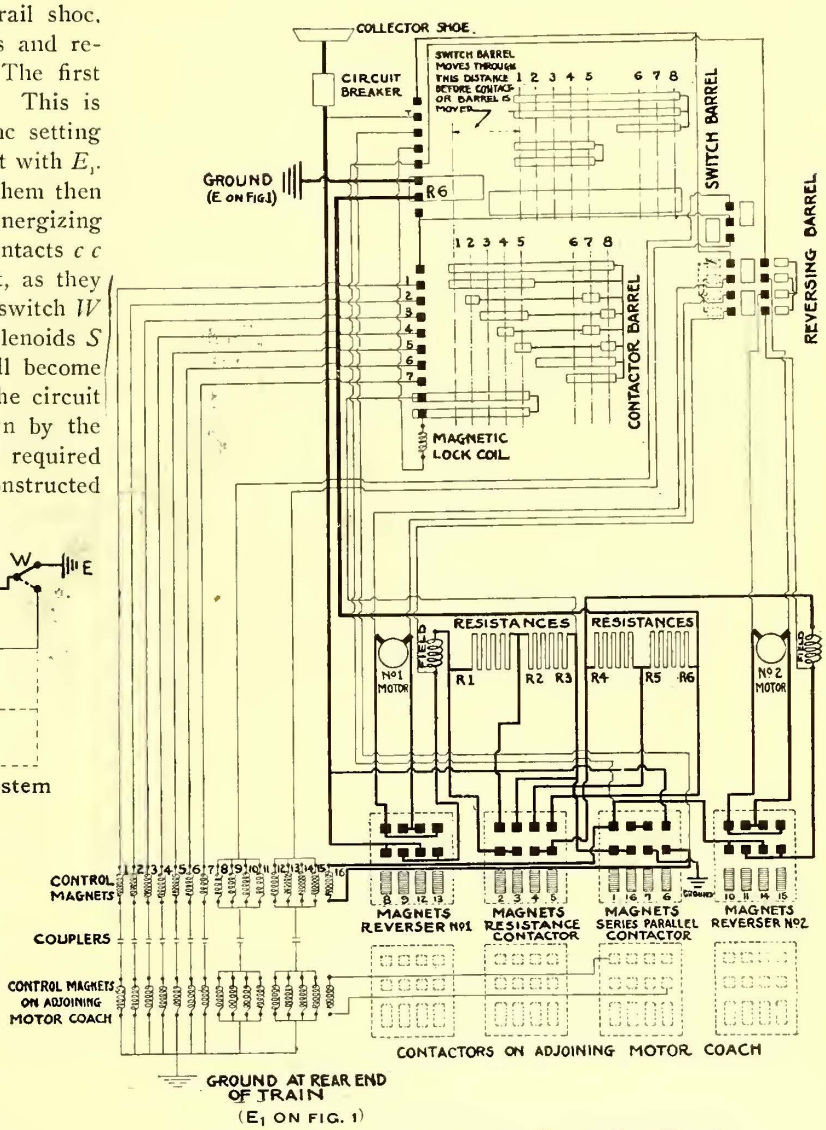


Fig. 2.—Schematic Diagram of Controller Circuits

tactors which are open and has also interrupted the motor circuit. To start up, the first controller movement is made at the reversing switch, which is pushed from "off" to either "forward" or "reverse" as desired. This movement completes the control circuit through the motors to ground at the ground sector of the master controller, but admits no current to the circuit. The reversing handle is mechanically interlocked with the controller handle and the above movement releases the controller handle and notching up can begin. A mechanical controller handle regulator is also employed to prevent notching up too fast. The ground sector then disconnects the ground E and the solenoid sector connects the end of R_6 with the control

system at the same time that the contactor barrel begins to move with the switch barrel, and both pass into the first notch. At this moment the trolley rings close a control circuit which is easily traced. The circuit includes the lower reversing barrel, the motors and their fields and resistances, and reverser solenoids 8, 9, 10, 11 and paralleling solenoid 1. All of these are in series with each other, and also with all the other control sections on the train to the final ground (E_1 of Fig. 1), which is always at the rear end of the train. It will thus be seen that the consequent closing of reverser contactors 8, 9, 10, 11 and series parallel contactor 1 starts up the motors in series, with all resistance in circuit. The next four notches simply cut resistance out of the series connection of the motors.

In the transition from series to parallel the interval between notch 5 and notch 6 breaks the circuit of the resistance solenoids 2, 3, 4, 5 and series solenoid 1. The resistance contactors close again with solenoid 6. The trolley ring and the reverser contactor solenoid circuits are of course maintained in the meantime. The control circuit of notch 6, it can be readily seen, causes the paralleling contactors 6, 7 and 16 to close, thus placing the motors in parallel with the resistance in circuit. Notches 7 and 8 simply cut out the resistance, and full speed is reached.

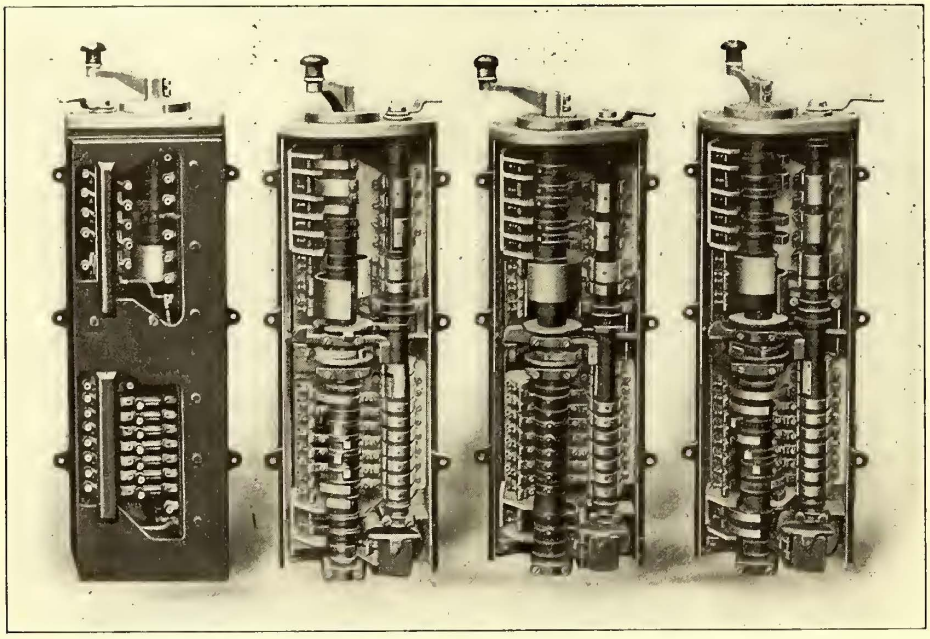


Fig. 3.—Master Controller

To shut off, the controller handle is returned to the "off" position, which can be effected by a single sweep of the handle. In this movement the switch barrel turns back independently of the contactor barrel, which remains at full parallel until the ground sector of the switch barrel diverts the motor current to ground E, which causes all the contactors to drop off and break the motor circuits throughout the train. Then the two barrels return together to the position shown in Fig. 2.

The master controller shown in Fig. 3 is of small size, for it does not break any current, so needs no magnetic blowout. In the base of the controller is a magnetic lock consisting of a small coil in series with the contactor solenoid 1, which determines the series connection of the motors. When this locking magnet is energized, it releases a catch and allows the motorman to notch up to full series. If the series contactor is not pulled up for any reason, the controller cannot be notched up, as it remains securely locked.

It should be carefully noted that the ground connection for the contactor circuit and that for the current diverted from that circuit are at opposite ends of the train. The former ground must, of course, be at the rear end, as it is here that the return current is allowed to go to ground after passing through all the contactor solenoids in the motor cars on the train. The other ground to which this current is diverted when it is desired to de-energize the solenoids is at the front of the train. To allow control from either end of the train, the entire system is paralleled at the front and rear master controllers.

A few explanatory words will probably make the system clearer. The negative or return current from the motors of the leading motor car, the master controller of which is being operated, supplies the control system of the entire train in which every solenoid is in series. For example, solenoid 1 is in series with solenoid 1 of each car until the circuit goes to ground E_1 at the rear end of the last car. The same is true of all the rest; they constitute separate circuits, all numbered according to the contactor they actuate. Every other car of the train has its contactors operated by this current from the leading car, and each discharges its negative current to ground at E_1, for their master controllers are in the position shown in Fig. 2 and the circuit is completed through the ground sector of each master controller.

The control system requires nine train wires which are grounded at both ends of the train. Special provision is made at the ends of coaches to carry the leads, and special plugs and sockets are used with jumpers at both ends of each car. No busline or shoe cable is necessary through the train.

ASSOCIATION PUBLICATIONS

The American Street & Interurban Railway Association has recently republished in pamphlet form the report of the committee on the construction of standard railway car storage and operating houses and the report of the committee on standardization presented at the convention at Atlantic City last fall. These reports have been issued for the convenience of those who desire copies.

The association has also issued a bulletin giving statistics of the percentage of gross receipts charged to different operating expenses for some 36 companies, and an additional circular giving statistics of wages of conductors and motormen. These two latter circulars are issued only for the benefit of member companies.

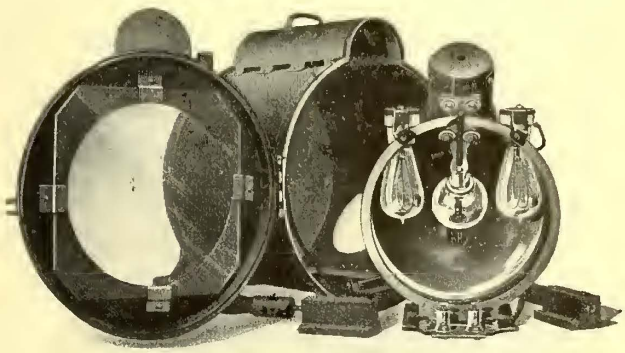
Some time ago the Easton (Pa.) Transit Company adopted the plan of changing the register card in a car every time a register was taken out for repairs. This is somewhat unusual, as on most roads a note is made of the trouble, but the register card is not disturbed.

A COMBINATION HEADLIGHT

The Trolley Supply Company, of Canton, Ohio, has just brought out the Star combined arc and incandescent headlight which it believes to embody the simplest and most durable construction possible in a combination lamp. The framing and most of the other parts, including the magnet and carbon holders, are made of malleable iron. The magnet is protected from the heat by the asbestos lining in its holder and is kept in position by a pair of malleable iron rings.

The clutch is constructed without links or chains. The reflector is made of nickeled brass instead of aluminum to maintain the luster with less trouble. Lava is used for the cap of the inner globe. The carbons are set at an angle of 45 deg.; the upper carbon is 5/16 in. in diameter and the lower ⅜ in. in diameter. Glass breakage due to heat is minimized by setting the arc back as far as possible. The resistance, which is mounted on porcelain, is surrounded by a galvanized wire netting through which ample ventilation is secured.

An important feature of this headlight is the screw on the upper carbon holder which regulates the length of the arc



Arc and Incandescent Headlight

and also permits adjustment for any possible wear of the parts. Cleaning and the replacement of carbons are facilitated by mounting all the mechanism on a plate which is removed by loosening a thumb screw reached through an opening in the case and then swinging out the lamp mechanism about a pivot bar at the lower front end. The current cable is fastened in terminals in front of the bottom plate.

RUSSIA WANTS TO BUILD ITS OWN CARS

At a recent meeting of the Council of the Congress of Russian Trade and Industry the question was considered of placing orders for electric cars for the St. Petersburg railways. The Town Council will require 157 motor cars and 50 trailers. The system was put in operation during the past year, and is equipped with the overhead system. Westinghouse-Parsons turbines are installed in the power station and the car equipment was supplied by the Westinghouse Company. It is said that the orders for the new car bodies will be placed with Russian builders.

The International Brotherhood of Locomotive Engineers, meeting at Columbus, Ohio, decided to admit motormen on electric locomotives which have taken the place of steam engines on railroads and those on elevated and subway trains. It was at first reported that motormen on interurban cars would be admitted and that those on surface systems in the cities would be the only ones not eligible, but this has since been denied by one of the officers.

ELECTRIC RAILWAY LEGAL DECISIONS

Massachusetts.—Street Railroads—Operation—Action for Injuries—Questions for Jury—Contributory Negligence—Drivers of Vehicles—Proximate Cause—Instructions—Requests—Instructions Already Given—Negligence—Proximate Cause—Concurrent Causes.

In an action against a street railway company for personal injuries sustained while driving on the track, where the sleigh caught in a switch, the question whether the bad condition of the road was due to defendant's negligence held one of fact for the jury.

In an action against a street railroad company for personal injuries received while driving on the car tracks, owing to the sleigh runner catching in a switch and a car striking it, where the evidence showed that the road was almost impassable, owing to deep snow, part of which was thrown there by defendant's snowplows, and that teams drove on the tracks, the driver of the sleigh was not negligent in driving on the track.

In such a case driving on the track, together with the condition of the snow at the switch, was the direct and proximate cause of the accident.

In an action against a street railroad company for injuries received while driving on the track, defendant's request for a ruling that, if plaintiff intrusted the care of the horse to the driver, in order to recover she must show that he exercised due care and diligence, is properly refused, where the court instructed that, if plaintiff had authority or control over the driver, she could not recover where he was at fault, but if she had no authority or control, and was under no duty to warn him, and had no reason to suspect want of care and skill on his part, she could recover, although he was at fault.

In an action for personal injuries, where defendant's negligence is the proximate cause of the injury, the fact that there are other concurring culpable causes will not preclude recovery.—(Miller v. Boston & N. St. Ry. Co., 83 N. E. Rep., 990.)

Missouri.—Street Railroads—Operation—Personal Injuries—Questions for Jury—Trial—Requests for Instructions—Applicability to Pleading—Street Railroads—Actions for Personal Injuries—Instruction—Instructions—Applicability to Evidence.

In an action for injuries to a minor crossing in front of a street car, evidence considered, and held sufficient to take to the jury the question of the motorman's negligence in not seeing the minor and avoiding the injury.

Where, in an action for personal injuries, the petition alleges that a railroad company knew or should have known that at a certain defined crossing children were in the habit of crossing the tracks, and the evidence shows that the injury was caused within the limits described by the petition, an instruction that the jury could not consider the fact that children were in the habit of crossing at other places was properly refused.

In an action by a parent for injuries to his minor son struck by a street car, a requested instruction that the jury, in determining whether or not the plaintiff's son was aware of the danger of crossing in front of a moving car, and whether or not he saw the car while in a place of safety and took his chances in crossing, the jury might consider the son's admission that he knew the danger and took chances, is erroneous in placing the boy on the equality with an adult and properly refused.

Where, in an action for injuries to a minor struck by a street car, running at an unlawful rate of speed, the minor admitted that he knew the danger and took his chances in endeavoring to cross in front of the car, a requested instruction, calling upon the jury to consider the admissions of the minor in determining whether he knew the danger and took his chances in crossing, is properly refused; there being no evidence that he knew that the car was being run at an unlawful rate of speed.—(Brown v. St. Louis & Suburban Ry. Co., 106 S. W. Rep., 83.)

New York.—Carriers—Personal Injuries—Care Required—Negligence—Question for Jury—Presentation of Objections Below—Sufficiency of Evidence.

Where workmen are engaged and material changes are continually being made along the street car tracks, those in charge of a car, particularly when it is crowded to the running board with passengers, should exercise special care to avoid accidents.

Plaintiff was a passenger in a street car, the seats of which were occupied, and he rode on the running board. Workmen had been excavating the street, and had built a fence near the car track, allowing a beam to project over where the running board would be. Held, that whether or not defendant's motorman was negligent in running past the fence at a high rate of speed, and failing to see the beam or to appreciate its danger, was a question for the jury.

It is not contributory negligence as a matter of law for a passenger to ride on the running board of a crowded street car.

Where a street car is crowded, a passenger riding on the run-

ning board assumes only the natural and usual risks of that position.

In an action against a street car company for personal injuries, where it was assumed on the trial that plaintiff was a passenger and defendant acquiesced in such assumption, and the complaint was dismissed at the trial because the evidence showed no negligence on defendant's part, and did show plaintiff's contributory negligence, defendant cannot urge for the first time on appeal that there was no evidence that plaintiff was a passenger.—(Cramer v. Brooklyn Heights R. Co., 83 N. E. Rep., 35.)

New York.—Evidence—Presumptions Against Suicide—Injury to Person by Street Car—Street Railroads—Injury to Pedestrians—Contributory Negligence—Questions for Jury.

While there is no presumption that a pedestrian killed by a street car was careful, there is a presumption that he did not commit suicide.

Deceased was walking south on a public footpath between the rails of defendant's track, and was struck by a southbound car, which came upon him from behind. It was customary to run northbound cars exclusively on this track and southbound cars on the track on the opposite side of the street; but there was no evidence that deceased knew of a temporary change in the custom. Held, that deceased was not bound as a matter of law to observe any special care to discover cars coming upon him from behind, and the question of contributory negligence was one of fact for the jury.—(Lamb v. Union Ry. Co. of New York City, 109 N. Y. Sup., 97.)

New York.—Carriers—Carriage of Passengers—Personal Injuries—Acts of Carrier's Employees.

Plaintiff boarded defendant's northbound car, and, falling asleep, was carried several blocks beyond his destination He then crossed the street to another station to catch defendant's southbound car, which he persisted in getting on without paying his fare. The trainmen by force kept him off the train. Held, that defendant was not liable for the assault, having fully performed its contract when it carried plaintiff on its northbound train to his destination, after which it was under no obligation to furnish him a return passage free of charge.—(Brown v Interborough Rapid Transit Co., 107 N. Y. Sup., 629.)

New York.—Carriers—Passengers—Assumption of Risks—Negligence.

A street car passenger, who voluntarily takes his stand on the platform or running board of a car, assumes the dangers necessarily incident to such position; but he is not guilty of negligence.

A street railway company maintained tracks 4 ft. apart for the operation of cars, between which there was a space of 22 in. in the clear. There were no defects in the roadbed or rolling stock. On a holiday, while its cars were overtaxed, a passenger on a crowded car took a position on the running board next to the parallel track, and was struck by a car thereon. He knew of the danger. Held, that the company was required only to use reasonable care to carry him safely under the circumstances, and an instruction that it must have used the "utmost" care was error.—(Gregory v. Elmira Water, Light & R. Co., 83 N. E. Rep., 32.)

New York.—Carriers—Carriage of Passengers—Negligence—Platforms—Taking Up Passengers—Action for Injury—Instructions—Duty to Give Warning.

That there was a space of 10 in. between the station and car platforms does not of itself constitute negligence.

Where, owing to the varying widths of a railroad company's cars, the space between the platform of a car and the station platform varied, it was the duty of the railroad company to use reasonable care to prevent accident by giving warning to one moving in the midst of a crowd of passengers seeking to board one of the narrower cars of the space between the platforms of the car and station.

A requested charge in an action for injury to a passenger respecting the "proximate or principal cause" was bad for using the word "principal," which is not a synonym of "proximate."

Where a passenger knows of an opening between the car and station platforms, the railroad company is not liable for failure to give warning thereof.—(Woolsey v. Brooklyn Heights R. Co., 108 N. Y. Sup., 16.)

Pennsylvania.—Street Railroads—Injury to Trespasser—Question for Jury—Negligence—Imputed Negligence—Trial—Remarks of Counsel.

In an action against a street railway company to recover for injuries to a boy five years old injured while riding on the step of the platform of a car, the question of negligence of defendant on conflicting evidence was for the jury.

Where the parents of a boy five years old knew that once or twice he had gone to the home of his aunt nearby, but did not know he was in the habit of doing it, the father of the boy was not precluded from recovering for injuries to the boy on the street, on the ground that he had permitted his son to go on the street in the business part of the city unattended.

In an action against a street railway company for injury to a child, remarks of counsel for plaintiff, without any foundation in fact, that evidence had been suppressed, and asking the jury to make this company out of its millions put "on that stump a foot as good as new," and it was idle for the railway company to cry for justice, but to give justice to the boy and make the railroad company pay from $5,000 to $20,000, and give them the justice they want, was ground for reversal.—(Saxton v. Pittsburg Rys. Co., 68 Atl. Rep., 1022.)

Pennsylvania.—Carriers—Injury to Passenger—Presumption of Negligence.

Where a man in a crowded car gives a woman his place, and stands on the front platform and is injured, he forfeits the advantage of the presumption that the accident resulted from the negligence of the company.—(Paterson v. Philadelphia Rapid Transit Co., 67 Atl. Rep., 616.)

Rhode Island.—Trial—Verdict—Form—Validity—Damages—Temporary Personal Injuries—Excessive Award.

A verdict must receive a reasonable construction, and the test of its validity is whether or not it is an intelligible answer to the issue submitted to the jury, and hence where, in an action originally brought against a railroad company for injuries to a passenger on a trolley car, another company was brought in as a defendant, and its counsel admitted that it was in control of the car at the time of the accident, and the issue for the jury's determination was therefore whether the second company was guilty of negligence or not, a verdict, "that the defendant corporation is guilty in manner and form, as the plaintiff has in her declaration thereof complained against it," is not defective because in the title of the case therein the name of the defendant originally sued appeared, and not the name of the one admitting its operation of the car.

Where a person was thrown from her seat in a trolley car to the ground and injured by a rush of passengers, or by the sudden stopping of the car, a verdict for $5,000 was excessive, in the absence of a showing that the injuries were permanent.—(Spofford v. Rhode Island Suburban Ry. Co., 69 Atl. Rep., 2.)

Rhode Island.—Street Railroads—Collision with Pedestrian—Proximate Cause—Question for Jury.

Whether the negligence of the motorman was the proximate cause of the injury, making the railroad company liable, notwithstanding the negligence of the pedestrian, is a question for the jury, where on a street 50 ft wide, there being no other pedestrians, cars, or vehicles in sight, a child started to run across the street, when a street car, which was late and running at a speed of 12 to 15 miles an hour, was 50 ft. away, and was struck by the car, which had given no warning signal, and went 120 ft. beyond the place of collision before it was stopped.—(Gormley v. Union R. Co., 67 Atl. Rep., 584.)

Texas.—Trial — Instructions — Refusal—Propriety—Negligence—Right of Recovery—Proximate Cause—Trial—Instructions—Refusal—Propriety—Trial—Instructions—Refusal—Propriety.

In an action against a street railway company for injuries caused by a collision between a car and plaintiff's buggy, an instruction to find for plaintiff, if the accident occurred at a street intersection and the car was not under such complete control that it could be immediately stopped, was properly refused, as eliminating the questions of proximate cause, contributory negligence, and injury.

No recovery may be had for negligence not proximately causing injury.

In an action against a street railway company for injury caused by a collision between a car and plaintiff's buggy, an instruction to find for plaintiff, if the motorman did not sound the bell at least 75 ft. before reaching the street intersection where the accident happened, and did not continue to sound it until the intersection was crossed, such failure being negligence per se, was properly refused, as ignoring the questions of proximate cause, contributory negligence, and injury.

In an action against a street railway company for injury caused by a collision between a car and plaintiff's buggy, an instruction to find for plaintiffs regardless of whether they were guilty of contributory negligence, if the motorman discovered their peril in time to have prevented the accident and did not use all means in his power to prevent the accident consistent with safety to himself and passengers, was properly refused, as ignoring the question of injury.

In an action against a street railway company for injury to a married woman, caused by a collision between a car and a buggy, an instruction to find for plaintiff, though the husband was guilty of negligence contributing to his injury, if the wife was not negligent, was properly refused, as assuming that she was injured.—(Feille et al. v. San Antonio Traction Co., 107 S. W. Rep., 367.)

LONDON LETTER

FROM OUR REGULAR CORRESPONDENT

The Franco-British Exhibition undoubtedly is the most important exhibition which has ever been held in London. It has an indirect bearing on tramway work in so far as it has added a much needed stimulus to the various tramways and electric railways leading to the vicinity of Shepherd's Bush, where the exhibition is situated. The exhibition covers about 140 acres, and is much more comprehensive than anything hitherto seen in London, and compares very favorably with any of the exhibitions held in Paris. In fact, it might fittingly be compared with the World's Fair held in Chicago in 1893. The White City, given good weather, will undoubtedly form one of the greatest of London's many attractions. The various palaces and buildings are very well laid out. The stadium itself, which seats more than 100,000 people, is the largest self-contained ground for sports since the days of ancient Rome. The electrical display is not elaborate, but in the Machinery Hall much machinery of interest to tramways and railways is being exhibited. It is interesting to note that the exhibition has at least afforded a suitable opportunity for the Central London Railway (which operates the original "Twopenny Tube") to make a loop at the western end of its route. Hitherto the tube has come to the surface near the power house, where a large yard with car houses is located. To accommodate visitors to the exhibition the company has utilized that portion of the railway which comes to the surface, and has added a loop so that the trains come on the surface to the very gates of the exhibition. In anticipation of the exposition traffic, the company has installed a new 2000-kw unit, consisting of a horizontal cross-compound engine built by T. Musgrave & Sons, of Bolton, and a three-phase revolving field alternator manufactured by the British Thomson-Houston Company, of Rugby. The Hammersmith & City Railway and the London & North Western Railway have also built new stations in the immediate vicinity, and the London County Council is completing a system of tramways in Wood Lane, where there is an entrance to the grounds, so as to improve the facilities for getting to and from the exhibition. The terminus of the London United Tramways which has always been at Shepherd's Bush is also useful to visitors from the west and southwest of London, and an entrance has been made to the exhibition from Uxbridge Road by means of a covered way, supported by steel columns. It extends over the freight yards of railways in that vicinity, over the Central London Railway extension and on to the Wood Lane entrance, the whole forming an approach more than half a mile long and 70 ft. wide. More than £30,000 was spent on the lighting features. Some 2000 arc lamps are used. Current is taken from the various borough councils which have powers in that part of London. Several substations have been erected in the exhibition.

London is once more in the throes of electric power bills, and much time is being taken up by Lord Cromer's Committee of the House of Lords in considering the first of the three bills deposited in Parliament for consideration this session. The one which is receiving attention at present is that for which H. F. Parshall and Robert Hammond are acting as chief engineers. There is nothing very different in it from the original Merz Bill, and Mr. Parshall stated before the committee that it was the intention of the company, should the bill be passed, to erect a station at Barking with a capacity of 60,000 kw and ultimately of 120,000 kw, the total expenditure on the first stage being £2,600,000 and for the completed station £4,270,000. Three-phase current at 15,000 volts and a frequency of 50 cycles would be transmitted to 14 substations connected by duplicate mains. All the prices given by Mr. Parshall are based upon estimates made by responsible firms glad to carry out the work at the prices given. The Opposition tried to make much of the point of all London being dependent for its lighting and power on one generating station, none of the big cities of the world being dependent upon one or even two stations. Robert Hammond said he did not consider the linking up of the existing stations as an efficient scheme for London, and that the present scheme would do for London what Niagara had done for the territory near Niagara Falls. His opinion is that it would be more economical for the present companies to take their future supply in bulk from the promoters than to extend their own works. In this connection it may be stated that the second bill to be considered by the same committee is promoted by eight of the existing London electric lighting companies which desire to link their stations and create a joint committee to manage the various undertakings as one. The third bill is a modification of the second. It was promoted by only a few of the West End electric lighting companies.

With regard to the London County Council tramway system there is not much to report. It is to be regretted that up to the time of writing the G. B. surface contact system in the Mile End Road had not been put into effective operation. Experimental cars are being run over the system, however, and defects corrected. A number of the cars have been equipped by the Council, but no definite results have yet been achieved. This is important, as it affects many lines contemplated in the north of London.

Another fatal tramway accident occurred during the month, this time on the Bournemouth tramway system. Seven people were killed and many injured. The accident occurred while descending Poole Hill, which is a severe grade with several sharp curves. The car went over a 20-ft. embankment and broke its way through branches of overhanging trees. It would seem to be another tale of defective brakes or ineffective operation of the brakes. An inquiry is being held by the Board of Trade, and it would appear, although the evidence is somewhat contradictory, that the brakes or brake shoes were not in perfect condition and were prevented from acting effectively.

J. B. Hamilton, manager of the Leeds Corporation Tramways, is once more to be congratulated on their success. During the past year the gross revenue amounted to £340,368, while the gross expenditure amounted to £177,316, leaving a gross profit of £163,051, and after deducting rates and taxes and sinking fund charges a net profit of £64,246 is left. During the year nearly 76,000,000 passengers were carried and the cars ran nearly 7,700,000 car-miles, the fares working out at about 10½d a car-mile.

The Midland Railway Company has just inaugurated electric traction on part of its electrified lines, the electrical working being for the present confined to the Morecambe and Heysham branch. The trains are composed of three cars, a motor coach accommodating 75 seated passengers and two trailer cars with 56 seats in each. The Morecambe-Heysham line is the first railway in England to be worked on the single-phase system, which has also been adopted by the Brighton for its South London electrification.

Application has been made to the Board of Trade for an inspection of the portion of the new Dalmuir to Balloch Tramway between Dumbarton and Alexandria, with the view of having this section opened for passenger traffic. The contractors for the undertaking, J. G. White & Co., Ltd., are now pushing ahead with the section of the scheme between Dumbarton and Dalmuir, and expect to finish this portion, as well as that between Alexandria, Jamestown and Balloch, early in June.

By the linking up of Rochester, Chatham, Gillingham and Rainham with a tramway service opened about Easter, it is possible, with the exception of a few miles, to travel on trams from mid-Kent to London. Starting from Rainham, a township little to the west of Sittingbourne, one can travel by tram to the top of Strood Hill, Rochester, from which spot a five-mile walk will take one to Gravesend. There the tram can be taken to Swanscombe, where a one-mile walk will reach the trams again, which continue through Dartford to London.

The president of the Board of Trade has appointed a committee, consisting of G. R. Askwith, K. C.; Sir John Gavey, K. T., C. B.; Dr. R. T. Glazebrooke, R. S.; Major P. A. MacMahon, F. R. S.; Major W. A. J. O'Meara, R. E., C. M. G., and A. P. Trotter, to prepare a program for the consideration of the delegates to the International Conference on Electrical Units and Standards, to be held in London in the ensuing autumn, and of making arrangements for the reception and assembly of the delegates attending the conference.

Definite action has at last been taken in regard to the laying of tramways to link Saddleworth and Moseley with the Oldham system. A prospectus will shortly be issued, and has already been filed with the Registrar of Joint Stock Companies, in connection with the Oldham and Saddleworth District Tramways Company, Limited. The share capital is to be £100,000, divided into 50,000 6 per cent cumulative preference shares of £1 each, and 50,000 ordinary shares of £1 each. It is also proposed to raise £100,000 in 4 per cent mortgage debenture stock. The consulting engineers are Sir Douglas Fox and Partners, London, and the resident engineer Robert Blackmore. The generating station will be at Stalybridge. The scheme provides for the laying of 4½ miles of tramways, starting at the Mossley boundary at Royal George and passing through Friezland, Waterside, Greenfield, Uppermill and Dobcross to the main street in Delph. A second length of 2½ miles starts at Greenfield and links up with Springhead, and a third length couples up Springhead and Mossley. The Stalybridge, Hyde, Mossley and Dukinfield Joint Tramways Board have agreed to supply the electric current at 1½d down to 1d unit, according to the quantity used. A favorable arrangement has been made with the joint board for running powers over the system, which has a length of 27 miles.

A. C. S.

News of Electric Railways

Indiana State Tax Board Fixes Traction Values

The Indiana State Tax Board has made a slight reduction in the valuation of traction properties. The board closed its first session May 26. The total valuation placed on traction properties for 1907 was $21,133,614. In 1908 it was $21,104,587. Reductions in the assessments were made for several reasons. In a number of cases it was shown that competition had affected the earnings of the lines; in other cases business depression had affected earnings. Several companies in Southern Indiana and one company in Northeastern Indiana suffered heavy losses on account of high water. The principal companies were assessed as follows:

	1907.	1908.
Indiana Union Traction Company	$3,689,563	$3,555,457
Ft. Wayne & Wabash Valley Traction Company	1,566,235	1,575,575
Terre Haute, Indianapolis & Eastern Traction Company	.....	3,074,074
Indianapolis & Southern Traction Company	.....	624,477
Indianapolis, Columbus & Southern Traction Company	398,550	531,045
Indianapolis Traction & Terminal Company	1,420,750	1,274,591
Indianapolis Street Railway Company	6,066,360	5,861,170

New England Street Railway Club

The May meeting of the New England Street Railway Club was held at the Worcester Polytechnic Institute on May 26. About 150 members and guests assembled at 5 p. m. at Park Square, Boston, where four special cars of the Boston & Worcester Street Railway were waiting. Through the courtesy of the Boston Elevated Railway, the Boston & Worcester Street Railway and the Worcester Consolidated Street Railway the club was given a complimentary trip from Park Square to the Worcester Polytechnic Institute and return. Lunch was served and the party arrived at Worcester about 8:15, where it was met by Professor Smith, Professor Richey and Instructor Adams, of the Electrical Engineering Department.

Mr. Adams entertained the members with some high-voltage experiments in the main lecture room. Insulator tests were made with potentials of from 100,000 volts to 125,000 volts, showing the character of the discharge over and around the insulator. A parallel wire demonstration was also made, showing the tendency of a high-voltage arc to ascend as in the horn type of lightning arrester. Discharges between glass tubes completed the display. Professor Riehey explained the purpose and equipment of the laboratories and the members made an inspection of the facilities available for instruction and experiment. The test car was shown in operation on its stand and an oscillograph and motor-stand test were both in service. At 9 p. m. the party boarded the special cars, E. G. Connette, general manager Worcester Consolidated Street Railway, being present as host.

The Strike in Cleveland

Efforts to settle the strike of employees of the Municipal Traction Company, of Cleveland, have failed. President DuPont holds to his determination to give the new men the preference in regard to seniority rights. There is little violence. The men have turned their attention to the referendum work and will attempt to accomplish their purpose by this means.

President DuPont is quoted as stating that cars have been operated on schedules. The receipts have been somewhat less than normal, but this has probably resulted from the fact that the steam roads are carrying many people who under other circumstances would patronize the local lines. Cars were started on Detroit Avenue and other West Side streets the latter part of last week. The New York, Chicago & St. Louis Railroad had been carrying most of the passengers from the western section of the city up to that time.

The names on the petitions for a referendum vote on the security franchise are being compared with the registration books as rapidly as possible by a large force from the city clerk's office. As there are more than 26,000 names to be checked and compared, it may take a month to complete the task.

It is said that Mayor Johnson is writing to each voter, asking if he signed the petition. Several members of the City Council have expressed themselves in favor of having an early vote, in order that business may go forward either under the new company or the old one, as decided by the vote.

Wisconsin Tax Commission Announces Valuations

The Wisconsin Tax Commission announces that it has fixed the preliminary valuation of the property of street railway companies and light, heat and power companies in Wisconsin at $36,098,000. This is the first time the commission has fixed the value of property of these companies, and the figures are subject to change after hearings to be held between now and July 1. The preliminary valuations follow:

Ashland Light, Power & Street Railway Company	$140,000
Beloit Traction Company	70,000
Chippewa Valley Railway, Light & Power Company	750,000
Duluth Street Railway Company	900,000
Eastern Wisconsin Railway & Light Company	750,000
Green Bay Traction Company	900,000
Janesville Street Railway Company	40,000
Kenosha Electric Railway Company	200,000
La Crosse & Onalaska Street Railway Company	18,000
Manitowoc & Northern Traction Company	145,000
Menominee & Marinette Light & Traction Company	230,000
Merrill Railway & Lighting Company	180,000
Milwaukee Electric Railway & Light Company	22,000,000
Milwaukee Light, Heat & Traction Company	5,200,000
Milwaukee Northern Railway Company	560,000
Rockford & Interurban Railway Company	325,000
Sheboygan Light, Power & Railway Company	650,000
Southern Wisconsin Railway Company	675,000
Twin City General Electric Company	60,000
Waupaca Electric Light & Railway Company	85,000
Wausau Street Railway Company	70,000
Winnebago Traction Company	625,000
Wisconsin Traction, Light, Heat & Power Company	1,025,000

Plans Announced by the Tidewater Company

The Birmingham & Gulf Railway & Navigation Company, which is controlled by the Tidewater Development Company, has filed a mortgage for $10,000,000 at Tuscaloosa, Ala., the proceeds of which will be used to carry out the company's plans for an electric railway from Tuscaloosa to Gadsden, Ala., via Birmingham, and a barge line on the Warrior and Tombigbee rivers. The company has the Tuscaloosa Belt Railway as a nucleus for its system, having purchased that line last year. With this projected railroad and the barge line it is intended to establish a new route for Alabama coal to the Gulf, Mobile being the objective port of shipment. Henry S. Thompson, of New York, is president of the company. J. A. Vandegrift, of Tuscaloosa and Philadelphia, is general manager. The belt line is now operated by steam locomotives, but it will be the first section of the through road to be worked with electricity.

J. M. Dewberry, vice-president, is quoted in a report from Birmingham as saying that the conversion of the Tuscaloosa Belt Railway to an electric railway, which was begun last fall, will be completed within two or three months, when construction will begin on the main line in Birmingham, working toward East Lake and Bessemer. Construction will be continued in both directions until the line is completed from Gadsden to Tuscaloosa, 170 miles, including double tracks in the Birmingham district, side-tracks, etc. The location surveys have been completed, most of the private right of way is assured and all the city franchises are obtained. The bonds were taken by Morris Bros., of Philadelphia, and George Davidson Rogers, of New York City. The Carnegie Trust Company, of New York, is trustee of the mortgage.

Mr. Dewberry is quoted as saying: "The entire transportation line is to be an electric railway from Gadsden through the Birmingham district to Tuscaloosa, and from that city by water to Mobile and New Orleans. The company will also operate steamboats on the Alabama River from Montgomery to Mobile and a line of steamers from Mobile through the Mississippi Sound to New Orleans. An option has been secured on Dauphin Island, near Mobile, for $70,000 with the object of making that place the export terminal. The company proposes to operate altogether about 850 miles of steamboat and barge line between Tuscaloosa, Mobile and New Orleans, and also between Mobile, Selma and Montgomery. The electric railway will make connections with the principal trunk line railroads of the South."

The officers of the Birmingham & Gulf Railway & Navigation Company are: Henry S. Thompson, New York, N. Y., president; J. M. Dewberry, Birmingham, Ala., vice-president; George D. Rogers, New York, N. Y., secretary and treasurer; E. T. Brackett, president Adirondack Trust Company, Saratoga Springs, N. Y.; J. M. Dewberry, president Tidewater Development Company, Birmingham, Ala.; Charles C. Dickinson, president Carnegie Trust Company, New York, N. Y.; Eugene F. Enslen, cashier Jefferson

County Savings Bank; Forney Johnston, of Campbell & Johnston, attorneys, both of Birmingham, Ala.; F. Z. Maguire, Robert B. Moorhead, Carnegie Trust Company, both of New York, N. Y.; James H. Morris, of Morris Bros., Philadelphia, Pa.; Geo. D. Rogers, Henry S. Thompson, vice-president Globe & Rutgers Fire Insurance Company, both of New York, N. Y.; J. A. Vandegrift, president Birmingham & Gulf Construction Company, Tuscaloosa, Ala.; W. H. Woodin, vice-president American Car & Foundry Company, New York, directors.

August Belmont on Short-Term Franchises

Discussing the failure of Governor Hughes of New York to sign the Robinson rapid transit bill, August Belmont, chairman of the board of the Interborough Rapid Transit Company, said before the Brooklyn League last week:

"It is absolutely impossible to construct a subway under the present conditions, and anybody who says that private capital can do the work as things are at present says something that is absolutely not so. The Governor has vetoed the Robinson bill, which sought to lengthen the period of franchise terms under which constructing companies could operate the roads. There is not one single interest that could be induced to undertake the operation of a road on a short-time franchise. As far back as 1906 I called the attention of Speaker Wadsworth of the State Legislature to the weak points in the Elsberg law, which was then under consideration by both houses in Albany, saying at the time that the city would be injured if the Elsberg bill became a law.

"Private capital cannot be invested with profit in any proposition under a short-term franchise agreement, and I said then, as I say now, that the Elsberg bill is the rankest folly, which was aimed at the corporations at a time when certain persons were trying to become popular by attacking corporations. The purpose of those who advocated the measures was to reduce the cooperation which public service corporations could give in the solutions of the big problems and force municipal operation on the city. Municipal operation is a very burdensome proposition from the viewpoint of taxation, as the ferry proposition has amply demonstrated.

"You can put out of your mind any idea of private capital interesting itself in short-term franchise propositions. It might be possible to build a road, but it will never be possible to equip and operate it, for the equipment is often half the cost. The Interborough Rapid Transit Company spent $35,000,000 or $40,000,000 on its equipment, and how can you expect capitalists to invest that amount for only 20 years? You must insure at least the return of the capital invested. If the city can build a subway it cannot lease it on a basis of cost so that the city will get its money back, because it could not possibly be operated at such a high franchise figure. Then, if the city is to stand the cost and lease out the subway much below the figure, so that a concern can afford to run it, that is a different matter, and you then have a sinking fund proposition on your hands. The fact is you are against a very awkward proposition."

Affairs in New York

The Public Service Commission of the First District of New York has asked the board of estimate to appropriate $2,850,000 for the partial construction of each of the divisions of the Fourth Avenue subway. As each division is partially constructed, a further sum toward completing it will be requested. Thus the work can uniformly go on in each section, instead of completing only one section at a time, and making it possible to abandon the others.

E. P. Bryan, president of the Interborough Rapid Transit Company, in a letter under date of May 29 to the Public Service Commission, requests the commission to act upon the suggestions of the company embodied in a previous letter regarding the purchase by the city of the Steinway tunnel, connecting Manhattan and Queens. The commission never took any action on these suggestions because it lacked jurisdiction in the premises. Mr. Bryan now calls attention to the fact that Governor Hughes has signed the Frawley bill empowering the commission, with the consent of the board of estimate, to open negotiations for the purchase of the tunnel. Chairman Willcox, of the commission, some time ago announced that while he realized the importance of this link connecting Queens and Manhattan, he believed that in view of the city's crippled finances, all the money available should be used in developing the subway systems which have already been laid out. This work, he said at the time, he thought was of more importance than the purchase and operation of the Steinway tunnel by the municipality.

Mr. Bryan incloses in his letter the text of the Feb. 27 proposition. This provides for the purchase of the tunnel by the city at $7,239,476.50, its cost to the Interborough Company. The company is willing to accept payment in 4 per cent bonds of the City of New York at par, and suggests that an operating agreement for 25 years be entered into by the city with the New York & Queens County Railway to operate the tunnel in connection with its surface lines in Queens. The expenses of operation, it is suggested, should be fixed by agreement at an arbitrary sum, one-half to be paid by the city and one-half by the company. A single fare of 5 cents is to be charged between New York and any point on the New York & Queens County system.

The Brooklyn Rapid Transit Company has issued the following statement of the reason of the company for declining to avail itself of the opportunity to run trains in the $10,000,000 subway loop, now building, to connect the two bridges:

"The officers of the Brooklyn Rapid Transit Company have presented to the members of the commission informally facts and figures concerning the effect of the operation of the Center Street loop connecting the Brooklyn and Williamsburg bridges. We are convinced that, with their knowledge of the financial and physical difficulties with the proposed Center Street bridge subway and the connections to it from the three bridges, the transportation interests of Brooklyn will be carefully considered. Whether or not the transportation interests in Brooklyn can best be served by the Manhattan lines entering Brooklyn, or the Brooklyn lines entering Manhattan, is a matter which can only be determined after more careful consideration."

The construction of a subway from the Williamsburg Bridge to Lafayette Avenue, Brooklyn; the building of another tunnel under the East River at Beekman Street, and the diversion of the proposed Broadway and Lexington Avenue line so as to take in the Center Street loop line are some of the schemes proposed, now that the Brooklyn Rapid Transit Company has refused to operate the loop subway connecting the Brooklyn and the Williamsburg bridges.

The Interborough Rapid Transit Company has applied to the Public Service Commission, First District, for authority to use the first section of the Fourth Avenue subway, Brooklyn, and the Manhattan Bridge, now under construction, for an extension of the company's subway system. The application has been referred to the committee of the whole.

At a hearing June 2 before Commissioner Maltbie on a proposed order that the companies under the jurisdiction of the commission should supply the commission with plans of all new cars, brakes, fenders and other appurtenances of rolling stock to be purchased before such accessories were bought, the representatives of the companies protested against promulgation of the order. The matter was finally settled by a proposal from Mr. Maltbie that the companies furnish the plans after, instead of before, purchase of the material.

Line Between Brantford and Hamilton, Ont., Opened.—The Brantford & Hamilton Electric Railway, between Brantford and Hamilton, Ont., has been opened.

Canadian Pacific Railway to Electrify Westminster Junction Line.—The Canadian Pacific Railway is arranging to electrify its line between New Westminster, B. C., and Westminster Junction next year.

Connecticut Commissioners Inspecting Railroads.—The Connecticut Board of Railroad Commissioners is making its annual inspection of electric railways. Last week the members of the board inspected many of the lines in the western part of the State, including the properties operated by the Connecticut Company in Willimantic, Norwich and New London.

Illinois University Bulletins.—The first edition of Bulletin No. 15 of the Engineering Experiment Station, "How to Burn Illinois Coal Without Smoke," by L. P. Breckenridge, was published in December, 1907, but on account of the large number of requests for it, a second edition of 10,000 copies has just been issued. A few pages are devoted to the principles of combustion and the losses due to smoking chimneys, but the larger part of the bulletin relates to the constructive features of those boiler settings and furnaces that have been found practically smokeless in operation at the power plant and in the experiment station at the University of Illinois. The leading dimensions of the settings and furnaces are given and sectional cuts show the general character of the settings. While the smokeless burning of Illinois coals furnishes the main discussion, the principles and methods explained apply equally well to the burning of all kinds of soft coal. Copies of this bulletin may be obtained gratis upon application to the director, Engineering Experiment Station, Urbana, Ill.

Springfield (Ill.) Franchise Questioned.—Quo warranto proceedings have been begun in the Sangamon Circuit Court,

Springfield, by the State's Attorney to determine the life of certain franchises under which the Springfield Consolidated Railway is operating.

Fender Test in Toronto.—The Toronto Railway Company has suggested that three experts outside the Province of Ontario be selected to make a test of fenders in the presence of the Ontario Railway & Municipal Board, agreeing to accept the decision of the board.

Inquiry Into Philadelphia Accident.—The Pennsylvania Railroad Commission is investigating an accident that occurred May 24 on the Chestnut Hill division of the Philadelphia Rapid Transit Company. According to the statement made to Charles O. Kruger, second vice-president and general manager of the company, by the motorman of the car, the accident was due to the fact that a passenger tampered with the rear brake.

Grade Crossing Protector Tested in Toledo.—Representatives of the Lake Shore & Michigan Southern and the Michigan Central railroads, in a conference with officials of the street railways in Toledo, Ohio, agreed upon a safety device for grade crossings in the city which will be submitted to the Ohio Railroad Commission, and, if approved, will be used. The details of the plan will not be announced until the Railroad Commission passes upon them.

John I. Beggs Addresses Students at Madison, Wis.—John I. Beggs, president and general manager of The Milwaukee (Wis.) Electric Railway & Light Company, addressed the students of Prof. B. H. Meyer at the University of Wisconsin, Madison, Wis., May 27, on railway problems. Mr. Beggs talked of the difficulties encountered in providing transportation, particularly in the cities, and of the development of the electric railway.

Disorder Follows Chester Strike.—The disorder that has marked the strike of the employees of the Chester Traction Company was renewed June 2 when three of the company's cars were damaged by dynamite. Two cars were wrecked on Saville Avenue, in Eddystone, and a third at Palmer's Corner, on the Media division, outside the city. The car at the latter point was badly damaged. Two passengers were carried on one of the cars, but neither person was hurt.

Road Between Lima and Toledo to Be Opened Soon.—The Ohio Electric Railway expects to have the road between Lima and Toledo, Ohio, in operation not later than June 15. Officials of the company inspected a portion of the road a few days ago. It is possible that the cars will be run over the line of the Maumee Valley Railways & Light Company until the new track between Toledo and Maumee is completed. Three of the new cars have been received and are ready for operation.

Connecticut Valley Street Railway Changes Fares.—The Connecticut Valley Street Railway, of Greenfield, Mass., announced last week that in accordance with the recommendations of the Board of Railroad Commissioners, the schedule of fares on the Millers Falls division, beginning June 1, would be as follows: Regular cash fares between Turners Falls, Lake Pleasant, Millers Falls or Montague will be two fares of 6 cents each. Workmen's tickets on this line will be withdrawn. It is intended to continue the coupon book basis of 4 1/6 cents.

Deposit of Boston Elevated to Secure Abuttors Recovered.—The full bench of the Massachusetts Supreme Court dismissed the Boston Elevated Railway petition to recover $500,000 deposited with the State Treasurer, at time of the construction of the elevated structure, to secure payment of claims of abuttors. The company asserted that, as all claims have been settled, it was entitled to the money, but the court rules that, as the company is still engaged in the construction of an elevated in Cambridge and of a subway approach on Washington Street, the treasurer must retain the fund.

Appleton Line To Be Extended.—As a result of a conference between John I. Beggs, of Milwaukee, president of the Wisconsin Traction, Light, Heat & Power Company, Superintendent Ellis and the members of the Appleton Board of Public Works May 30, it has been practically decided to extend the lines of the company to Appleton to the driving park and form a loop circling the city about two miles long. On June 16 the case against the company in which application is made for a 5 instead of a 10-cent fare between Appleton and the Lake Winnebago resorts comes up for settlement. The company will contend that owing to the expense of operating the line it can not afford a 5-cent fare.

Franchise Conditions in Hamilton, Ont.—The special committee of the City Council, Hamilton, Ont., went over last week the clauses in the proposed new agreement with representatives of the Dominion Power & Transmission Company, Ltd. Several important matters were agreed on, subject to modification. The mileage will remain as at present till the end of 1928. The company will be asked to put on 10 new double-truck cars the first year and 10 for the next succeeding four years till 50 cars have been added. No extensions will be made during the last three years of the franchise. The company will be expected to spend $100,000 in 1908, $200,000 in 1909, and $200,000 in 1910. One-third of the new extensions will be made in each of the first three years.

Investigation of Relations Between Oil Companies and Railways.—Calvin Skinner, superintendent of the Scioto Valley Traction Company, of Columbus, Ohio, testified in New York on May 29, in the investigation which the Interstate Commerce Commission is making of the relations between the Standard Oil Company and its subsidiary companies with the railroads. Most of Mr. Skinner's testimony related to his steam railroad experiences with the lubrication methods and oils of the Galena Signal Oil Company, but incidentally he mentioned that the introduction by him of Galena methods and material on the Scioto Valley system had reduced lubricating costs 3 to 4 cents per 1000 miles run. The Scioto company pays 20 cents per gallon.

Bridge Suit Decided in Favor of Cincinnati Company.—In a suit brought by Councilman Kellogg, as a taxpayer, against the Cincinnati Traction Company to enjoin it from constructing a bridge over Eastern Avenue, at Pendleton, for the purpose of carrying coal to its power house near that place, the Common Pleas Court rendered a decision in favor of the defendant by consent, in order that the case may be carried to the Supreme Court as quickly as possible and the points brought out tested. Mr. Kellogg claims that the Council had no right to pass an ordinance allowing the building of a bridge in a certain locality, but that such an ordinance should be general in its character, allowing any one to build a bridge over any street, so long as the bridge did not interfere with travel on the street. In addition, it was claimed that if a property owner has a right to build a bridge across a street simply because it does not interfere with travel, then the property owner does not need the consent of the Council. The answer filed by the traction company and the city, which is made a party defendant, was to the effect that the structure contemplated is to be substantial and ornamental and an improvement of great convenience.

Legislation Affecting Electric Railways

New York.—The Assembly Committee on Electricity, Gas & Water Supply has reported the Page-Wainwright bill. This bill provides that "a railroad corporation and a street railroad corporation shall not be required to establish through routes or joint rates with each other."

Massachusetts.—A bill authorizing the New York, New Haven & Hartford Railroad to hold stock of the Boston & Maine Railroad until July 1, 1910, and to acquire additional Boston & Maine stock, but not to vote on the same, the Board of Railroad Commissioners being made trustees with the right to vote the stock, was agreed upon May 27 by the committee on railroads of the Legislature. The House of Representatives has passed the bill to provide that railroads and street railways may issue additional stock at a price fixed by their stockholders and approved by the railroad commissioners. Before passage the bill was amended at request of the Public Franchise League so that the commissioners shall refuse to sanction the issue if the price is "so low as to be inconsistent with public interest."

Boston Elevated-West End.—The bill authorizing the consolidation of the Boston Elevated and the West End has been signed. The Elevated Railway is authorized to increase its capital stock to an amount equal at par to the par value of the capital stock of the West End Street Railway at the time of the purchase, such new stock to consist of shares of $100 each, divided into first preferred stock and second preferred stock, the par value of the first to equal the par value of the preferred stock of the West End Street Railway, and the par value of the second to equal the par value of the common stock of the West End Street Railway. In short, holders of West End Street Railway preferred stock are to be offered 8 per cent first preferred of the Boston Elevated Railway, and West End Street Railway common shareholders 7 per cent second preferred of the Elevated Railway, thus maintaining the present dividends paid under the lease. It is estimated that the annual saving in operating economies and lessened investment required under the consolidation will amount to $310,000 annually, a sum equal to 2 per cent on the present $13,300,000 Boston Elevated stock.

Financial and Corporate

Stock and Money Markets

New York, June 2, 1908.

Stocks listed on the Stock Exchange have been higher and the strength in prices has been accompanied by a good volume of trading. The appointment of a receiver for the Wabash-Pittsburg Terminal Railway had been forecast for so long a time that the court proceedings did not influence the general market. Failure of this property to earn its fixed charges was due primarily to the expensive nature of its construction and the physical inability of its single-track outlet, the Wheeling & Lake Erie Railroad, to handle the traffic gathered by the terminal lines at Pittsburg. With the affairs of the Pittsburg terminal property in the hands of the courts the situation affecting the Gould system of railways becomes less complicated.

The annual report of the Amalgamated Copper Company, showing largely reduced earnings as compared with the previous year, had no adverse effect. The statement of views of the present outlook in the copper industry was optimistic. In the fiscal year ended April 30, 1908, the net income was $6,680,556, as compared with $14,154,400 in the previous fiscal year. The report said that on February 1 the surplus stock of copper had practically disappeared and that the mines are now operated at their full capacity.

Another event of importance, which did not influence prices of securities, was the announcement on behalf of the United States Steel Corporation of a reduction in the price of steel bars from $1.60 to $1.40 per 100 lb. This corporation and the large manufacturers associated in the general movement to maintain prices follow in this action a reduction made by the smaller manufacturers, who were securing the business offered by making a concession from the prevailing quotation.

Rates for money continue low and the going rate for call funds on Stock Exchange collateral is 1¾ per cent. Time funds range from 2½ per cent for 60 days to 4½ per cent for loans extending beyond the turn of the year, giving evidence of the excess of bankers' balances. Sentiment is divided concerning the probability of higher rates when the demand for currency for crop moving purposes starts.

Other Markets

Traction securities listed in the Philadelphia market have not been active and have held on about the level which they reached in the decline of the previous week.

Securities of the United Railways & Electric Company, of Baltimore, have been active on the Baltimore Stock Exchange. The refunding 5 per cent bonds were lower, selling at 76⅜ to 76¾, and the income bonds were quoted at 50¾ to 51½, ex-coupon.

Little trading took place on the Chicago Stock Exchange in electric railway securities. Interest in the stocks of the elevated railways has been reduced by the cessation of agitation of consolidation.

In the Boston market there has been a little trading in Boston Elevated Railway stock at 133 to 135.

Cleveland Electric Railway stock held between 50 and 51. Several 100-share lots sold June 1 at 51, but the close was 50, and there was no change on Tuesday. Washington, Baltimore & Annapolis Electric Railway pooling certificates closed at 14, although they sold a point or two lower during the week. Northern Ohio Traction & Light Company common held at 17 and Aurora, Elgin & Chicago Railway common at 30 bid.

Quotations for various traction securities as compared with last week follow:

	May 26.	June 2.
American Railways Company, Philadelphia	44½	44⅝
Boston Elevated Railway	a135	a134
Brooklyn Rapid Transit Company	51	49⅛
Chicago City Railway	160	a190
Cleveland Electric Railway	51½	a51¾
Consolidated Traction Company of New Jersey	70¼	71
Detroit United Railway	34	37⅛
Interborough-Metropolitan Company	12	12⅛
Interborough-Metropolitan Company (preferred)	32⅞	32⅞
Manhattan Railway	136⅞	137½
Massachusetts Electric Companies (common)	9	10
Massachusetts Electric Companies (preferred)	44	*44½
Metropolitan West Side Elevated Railway, Chicago (common)	17	*18
Metropolitan West Side Elevated Railway, Chicago (preferred)	53	*54
Metropolitan Street Railway	26	26
North American Company	60⅞	63⅜
Philadelphia Company Pittsburg (common)	39	39
Philadelphia Rapid Transit Company	14¾	14¾
Philadelphia Traction Company	90	89½
Public Service Corporation, certificates	69	a70
Public Service Corporation, 5 per cent notes	96	a97
Twin City Rapid Transit Company, Minneapolis (common)	89½	90⅛
Union Traction Company, Philadelphia	51¼	52

a Asked.
* Last Sale.

Underground Electric Railways Company, Ltd., London

Under the plan of readjustment recommended by the directors holders of the $25,000,000 share capital are not assessed. Cash requirements are to be met by the sale to Speyer & Company, of New York, and others of $5,000,000 of 12-year 5 per cent prior lien bonds. The company will pledge, in addition to $55,000,000 face value of stocks and shares, held by the London & Westminster Bank as trustee for the noteholders, an additional $17,500,000 of shares and the equity in the power house, and issue against this total of $72,500,000 securities, the $5,000,000 prior lien bonds, $15,000,000 of 4½ per cent bonds due in 1933, and $26,000,000 of 6 per cent income bonds due in 1948. The holders of the $35,000,000 outstanding 5 per cent notes will be asked to exchange the notes as to 40 per cent of par value into 4½ per cent bonds at par, and as to 70 per cent of par value into 6 per cent income bonds at par. Sir George Gibb, managing director and receiver, has made an estimate of future net revenues, indicating, however, that the company is not warranted in undertaking a definite obligation to pay the interest during the first few years on the 4½ per cent bonds of 1933. Speyer & Company have undertaken to provide up to $1,500,000 for any possible deficiency in fixed charges during the next few years. They will purchase on or before Jan. 1 and July 1 commencing with Jan. 1, 1909, such an amount of 4½ per cent bonds and 6 per cent income bonds at $1,500 (and accrued interest on the 4½ per cent bonds), for $1,000 nominal of 4½ per cent bonds and $1,500 of income bonds, as will make good any deficiency in the interest for the preceding half-year on the 4½ per cent bonds. The directors are of the opinion that this $1,500,000 will be sufficient to make up any deficiencies to and including July 1, 1912, and that thereafter, if not before, the surplus income will be sufficient to meet all of the fixed charges. Sir George Gibb's estimate of the surplus to and including 1913, follows:

Year.	Surplus after interest on prior lien bonds and income tax.	Required for 4½ per cent bonds and income tax.	Deficit.	Surplus available for income bonds.
1908	£12,147	£66,150	£54,003	.....
1909	45,234	141,750	96,516	.....
1910	81,121	141,750	60,629	.....
1911	115,608	141,750	26,142	.....
1912	143,108	141,750	.....	£1,358
1913	164,908	141,750	.....	23,158

This estimate assumes that the holdings in subsidiary companies are retained, that the amount of prior lien bonds issued remains at £1,000,000, and that the coupons due Dec. 1, 1907, on the notes and those for the interest to July 1, 1908, on the 4½ per cent bonds, are provided for out of the proceeds of the prior lien bonds.

Creditors' Committee of Toledo Railways & Light Company

On account of maturing bonds and franchises the Toledo (Ohio) Railways & Light Company has been unable, as announced in a previous issue, to finance its present loans, so a committee of creditors consisting of the following has been organized: J. R. Nutt, chairman, secretary Citizens' Savings & Trust Company, Cleveland; Norman B. Ream, New York; Myron T. Herrick, president Society for Savings, Cleveland; C. Ledyard Blair, of Blair & Company, New York; John Sherwin, president First National Bank, Cleveland; H. P. McIntosh, president Guardian Savings & Trust Company, Cleveland; William B. Hale, trustee the W. E. Hale estate, Chicago.

This committee already controls a majority of the 4 per cent bonds of the company and has invited all of the other 4 per cent bondholders and the secured creditors to deposit their claims with the committee. It is expected that the committee will ask for deposit also of the unsecured claims. The members of the committee feel that with wise and conservative management it will be possible to pay all the creditors of the company and leave a substantial equity for the stockholders, and that it is desirable to avoid, if possible, the expense of a receivership as well as the impairment of value which would be likely to result from insolvency proceedings of any kind.

The company is now applying its net earnings, after paying its operating expenses and keeping the property in repair, to its unpaid voucher account, and will apply the balance in payment of maturing interest on its secured debt. The committee is now engaged in making a careful examination of the affairs of the company and expects to present a plan for placing the affairs upon a permanent financial basis.

The Toledo Railways & Light Company owns all of the electric railway lines, as well as the electric lighting, heating and gas plants, in Toledo. It also controls, through owner-

ship of the entire stock, the following: Toledo & Western Railroad, 80 miles, of which 75 miles are on private right of way; Adrian Street Railway; Toledo, Ottawa Beach & Northern Railroad; Maumee Valley Railways & Light Company; Toledo Casino Company; Toledo Beach Company.

In June, 1907, the property of the Toledo Gas, Electric & Heating Company was bought by the Toledo Railways & Light Company, so that an accurate statement of the earnings of the original property is difficult to make, but based upon the separate earnings of the several companies, it is estimated that the gross earnings for 1908 will exceed $3,000,000 and that the operating expenses will not exceed $1,800,000.

The outstanding bonds of the company, which mature on July 1, 1909, are: Bonds issued by the Toledo Traction Company and its constituent companies, $6,000,000; bonds issued by the Toledo Railways & Light Company, $4,866,000. There are also $150,000 bonds of the Toledo Gas Light & Coke Company, which mature Nov. 1, 1908, making a total for which provision must be made of $11,016,000.

The franchises of the company are operated under more than 100 ordinances of the city of Toledo and proceedings of the Lucas County Commissioners. The franchises relating to gas, electricity, power, light, heating and the underground conduit system are perpetual, subject only to the ordinary police regulations and to the statutory requirements of the State of Ohio that the prices to be charged shall be regulated at intervals of not exceeding 10 years. The rights of the company to operate its street railway in certain streets will expire Nov. 9, 1910, but the larger part of the system is being operated under ordinances which expire in 1914. 1915 and 1916.

The purchases made by the company, especially that of control of the Toledo Gas, Electric & Heating Company in June, 1907, and the large improvements made in the power house and system of the company in 1907, created a large floating indebtedness, which, at the time of the panic in 1907, amounted in round figures to $2.500,000. About $1,500,000 of this indebtedness is secured by the deposit of treasury bonds of the company as follows: $1,134,000, Toledo Railways & Light Company 4's; $500.000, Maumee Valley Railways & Light Company Consolidated 4½'s; $500,000, Toledo, Ottawa Beach & Northern Railroad first mortgage 5's; $108,000, Toledo Gas, Electric & Heating Company 5's; $75,000, Adrian Street Railway 5's (entire issue); a total of $2.317,000. The balance of the floating debt of the company is practically unsecured.

Cleveland (Ohio) Electric Railway Changes

Action has been taken to change the name of the Cleveland Electric Railway to the Cleveland Railway Company and to reduce the number of directors to nine, as follows: President, Horace E. Andrews; vice-president, J. J. Stanley; C. F. Emery, L. C. Hanna, R. A. Harmon, Samuel Mather, H. P. McIntosh, R. R. Rhodes and J. H. Wade. The stock of the Cleveland Electric Railway will be changed for stock of the new company in the ratio of 55 to 100. Stock of the Forest City Railway will also be exchanged for the new stock. Henry J. Davies is secretary of the company.

Charleston & Summerville Electric Railway, Charleston, S. C.—At a meeting of stockholders it was voted to issue $100,000 additional common stock and $300,000 additional preferred stock.

Danbury & Harlem Traction Company, Danbury, Conn.—On behalf of three Philadelphia banks application was made on June 2, in the Superior Court at Bridgeport, Conn., for a temporary receiver for the Danbury & Harlem Traction Company, which is building an electric railway from Danbury to Golden Bridge, N. Y., where it will connect with the New York & Harlem Railroad. The allegation is that the company has defaulted in payment of interest on its bonds. The company has a power plant and has built two-thirds of its line. It is capitalized for $500,000 and has issued bonds to the amount of $300,000. Dietrich E. Loewe, of Danbury, is the president of the company. A hearing on the receivership will be held on June 9. Construction has been at a standstill about two years.

Elmira, Corning & Waverly Railroad, Waverly, N. Y.—It is reported that plans are under consideration for consolidation of the properties of the Elmira, Corning & Waverly Railroad, the Corning & Painted Post Street Railway and the Waverly, Sayre & Athens Traction Company, which are controlled by practically the same interest as the Binghamton (N. Y.) Railway, of which G. Tracy Rogers is president. It is also reported that the Binghamton Railway will be extended to Owego and Waverly, thus affording a through line between Painted Post and Binghamton.

Mason City & Clear Lake Traction Company, Mason City, Iowa.—This company has filed articles changing the name of the company to the Mason City & Clear Lake Railway and making the capital stock $200,000.

New York City Railway.—The Guaranty Trust Company, of New York, as trustee, has brought suit to compel the receivers to pay the taxes on the property of the Fulton Street Railroad. The trust company, as trustee under the mortgage sharing the issue of $500,000 of 4 per cent bonds, stated that there has been default in the payment of interest and taxes and that the default in the latter resulted in a lien prior to the mortgage. Since this suit was started the receivers have taken off the equipment from the Fulton Street road and have decided to discontinue operation of the line. The line is one mile in length and its equipment consisted of five cars propelled by horse power. In recent years the Fulton company is said to have operated at a loss of about $25,000 per annum. It is expected that the claim will be made that the rights of the bondholders extend only to the two blocks of double track running between Broadway and William Street.—Counsel representing the Morton Trust Company, the Guaranty Trust Company and other interests opposing the issue of $3,500,000 receivers' certificates by the receivers of the New York City and the Metropolitan street railway companies, appeared before Judges Ward and Holt, of the United States Circuit Court of Appeals, on May 29. In the argument for the rehearing, counsel asserted that the Circuit Court had apparently adjudicated upon points still in dispute, had increased the interest on the certificates from 5 per cent to 6 per cent, and to insure the marketability of the certificates as a guarantee of payment, had included, besides the net income of the two companies, property owned by the corporations not covered by the mortgages, which would in no wise be benefited by the proposed improvements. Decision was reserved by the judges.—Trial of the suit instituted by the receivers of the New York City Railway and the Metropolitan Street Railway against the Metropolitan Securities Company to recover $4,964,000 as the balance of $8,000,000 advanced under agreement by the Metropolitan Street Railway for a general rehabilitation of the surface lines of the New York City Railway, was begun before Judge Ward in the United States Circuit Court June 1.

New York-Philadelphia Company, Philadelphia.—At a meeting of bondholders in Trenton, N. J., on May 29 a protective committee was formed, composed of Hugh H. Hamill, president of the Trenton Trust & Safe Deposit Company; Harmon D. Yerkes, of Philadelphia, and Samuel Rice, of New York.

Orangeburg City Street Railway, Orangeburg, S. C.—This company is planning to sell its street railway system. J. W. H. Dukes, of Orangeburg, president of the company, states that the road has not been operated during the last year. The rolling stock consists of six cars and there are about two miles of track laid with 30-lb. and 40-lb. T-rails.

Public Service Corporation, Newark, N. J.—The mortgage securing the $50,000,000 of bonds authorized by the stockholders has been recorded.

Rochester, Charlotte & Manitou Railroad, Rochester, N. Y.—W. Butler Crittenden has been appointed receiver for this road.

Tampa (Fla.) Electric Company.—This company proposes to issue $2,000,000 of 5 per cent 25-year bonds to provide funds for improvement of the railway, increasing equipment and enlarging the capacity of the power station.

United Railroads of San Francisco.—Patrick Calhoun, the president, has issued a statement for the first three months of this year showing gross earnings of $1,522,716, as compared with $1,606,022 for the corresponding period of 1907. Estimates for April and the first half of May indicate that by the end of June the company will probably overcome this decrease. In 1905 the gross earnings were $7,066,892. In 1906 the total was $5,955,786, and last year it was $4,745,116. In March of this year the earnings were $537,700, the first month they exceeded the half-million mark since the beginning of the strike in May, 1907. Mr. Calhoun has closed negotiations for the sale to a syndicate of San Francisco and New York capitalists of $500,000 of the bonds which have been in the treasury of the company since its organization. The proceeds will be used for improvements. Practically all of the money derived from the sale of $5,000,000 preferred stock has been used to liquidate a floating debt accumulated since the fire of April, 1906. What is left of that money, with the proceeds of the bond sale, will go mainly toward enlargement of the electric power facilities.

Washington (D. C.) Railway & Electric Company.—In connection with the election of Clarence F. Norment as president, talk has been revived of consolidation of the property of this company with that of the Capital Traction Company.

Traffic and Transportation

Changes in Service Orders Requested in New York

E. P. Bryan, president of the Interborough Rapid Transit Company, of New York, and Frank Hedley, general manager, appeared before the Public Service Commission, First District, June 1. They asked for a radical modification of the service which the company is now required to give. In explanation, it was stated that because of business depression and the departure of many people from the city the ticket sales on the elevated lines and in the subway had fallen off several millions a month. Both the representatives of the company said that the numbers of passengers now carried by the elevated and subway lines did not require the present service, and they wanted permission to reduce it. Unless this permission was granted, they stated, financial trouble was certain to result. The car mileage of the Interborough company, they said, had been increased 14 per cent, while the increase in traffic in the first four months of 1908 was only 5 per cent. The matter was referred to Commissioners Maltbie and Eustis, and inspectors will investigate the question whether the commission is requiring too many trains for this season of the year. Mr. Bryan and Mr. Hedley told the commissioners that the company is dissatisfied with the amount of business on the Brooklyn extension, and that the opening of the line to the Long Island Railroad station had resulted in an increase of less than 15 per cent over the traffic carried when the line ended at Borough Hall.

A shuttle service between Bowling Green station and South Ferry in the subway and the running of all express trains to Brooklyn is recommended by the Interborough Rapid Transit Company to the Public Service Commission as the best plan of operating that part of its system. It would be necessary to build an additional platform on the west side of the Bowling Green station and a spur track at the cost of $75,000. By this means the company would be able to provide a two-minute headway on its Brooklyn trains in the rush hours.

Hearing in Boston on Increased Suburban Fares

A hearing upon the recent fare increases from 5 cents to 6 cents by the Natick & Cochituate Street Railway and the Middlesex & Boston Street Railway was held before the Massachusetts Railroad Commission on May 26. Chairman Sweetser, of the Wellesley Board of Selectmen, submitted a statement to show that the Natick & Cochituate railway could pay 7 per cent dividends on a total capitalization, including floating debt, of $300,000, if the present 6-cent fare was reduced to 5 cents, without free transfers to and from its Needham branch, and with the present reduction of service from four cars to three cars per hour, assuming that a 10 per cent loss in traffic follows the cessation of transfers at Wellesley Square. Mr. Sweetser claimed that under present conditions 2,000,000 passengers yearly on the main line of the company are paying 1 cent each to carry the 140,000 free transfer passengers to and from the Needham branch. Dividing the system into three parts, the line from Newton Lower Falls to Natick earned in 1907 net, above operating expenses and taxes, $14,172, and the Cochituate branch earned net $5,489, while the Needham branch failed to meet operating expenses by $7,432. Restoration of a full fare on the Needham branch in both directions would increase its earnings $7,000 per year and remove the tax upon the main-line traffic. Mr. Sweetser stated that he felt that a fair return on the investment should be allowed and named 7 per cent as a reasonable figure.

The companies were represented by M. C. Brush, general manager, who stated that inside of seven days a brief would be filed in reply to the argument of Mr. Sweetser. Within seven years the dividend rate on the Natick & Cochituate railway has been decreased from 8 per cent to 2 per cent, and on the Middlesex line from 5 per cent to nothing. For the year ending Sept. 30, 1907, earnings were:

	Gross earnings.	Operating expenses.	Net earnings.	Fixed charges.
Natick & Cochituate	$100,078	$83,298	$16,780	$14,766
Middlesex	76,705	55,069	21,635	26,905

	Earnings per car mile, cts.	Operating exp. per car mile, cts.	Operating per cent of, gross.	Gross earnings, per mile track.
Natick & Cochituate	18.95	15.78	83.23	$5,335
Middlesex	23.12	16.60	71.8	4,774

Mr. Brush compares earnings of the Natick & Cochituate railway for March, April and May, 1907, under the 5-cent fare units with the corresponding period of 1908, when the unit was 6 cents, as follows:

	March.		April.		May.	
	1907.	1908.	1907.	1908.	1907.	1908.
Gross pass. receipts.	$7,536	$7,103	$7,664	$7,301	$5,013	$5,063
Decrease	....	433	....	362	....	50
Per cent decrease	....	5.75	....	4.73	....	1.01
Earnings per car mile, cents	16.83	18.52	17.64	18.76	18.21	21.09
Increase, cents	....	1.69	....	1.12	....	2.88
Per cent increase	....	10.04	....	6.35	....	15.81

In March there was a decrease in passenger receipts in 20 of the 31 days; in April a decrease in 24 days out of 30, and in May a decrease in 8 days out of 19.

Freight Business Conducted for the Accommodation of the Public

The United Traction Company, of Albany, N. Y., has filed an answer with the Public Service Commission, Second District, concerning the complaint regarding its freight rates. The company states:

"The company alleges that what it really does is to conduct an express business at rates which are much less than the charges made for like service by other express companies. The company has one express or freight depot in Albany, Watervliet, Troy and Cohoes, and after a telephone message from merchants in any of these places a package of 100 lb. or less will be sent for, obtained at the merchant's place of business and carted to an express or freight depot of the company and then placed upon its express or freight cars and forwarded to the express or freight depot nearest the point of delivery and there unloaded, and from thence loaded to another conveyance and delivered to the consignee, perhaps miles away from the depot, all at a minimum charge of 25 cents, with any package over 100 lb. at a cost of 15 cents per 100 lb.

"It is respectfully submitted that the express or freight charges of this company are absolutely fair and reasonable and are lower than those of other methods of transportation. While it is true that for a time less rates were charged by this company than now, it was found that this department was conducted at a loss, and for that reason the increase was made. Any decrease in the rates now charged will result in the company conducting its freight business without profit or at an actual loss, or compel it to discontinue the department. The express or freight department of the company at the present rate of charges does not pay any more than operating expenses and the proper charges and is conducted only for the accommodation of the public and not for the profit of the company.

"The defendant respectfully submits that the charges should be withdrawn."

Milk Train on Worcester Railway.—The Worcester & Southbridge Street Railway, Worcester, Mass., has started the operation of a milk train between Charlton and Worcester.

Freight Privilege Desired in Spencer, Mass.—The Worcester (Mass.) Consolidated Street Railway has asked the Selectmen of Spencer, Mass., for permission to carry newspapers, baggage, express and freight over its line in Spencer.

Through Trains Between Indianapolis and Fort Wayne, Ind.—Five through trains are now operated daily in each direction between Ft. Wayne and Indianapolis, Ind., over the lines of the Ft. Wayne & Wabash Valley Traction Company and the Indiana Union Traction Company. The time required for the trip is as follows: Indianapolis to Peru, 76 miles, 2 hours and 20 minutes; Peru to Ft. Wayne, 60 miles, 1 hour and 50 minutes; total, 136 miles, 4 hours and 10 minutes.

Through Routes Between Indianapolis and Ohio River Points.—Arrangements for through transportation of freight between Indianapolis and Ohio River points have been made by the Indianapolis & Louisville Traction Company. Connection will be made by the traction company at New Albany, Ind., with the boats of the Louisville & Evansville Packet Company. The latter company will connect at Evansville with boats of the Evansville & Padueah and the Evansville & Cairo packet lines.

Criticisms of Service Invited.—The Jacksonville (Fla.) Electric Company has published advertisements asking passengers to report to the office of the company any complaints, criticisms or suggestions which it is desired to make. The Jacksonville *Times-Union* says regarding the announcement: "It is certainly a plain, frank, straightforward statement, and the company is to be commended for its evident desire to get into closer touch with its patrons and to render adequate and satisfactory service to the public."

Transfer System of Philadelphia Rapid Transit Company.—An official of the Philadelphia Rapid Transit Company writes that no change has been made in the form of the transfer ticket from that used prior to May 18, when the new order governing the use of transfers went into effect. Passengers who desire a transfer now must pay the conductor 5 cents in cash and secure the transfer at the time of the payment of fare.

These are practically all of the instructions which have been given to the trainmen, who carry out directions rigidly.

Plans for Handling Coney Island Traffic.—The Brooklyn Rapid Transit Company has made its plans for handling the summer traffic to Coney Island. The most radical change in the summer operation this year will be that the recently reconstructed and four-tracked Brighton line becomes an important factor in the through express service. The new schedule provides for increases in the local service to Coney Island as well as the inauguration of the express service. The plan is to keep the Brooklyn traffic separated as much as possible from the Manhattan crowds and to run the heavily laden trains from Park Row through on the inside express tracks out of the way of the Brooklyn trains. In addition to all of this a "short line" will be run between Prospect Park and Brighton Beach at such times of day and on such days as traffic warrants.

Twin City Rapid Transit Company, Minneapolis.—This company has issued summer timetables and is distributing again the circulars entitled "Airship View of Beautiful Big Island Park and Lake Minnetonka" and "Twin City Trolley Trips." A folder entitled "Best Way to See the Twin Cities," issued for the third season, gives details of the sightseeing trolley service of the company which was started June 1. A folding postal card gives views of Lake Minnetonka and calls attention to the facilities provided by the company for getting to and from the resort and for accommodating patrons, especially those who desire to spend their vacations or the summer at the lake. The folders and cards were prepared by A. W. Warnock, general passenger agent of the company, who has earned a reputation for his publicity work.

Injunction Against Universal Transfer System Secured in Richmond.—Upon petition of the Central Trust Company, of New York, Judge Edmund Waddill, Jr., of the United States District Court, at Richmond, Va., has issued a temporary order restraining the city authorities of Richmond and the Virginia Passenger & Power Company from putting into effect the universal transfer ordinance recently passed by the Council, and directing all the parties to appear before him on June 29 to show cause why a permanent injunction should not be issued. The trust company stated in its petition that, "by reason of the transfer points between the lines of the various companies operated in the city of Richmond, and the operation of such lines thereat, the effect of the provision of the ordinance of May, 1908, would be to greatly reduce the receipts of the defendant Richmond companies, which receipts, under the present method of operation and transfer, have proved insufficient to pay fixed charges."

Another Hitch in Chicago Elevated Loop Relief Plans.—At a meeting of the Council Committee on Local Transportation in Chicago, May 28, George Weston, consulting engineer for the committee, presented a preliminary report regarding conferences with representatives of the four elevated roads using the loop. The South Side Elevated Railroad objected strongly to through routing, on the ground that it would add yearly $27,000 to the cost of conducting transportation, due to extra car mileage, with no proportionate increase in revenue. The Metropolitan West Side Elevated Railway also objected to some details of the proposed method of through routing. The consensus of opinion of the representatives of the four roads was that Mr. Weston's plans would increase the present maximum capacity of the loop only 33 per cent instead of 43 per cent, as estimated in the report. The Council committee requested Mr. Weston to reopen the conferences and report a definite plan which the committee could approve and seek to have the companies put in force immediately.

Terms of Agreement with Men at Pittsburg.—The Pittsburg Railways Company has posted notices in its car houses outlining the regulations and wage schedules that will govern motormen and conductors until April 20, 1909. The first two years the men are to be paid 24½ cents an hour, the third year 25½ cents an hour and after the third year 26½ cents an hour. The hours of service are to be made as near as possible on the basis of 11 hours and a minimum of 8 hours, with 10 per cent leeway. The men are to be permitted to register for their day off, assignment to be made in accordance with priority of registration. There is to be no discrimination between union and non-union men, and appeals from the decision of the superintendent in cases of reprimand are to be heard by the president at 10 a. m. the first and third Tuesday of each month. All men taken off their own run to work on one with not so many working hours are to be paid the time called for by their run. It is further provided that any employee elected to an executive position in the union shall upon his retirement from the office be reinstated by the company, his standing to be the same as when he retired from the company.

Personal Mention

Mr. John M. Campbell, of Kingston, Ont., has been appointed president of the Buffalo, Lockport & Rochester Railway, with offices at Albion, N. Y. The purpose of this company is eventually to furnish a high-speed electric service between Buffalo and Rochester in addition to a local service.

Mr. Thomas L. Hartigan, president of the Manila (P. I.) Electric Railroad & Light Company, has returned to the United States. He will spend the summer here and return to Manila next autumn.

Mr. John Blair McAfee, of Philadelphia, has been elected president of the Norfolk & Portsmouth Traction Company, of Norfolk, Va., to succeed Mr. L. Lancaster Williams, who, on account of his position as receiver for the Seaboard Air Line Railway, was unable to serve.

Mr. J. P. Tanner, chief accountant in the water-works department of the city of Cleveland, Ohio, has taken a position with the Municipal Traction Company. He will systematize the work of the accounting department so far as the receipts from operation are concerned. It is anticipated that the pay-as-you-enter cars will be used altogether later and this will necessitate a somewhat different system. Mr. E. R. Price, cashier of the company, has resigned, and Mr. Tanner will take up this work also. Mr. Tanner was formerly in the employ of Ernst & Ernst, public accountants.

Mr. F. R. Price has resigned as cashier of the Municipal Traction Company, of Cleveland. A few weeks ago he had an attack of nervous prostration and was granted a vacation with the intention that he should continue in office on his return. He has concluded to take a long rest for the benefit of his health before going into any other work. Mr. Price entered the service of the Cleveland Electric Railway Company 10 years ago and served as cashier under both Mr. Henry A. Everett and Mr. Horace A. Andrews while they were presidents of the company. Mr. J. P. Tanner will assume the duties of the office.

Mr. Clarence F. Norment has been elected president of the Washington (D. C.) Railway & Electric Company to succeed Mr. Allan L. McDermott, who represented interests formerly in control of the property. Mr. McDermott was elected special counsel. Mr. Ward Thoron has been elected first vice-president, succeeding Mr. Norment in that capacity. Gen. George H. Harries was continued as second vice-president, a position he has held for a number of years. Mr. Thoron has been actively identified with the company since the beginning of the year and, like the other two officers mentioned, represents the change in the ownership of the stock which has been in progress of late years.

Mr. Horace C. Andrews has been elected president of the Schenectady (N. Y.) Railway, to succeed Mr. F. A. Harrington, resigned, who has been president of the company since the property was taken over by the New York Central Railroad and the Delaware & Hudson Railroad interests several years ago. Mr. Andrews was president of the Cleveland Electric Railway Company until that property was taken over recently by the Municipal Traction Company, and as a member of the Andrews-Vanderbilt syndicate has been devoting a large part of his time to the interests of the syndicate in New York State. As president of the Mohawk Valley Company, he is associated in the management of the Utica & Mohawk Valley Railway, Rochester Railway, Oneida Railway, Syracuse Rapid Transit Company, Rochester & Sodus Bay Railroad, Canandaigua Gas Light Company, Ontario Light & Traction Company and other properties controlled by the Mohawk Valley Company.

OBITUARY

Prof. W. A. Anthony, professor emeritus of physics and electrical engineering in Cooper Institute, New York, died at his home in that city Friday, May 29, of heart disease at the age of 73 years. Prof. Anthony was born in Coventry, R. I., Nov. 17, 1835, and was graduated from Yale. He taught physics in Iowa Agricultural College and in Cornell for 18 years and then went into business for himself as a consulting engineer. In 1895 he became professor of physics and electrical engineering at Cooper Union, and three months ago was retired from the faculty and made professor emeritus. Prof. Anthony was a member of the American Institute of Electrical Engineers, the Franklin Institute, of Philadelphia, and the American Social Science Association. He was president of the American Institute of Electrical Engineers in 1890-1 and always took a deep interest in the welfare of the organization.

Electric Railway Patents

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED MAY 19, 1908.

Rail Joint, 887,792; William H. Grosse, Green Bay, Wis. App. filed Oct. 5, 1907. The ends of the abutting rails each have an extension and a recess, the extension upon one rail being designed to be received within the recess of the opposit rail and the end wall of one of the recesses being cut away and the extremity of the corresponding extension being notched for engagement with a tool inserted within the said cut away portion.

Passenger Car, 887,804; Joseph H. Herbst, Hyman Fass and Maurice Sjank, New York, N. Y. App. filed Dec. 24, 1907. Adjacent entrance and exit doors are provided, the exit door actuating a device for locking the entrance door so as to separate passengers boarding and leaving the car.

Rail Spike Supporter and Protector, 887,830; Jeremiah Murray, Utica, N. Y. App. filed July 18, 1906. Plate recessed at the end and adapted to the tie and to receive and engage the spike and flange of the rail at each side of the spike. Offset spike openings are provided in the extending portion.

Double-Necked Rail for Railways, 887,832; John A. Myers, Braddock, Pa. App. filed June 29, 1907. The rail has double necks spaced apart, a head and a recessed bottom plate, one neck being continuous with the bottom plate and head and the other extending from the head and adapted to the recess of the bottom plate to be compressed therein.

Cast Iron Axle, 887,848; Elbert R. Robinson, Chicago, Ill. App. filed Feb. 6, 1907. A cast axle with bearing portions chilled and the intermediate portion annealed to prevent breakage.

Trolley Wire Supporting Device for Bascule Bridges, 887,868; Joseph B. Strauss, Chicago, Ill. App. filed Jan. 28, 1907. A flexible section kept taut by a weight.

Electric Railway System, 887,932; Samuel C. Frey, York, Pa. App. filed Nov. 28, 1906. A car stop and signaling block system adapted for single track roads, having a signal system and train stop device whereby the signals are enforced.

Car Fender, 887,939; Edward Hohn and Leopold Hohn, Millvale, Pa. App. filed Dec. 28, 1907. The fender has a base platform and a supplemental platform spring supported thereon.

Electrically Controlled Switch-operating Mechanism for Railways, 887,980; Karel W. G. J. Stoffels and Johannes J. H. W. Weenen, Amsterdam, Netherlands. App. filed Jan. 23, 1907. A track switch with operating magnets selectively controlled by a pair of conductors supported adjacent to the wire.

Railway Tie, 887,983; Joseph A. Swope, Hanford, Cal. App. filed July 15, 1907. A tie provided with a key-locking mechanism to receive the rails.

Railway Tie and Rail-fastening Device, 888,030; James J. O'Donnell, Paducah, Ky. App. filed July 10, 1907. Details.

Third-rail Electric Railway System, 888,099; Charles Kozesnik, New York, N. Y. App. filed Oct. 30, 1906. A hollow third-rail for electric railways.

Fluid Pressure Brake, 888,207; Walter V. Turner, Edgewood, Pa. App. filed Oct. 1, 1906. Means for charging fluid under pressure from a supplementary source into the brake cylinder when the train pipe pressure has been reduced.

Trolley Pole, 888,223; George W. Chatmond, Louisville, Ky. App. filed Nov. 7, 1907. The pole is pivoted and arranged so it can be held in any selected position.

Railroad Tie, 888,227; Joseph B. Depriest, Manassa, Colo. App. filed July 8, 1907. Details.

Guard Rail Clamp, 888,314; Warner B. Cooke, Jenkinstown, Pa. App. filed April 26, 1907. Improvement of guard rail clamps made of a single piece of wrought metal.

Railroad Tie, 888,317; Sylvester H. Deihn, Altoona, Pa. App. filed June 28, 1907. Means for attaching the rails to a metallic channel-shaped tie.

Sliding Current Collector, 888,382; H. Armstrong, Schenectady, N. Y. App. filed Aug. 6, 1906. A trolley contact shoe consisting of a horizontally supported plate with hooked extremities. In order to avoid cutting deep grooves or ruts in the shoe, it is made with a plurality of longitudinally adjustable adjacent bars which can be set to new positions from time to time.

Construction News

FRANCHISES

Monrovia, Cal.—H. Kirchenschlager has presented a petition to the City Trustees asking that franchises for a double-track local street railway be advertised for sale. It is stipulated in the petition that the motive power be electricity, gas or gasoline motor; that construction shall begin within 60 days from the time the franchise is let, and track laid on J. I. C. Avenue from Chestnut Avenue north to city limits, within six months thereafter. The balance of the work is to be completed in four years. Franchises are desired on all the principal thoroughfares that are north of Chestnut Avenue.

Grand Junction, Colo.—It is reported that Morris K. Devereaux and Eugene S. Sunderlin will apply for a franchise to construct a street railway in Grand Junction.

Sandpoint, Idaho.—F. M. Molyneaux, Al Filson, V. M. McBride and Earl Farwin, of Sandpoint, and V. M. Smith, of New York, have applied for a franchise to construct and operate a street railway system in Sandpoint.

Springfield, Ill.—The Springfield, Clear Lake & Rochester Interurban Railway has applied to the City Council for a franchise to operate cars from the eastern terminal to Sixth and Monroe Streets, thence around the loop on Washington and Fifth Streets. J. E. Melick is president.

Windsor, Ill.—The City Council has granted a franchise to the Mattoon, Shelbyville, Pana & Hillsboro Traction Company to construct its line in Windsor.

Pelham, Mass.—The Holyoke Street Railway has been granted a franchise for the extension of the Amherst & Sunderland branch to the Orient Springs Grove. It is said that the company will build the extension at once. W. L. Loomis, president.

United Railways, St. Louis, Mo.—This company has applied to the County Court at Clayton, Mo., for a franchise to double-track the line to St. Charles.

Asbury Park, N. J.—The Atlantic Coast Electric Railroad has made application for a franchise to construct a double-track line from Florence Avenue to the Monmouth Beach borough line in Long Branch.

Portland, Ore.—The County Court has granted to the United Railways two franchises, one to construct a line along the Macadam Road and another to build a line on the St. Helens Road. On the latter line the work will be commenced within 60 days and be completed in a year.

Irwin, Pa.—The City Council has granted the Irwin-Herminie Electric Railway a franchise for operating cars from the west borough line of Pennsylvania Avenue, over the tracks of the Pittsburg, McKeesport & Greensburg Railway and then in Main Street to the north borough line. The company is to pay the borough over $8,000 for the franchise, one-third in cash and the balance in regular payments. The franchise is for 33 1/3 years, with two renewals. Work is to be started in 60 days and to be completed in one year.

Westerly, R. I.—The Ashaway & Westerly Railway Company has been granted a franchise to build an electric railway in Westerly. It is the intention of this company to construct a road from Ashaway to Westerly. Frank Hill is secretary and treasurer of the company.

Walla Walla, Wash.—The Walla Walla Valley Traction Company, operating the street railway and the line to Milton, Ore., has applied to the County Commissioners for a franchise over the county roads from the south limits of the city to the north side of the Ransom Clark donation claim.

RECENT INCORPORATIONS

Redlands Construction Company, Redlands, Cal.—Incorporated in California, with capital stock of $500,000, to construct the Redlands & Yucaipa Railroad. Directors: J. M. Neeland, M. N. Newmark, A. P. Maginness, M. H. French, W. D. Larrabee, Paul Hirsch, C. S. Chesnut, W. M. Campbell and O. M. Miller, of Los Angeles and Redlands. It was decided at the recent meeting of stockholders of the Redlands & Yucaipa Company to organize this company to have charge of the construction and also to increase the capital stock from $1,000,000 to $2,000,000. A meeting of stockholders has been called for July 23 to vote on the increase in stock.

Gary-Hobart Electric Railway Company, Gary, Ind.—Incorporated in Indiana to construct street and interurban railroads in and connecting the towns of Gary, Liverpool, Hobart and intervening villages in Lake County. Capital stock $10,000. Directors: L. Clark Wood, Samuel A. Mulhauser and C. A. Teller, of Chicago.

Gary & Southern Traction Company, Crown Point, Ind.—Incorporated in Indiana, with capital stock of $10,000, to construct an electric railroad in Crown Point and Gary and through Lake County. Directors: F. M. Clark and H. C. Wood, Chicago; H. W. Seaman, Clinton, Ia., and Warren Bicknell, Cleveland, Ohio.

Indianapolis, Cloverdale & Terre Haute Traction Company, Indianapolis, Ind.—Incorporated in Indiana to construct and operate an electric railway connecting Indianapolis, West Newton, Mooresville, Gasburg, Monrovia, Hall, Eminence, Cloverdale, Poland, Ashville, Brazil and Terre Haute. This company was originally incorporated under the Voluntary Association Act, but found it could not exercise the right of eminent domain. Directors: E. M. Bowman, H. F. Butze, Samuel T. Axtell, W. L. Cook and H. C. Sandresky.

Charleston, Westfield, Marshall & Terre Haute Railway, Charleston, Ill.—Incorporated in Illinois with a capital stock of $50,000 for the purpose of constructing an electric railway from Terre Haute, Ind., to Charleston, Ill. Directors: W. B. Scholfield, Norman Bennett and Seymour Hurst, all of Marshall, Ill.; James W. Dawson, M. L. Briscoe, W. L. Briggs, of Westfield, Ill.; W. R. Patton, of Charleston. The officers are: W. R. Patton, president; J. W. Dawson, vice-president, and Seymour Hurst, secretary.

Charleston & Casey Traction Company, Casey, Ill.—Incorporated, with a capital stock of $2,500, to construct an electric railway from Charleston, Ill., to Casey, Ill. The principal office is at Casey. Among the incorporators are: H. R. Patton, Charleston, Ill.; William Stull, Charleston, Ill., and S. S. Yanaway, of Casey, Ill.

Keokuk & Columbus Junction Transit Co., Keokuk, Iowa.—Incorporated with capital stock of $10,000 to construct and operate an electric railway to connect Keokuk, Charleston, New Boston, West Point, Lowell, New London, Winfield and Columbus Junction. It is estimated that the length of the road will be about 75 miles. Officers: J. E. Peterson, New London, president; D. B. Hamill, Keokuk, vice-president; T. A. Craig, Keokuk, secretary; Ira W. Mills, Keokuk, treasurer.

Excelsior Springs & Suburban Railway, Excelsior Springs, Mo.—Chartered with $50,000 capital stock to build a road from a junction of the Chicago, Milwaukee & St. Paul Railroad near Excelsior to a point in the central portion of Excelsior Springs, a distance of two miles. The stockholders are: Allen M. Bates, Hugh Wilhite and W. P. Southard, of Excelsior Springs; Henry J. Arnold, of Denver, Colo., and John E. Lundstrain, of Colorado Springs.

Columbus, Marion, Upper Sandusky & Toledo Construction Company, Upper Sandusky, Ohio.—Incorporated for the purpose of building an electric railway to connect the towns named in the title. Incorporators: Gen. J. Kent Hamilton, George A. Bassett, George P. Kirby, W. L. Rowland and W. S. Thurston, Jr., all of Toledo.

Parkersburg Bridge Company.—Incorporated to build a bridge over the Ohio River between Parkersburg, W. Va., and Belpre, Ohio. After the bridge has been completed the company intends to start preliminary work on the construction of a system of interurban railways which will connect Pittsburg, Pa., and Cincinnati, Ohio, the first section being from Pomeroy to Gallipolis, Collville and Columbus, by way of Logan and Lancaster, Ohio. Application has been made to the government to build the bridge, and work will be started as soon as permission is obtained. Capital stock, $400,000. Incorporators: J. H. Brooks, J. G. Lee, S. C. Williams, C. Newell and James Newell, of East Liverpool, O.

Springfield & Washington Railway, Springfield, Ohio.—Incorporated to build a line connecting Springfield, Washington C. H. and Chillicothe. Incorporators: George W. Baker, Hiram C. Baker, Charles Baughton, W. E. Roderick, Ulric Sloane and W. W. Keifer. Capital stock, $1,000,000. Mr. Baker recently purchased the property of the Washington Traction Company, which is in operation between Springfield and South Charleston, and the new company has been organized to complete the line in accordance with the original plans.

Guthrie & Interurban Railway, Guthrie, Okla.—Incorporated in Oklahoma, with $100,000 capital stock, to build an electric interurban railway from Guthrie to a point on the Cimarron River, a distance of five miles. Incorporators: C. R. Renfro, F. E. Houghton, G. Crow and R. E. Overton, Guthrie, and E. C. Brown, St. Louis.

Wasco County Electric & Power Company, Portland, Ore.—It is announced that this company has been organized for the purpose of entering the Deschutes and John Day valleys with an electric railway that will be built south from Condon. Capital stock of the company is given at $3,000,000. It is said that an attempt will be made to place $15,000,000 in bonds in the East. Among the incorporators are: George S. Carpenter, of Fossil; Mark W. Gill, W. H. Grindstaff, Dr. H. I. Kenney, R. L. Donald, H. J. Martin, O. B. Hathaway, E. P. Schow, C. D. Charles and F. S. Munn, of Portland, and F. T. Hurlburt, of Condon. The plan of the new company is to build from Condon southwest to Antelope, Madras and Bend. Branches will be built to Howard and Dayville. It is expected to construct big water power plants that will generate electricity to operate the lines constructed. These will be built on the Deschutes and John Day rivers.

Mount Holly & Gettysburg Street Railway, Carlisle, Pa.—Chartered, with a capital of $18,000, to build an electric railway from Mount Holly Park to the Hunter's Run station of the Hunter's Run & State Belt Railroad Company, a distance of three miles. The new line will really be an extension of the Carlisle & Mount Holly Electric Railway, which now terminates at Mount Holly Park, and there is a strong probability of the line being still further extended to Gettysburg via Bendersville, Arendtsville and Mummasburg. The directors are: T. M. Nelson, Chambersburg, president; A. H. Nelson, W. M. Alexander, C. H. Mullin, Wm. McGowan, W. F. Pascoe and Frank A. Zimmermann.

Alexander & Eastern Railway, Alexander, W. Va.—Chartered to build a line from Alexander, W. Va., to Elkins, W. Va., 25 miles or 30 miles. The incorporators are: John B. Hart and Charles M. Hart, of Clarksburg. The authorized capital stock is $100,000.

TRACK & ROADWAY

Vancouver Island & Eastern Railway, Vancouver, B. C.—This company is reported to have applied for a charter. It was organized last year to build an electric railway from Esquimault Harbor, Vancouver Island, north to Seymour's Narrows, and from Bute Inlet or Frederick Inlet, on the mainland of British Columbia, east via Yellow Head Pass to Edmonton. The provisional directors include T. W. Paterson, T. J. Jones, R. C. Lowe and H. A. Munn, of Victoria, B. C.; James Smith, of Edmonton, Alta., and M. J. Harvey, of Toronto, Ont.

Redlands Central Railway, Redlands, Cal.—The company will award contracts soon for the following material for 1½ miles of single track: 60 lb. A. S. C. E. T-rail; 35-ft. poles; 4 ft. 8½ in. and 8-ft. split redwood ties, and No. 0000 trolley wire. John H. Fisher, general manager.

Tampa-Sulphur Springs Traction Company, Tampa, Fla.—This company is planning to build a ¾-mile extension to its system in Ybor City. Contracts for overhead material are to be awarded during the next three weeks. The company is planning to erect a pier, 27 ft. x 26 ft., for its new bridge, which will cross the river to West Tampa. L. Brill is general manager.

Charleston & Summerville Electric Railway, Charleston, Ill.—This company has applied to the City Council for an extension of time for fulfilling the terms of the franchise. This road is reported to be under construction and when completed will connect Charleston and Summerville. F. S. Wright, vice-president.

Mattoon-Shelbyville-Pana & Hillsboro Traction Company, Mattoon, Ill.—It is said that practically all the necessary franchises have been secured for this line. Of the 66 miles proposed, right of way has been secured for about 12 miles. This company contemplates the building of an electric railway to connect Mattoon, Charleston, Shelbyville, Pana and Hillsboro. W. R. Patton, of Charleston, is president.

Quincy Horse Railway & Carrying Company, Quincy, Ill.—It is announced that this company has made a contract with the Pennsylvania Steel Company for special steel rails, costing $4,000, to complete a downtown loop.

Chicago, Ottawa & Peoria Railway, Streator, Ill.—It is reported that this company has sold a block of bonds and that construction work is to be started shortly on the line between Streator and Ottawa, Ill. Among the directors are: H. E. Chubbuck, Ottawa, Ill., and George Mattis, Champaign, Ill.

Mississippi Valley Interurban Railway, Springfield, Ill.—It is reported that this company, of which John E. Melick, of Springfield, Ill., is president, is preparing to extend its lines in Bond, Christian, Montgomery and Sagamon counties. It is expected to extend the road to Vandalia, Greenville and Donnellson, and on another section to Bunker Hill, Jerseyville, Brussels, Hamburg, Hardin and Belleview. B. F. Bond is superintendent of construction, with headquarters at Hillsboro.

Taylorville (Ill.) Railway, Light, Heat & Power Company.—W. B. Adams writes that construction is soon to start on this road. It will be a local line, about four miles in length. Mr. Adams states that the road has been financed, but the contract to build the line has not yet been awarded. The power station will be located at Taylorville and current will be sold for commercial purposes. Overhead trolley will be used. The company expects to operate an amusement park, about one mile from the city. Capital stock, $150,000. Officers: James Forester, Taylorville, president; Henry Cheney, Taylorville, vice-president; James A. Adams, secretary, and W. B. Adams, general manager.

Indianapolis & South Bend Traction Company, Logansport, Ind.—John H. Kellar, president and general manager, writes that the surveys for this road are well under way, and it is expected to begin grading immediately after the survey is completed. The company is directing the work from its Logansport office and will begin construction from that point.

Vincennes & Washington Transit Company, Monroe City, Ind.—This company has been organized for the purpose of building an electric railway from Vincennes, Ind., east through Monroe City to Washington, Ind., thence northeast through Davies, Greene, Martin and Monroe Counties, to Bloomington; also from a point on this line near Monroe City northeast through Sullivan and Greene Counties to Linton, thence east through Greene and Monroe Counties to Bloomington. General offices of the road will be at Monroe City, Knox County, Ind. Capital stock, $60,000. Directors: J. J. Burns, C. F. Burns and J. Frank Munroe, Chicago; M. A. Peoples, Willis W. Claycomb and Charles S. Nausett, Monroe City; P. M. Davidson, Troy, Ill. This road is being built under direction of Burns & Company, Chicago. The interurban line between Vincennes and Washington, 21 miles, will be constructed first, and work is now under way between Monroe City and Wheatland, 4 miles. On this part of the road surveys are completed, right of way obtained and about one mile graded. Burns & Company will purchase all supplies and materials and award all contracts.

Terre Haute & Merom Traction Company, Terre Haute, Ind.—It is stated that the contract for the building of this line through Gardentown was recently awarded to Donn Roberts, of Terre Haute. L. Brown, president.

Sioux City, Iowa.—It is stated that F. W. Bisbee, of Castana, Iowa, is interested in a plan to build an electric railway from Sioux City to Council Bluffs and Omaha and that the promoters are prepared to make the preliminary survey.

Union Traction Company, Independence, Kan.—This company has just been voted $20,000 in bonds by Arkansas City as aid toward the construction of an electric interurban railway between Arkansas City and Winfield. It is said that a vote will be taken soon on aid to an equal amount in Winfield. D. H. Siggins, of Coffeyville, is president.

Joplin & Pittsburg Railway, Pittsburg, Kan.—The contract for the construction of this road has been awarded to Smethurst & Allen, of Philadelphia, Pa.

Wichita (Kan.) Railroad & Light Company.—It is stated that this company contemplates constructing two miles of double track. S. L. Nelson, of Peoria, Ill., is general manager.

Lexington (Ky.) Railway.—This company is authorized by a city ordinance just approved to extend its lines on East Main Street and on East High Street, starting from Clay Avenue and running to Hanover Avenue. Louis DesCognets is vice-president, Lexington, Ky.

Washington, Frederick & Gettysburg Railway, Frederick, Md.—A. C. McBride, general manager, writes that the contract for extending the railway from Lewiston to the Monocacy Valley Railroad has been awarded to J. E. McDonough, of Frederick, Md.

Youghiogheny Light & Power Company, Oakland, Md.—It is understood that this company will build a standard-gage electric railway to Swallow Falls with branches to Uniontown, Pa., and Kingwood, and another branch to connect with the railroad of the Jennings Lumber & Coal Company. A. C. Sturgis, president; Truman West, vice-president; P. A. Chisholm, second vice-president; James D. Hamill, treasurer; Bowie Johnson, secretary, and H. P. Tasker, general manager.

Boston (Mass.) Elevated Railway—This company has asked the Railroad Commission to approve its proposed track location in Washington Street, Forest Hills, in connection with the elevated terminal station to be built near the Arborway. The company desires to build a surface loop track to facilitate handling traffic between Hyde Park, West Roxbury, Roslindale and other suburbs and the street platforms beneath the elevated station. No opposition developed at a hearing on May 27. The company has also asked an extension of time for forfeiting or constructing trackage in Salem Street, Malden, in connection with the proposed Spot Pond line, and for approval of a connection between the Boston Elevated and Boston & Northern Street Railway tracks in Salem Street, Malden. The plan is for a joint use of tracks in Salem Street, to allow the Elevated road to run a new line into Boston via Malden Square.

Compania Ferrocarriles Electricos, Chihuahua, Mex.—Martin Talonier, managing director, states that actual construction work on the electric railroad lines through the principal streets of Chihuahua will commence shortly. He expects to have the lines ready for opening by Sept. 16.

St. Paul, Minneapolis & Seattle Electric Railroad, St. Paul, Minn.—This company is reported to have entered into a contract with A. A. Carlstrom, of Seattle, for the first 10 miles of grading for its line. J. W. Mossop is vice-president and general manager.

Omaha, Lincoln & Beatrice Railway, Lincoln, Neb.—E. C. Hurd, secretary, writes that this company will place contracts during the next few weeks for the construction of 1⅛ miles of new track, with curves, turn-outs and overhead work.

Albuquerque, N. Mex.—It is reported that D. K. B. Sellers is interested in a project to build an electric railway on the Highlands.

Binghamton (N. Y.) Railway.—It is reported that the Binghamton Railway will be extended to Owego and Waverly.

Yarmouth (N. S.) Street Railway.—It is announced that this company will place contracts during the next four weeks for the construction of an extension. About a mile of new track is to be added. B. G. Burrill is president.

Cincinnati, Ohio.—A new traction railway to connect Cincinnati with Fort Wayne is being planned by capitalists of Dayton, Ohio. The old Gamble road, extending from Brighton to Cheviot, will be used as a means of entering Cincinnati. Dr. T. H. George, of Dayton, Ohio, is the promoter.

Ohio Electric Railway, Cincinnati, Ohio.—This company has been granted an extension of one year's time in which to begin the work of electrifying the Columbus & Lake Michigan Railroad by the City Council of Defiance, Ohio.

Ardmore, Okla.—J. D. Conolly, of Titusville, Pa., and E. A. Rea, of Corydon, Iowa, are reported to contemplate the construction of a street railway in Ardmore.

Dunnville, Ont.—The rate-payers have approved a by-law authorizing the purchase of $30,000 Dunnville, Wellandport & Beamsville Electric Railway bonds to assist in construction of the road.

Port Arthur (Ont.) Electric Railway.—The Electric Railway Commissioners have been authorized to proceed with the double-tracking of the electric railway between Current River Park and the southern boundary of the city. This road is owned and operated by the city.

Toronto Railway, Toronto, Ont.—The City of West Toronto has applied to the Ontario Railway & Municipal Board for an order directing the Toronto Railway to construct new tracks and substructures on Dundas Street between the eastern limits of the municipality and Keele Street, on the "Y" at the corner of these streets, and on Keele Street, North.

Astoria, Ore.—Preliminary steps have been taken toward the organization of the Astoria Seaside & Tillamook Railroad, capital stock $2,000,000, which proposes to build an electric railway from Astoria to Seaside and thence to Tillamook. The company is being organized by F. L. Evans.

Huntingdon, Pa.—It is reported that F. M. Bollinger and M. A. Miller will organize a company for the purpose of promoting the construction of a street railway system in Huntingdon and along Stone Creek for a distance of 2½ miles, to a point where it is the intention to build an amusement park. It

is said that application will be made for a charter on June 11 under the name of the Brookside Electric Railway.

Manor Valley Electric Railway, Manor, Pa.—This company has applied for a charter. It is proposed to build an electric railway from Manor to Export, seven miles. It is said that the surveys are made and the right of way and capital for building the line are partly secured. H. A. Lauffer is president.

Stroudsburg & Water Gap Street Railway, Stroudsburg, Pa.—This company has been granted the privilege of extending its Mountain View line to the Casino, in the center of the Delaware Water Gap. It is said that part of the line, from the Glenwood House to the Cherry Valley Inn, will be completed soon. A. A. Holbrook, general manager.

Sunbury & Northumberland Electric Railway, Sunbury, Pa.—R. West, general manager, informs the Electric Railway Journal that the Sunbury & Northumberland Electric Railway Company is in the market for 6000 ft. standard track and overhead material; also for a 60-ft. Ferris wheel.

Hull (Que.) Electric Railway.—The City Council of Hull has received the reply from the Canadian Pacific Railway, which owns the Hull Electric Railway, to the proposition for double-tracking the railway and the construction of a belt line around the city. All the city stipulations were agreed to, save the one which required the payment by the company of $7,500 to assist in lowering street drains.

Rhode Island Company, Providence, R. I.—It is stated that this company will begin soon construction work on the Promenade Street line to Olneyville. The company will strengthen the two highway bridges on Valley Street. A. E. Potter is general manager.

Knoxville, Sevierville & Eastern Railway, Knoxville, Tenn.—It is reported that construction on the first section of this line will begin before June 14, the bonds voted by Sevier County to the amount of $150,000 having been declared valid. W. J. Oliver & Company will build the line, which is designed to reach ultimately into North Carolina.

San Angelo (Tex.) Power & Traction Company.—It is reported that construction work has been begun on this line. The first mile of track is to be completed by Sept. 7. The company is also reported to be negotiating for rails and other material. Directors: J. H. Ransom, W. D. Fuller, T. M. Vaughan, E. E. Bailey and John W. Harris. The managing officers are: E. E. Bailey, president and general manager; J. H. Ransom, vice-president and assistant general manager; W. D. Fuller, general superintendent; T. M. Vaughan, secretary; John W. Harris, treasurer; J. Curtys Simmons, general attorney.

Seattle, Wash.—An extension of time until May 18, 1909, has been granted to Edwin S. Gill and John McQuade for beginning of construction on an electric railway from Seattle to Everett, under the terms of a franchise granted by the commissioners on May 17, 1906.

Wheeling (W. Va.) Traction Company.—It is reported that this company contemplates extending its line at Moundsville this summer. G. O. Nagle is superintendent. Up to the present time nothing definite has been decided.

AMUSEMENT PARKS

People's Traction Company, Galesburg, Ill.—We are informed that this company has leased ground for a baseball park and erected a grand stand and bleachers. The park is situated on the company's line southwest of the city limits.

Dartmouth & Westport Street Railway, New Bedford, Mass.—This company has purchased a tract of land one-half mile from Lincoln Park and containing 140 acres. It is reported that the company will equip and operate an amusement park.

Palisades Amusement Park.—This park, overlooking the Hudson River and Manhattan Island, will be operated by the Amusement Securities Company during the summer season of 1908. Among the attractions will be the Rustic Theater. A broad walk on the edge of the Palisades will be one of the features. Bands will play popular and classic music in the afternoons and evenings, while free open-air vaudeville and specialty acts will be presented. Electric lights will be used on the river front and throughout the park, and it is expected that a large electric sign will be erected just above the Palisades. Subway and surface cars will carry people from Manhattan, the Bronx and Brooklyn to the West 130th Street ferries, which cross the river to a point near the park gates. This walk will be illuminated at night. There are five ferries. The electric railway which carries passengers to the park entrance may be used by those who prefer to ride up the hill. Communications in regard to concessions, privileges, construction work, etc., should be addressed to A. H. Dexter, general manager, Amusement Securities Company, 1402 Broadway, New York.

Yarmouth (N. S.) Street Railway, Yarmouth, N. S.—This company, it is announced, has recently purchased a site for a park, but the park will not be equipped until next year.

POWER HOUSES & SUBSTATIONS

United Railroads of San Francisco.—This company has recently purchased the following apparatus for its North Beach power station: One 5000-kw Curtis turbo-generator, with necessary exciter set, transformers and switchboard; 3000 hp in boilers consisting of 6 units to be operated in batteries of two boilers each, with auxiliaries, consisting of condensers, vacuum, oil and centrifugal pumps, accumulator, etc. The company has also purchased one 4000-kw frequency changer. Charles N. Black, general manager.

De Kalb-Sycamore-Interurban Traction Company, De Kalb, Ill.—D. Thomson, general manager, writes that this company is installing two 400-hp Wickes boilers with Murphy automatic stokers. In addition the company is also installing the Green Fuel Economizer Company's system of exhaust draft and has contracted with the Economical Engineering & Construction Company, of Chicago, for vacuum ash and coal handling machinery.

Yarmouth (N. S.) Street Railway.—B. G. Burill writes that this company intends to purchase a 300-kw generator, turbines and hydraulic equipments. The specifications for this apparatus have not yet been prepared. The company has recently purchased a 150-hp Robb Armstrong engine and a 100-kw Canadian General Electric alternator.

SHOPS & BUILDINGS

Omaha, Lincoln & Beatrice Railway, Lincoln, Neb.—This company is planning to erect a car house and repair shop, 33 ft. x 76 ft.

Third Avenue Railroad, New York.—The company has filed plans with the Building Department for razing the three towers and central mansard of the old car house at Third Avenue and Sixty-fifth Street.

Yarmouth (N. S.) Street Railway.—This company plans to build an addition to its car house.

Toledo Urban & Interurban Railway Company, Toledo, Ohio.—We are advised by Manager Chas. F. Smith that the Toledo Urban & Interurban Railway Company expects to place contracts during the next two months for the erection of a brick waiting station near Toledo.

NEW PUBLICATIONS

Accidents, Their Causes and Remedies, by Thomas D. West. The Competent Life Book Agency, Sharpsville, Pa.; 95 pages; illustrated; paper. Price, 25 cents.

Mr. West is president of the American Anti-Accident Association and his pamphlet is devoted to advocating the adoption of provisions in various lines of work to reduce accidents, many of which he believes can be avoided by care. The book contains many practical suggestions.

Trolley Wayfinder. Edition for 1908. Boston: New England Street Railway Club; 104 pages. Price, $0.10.

Since the first edition of this publication appeared several years ago it has continued to advance in favor until now it has become somewhat of a handbook for residents and travelers in New England.

The book is the official publication of the New England Street Railway Club, and all the companies in the New England States assist in preparation of the material published.

The book is as accurate as it is possible to make a publication of this character, for railroad schedules are subject to frequent revision. The names of cities and towns reached by the electric railways are arranged alphabetically, and the distance, fare and time between points are given. Many maps of different systems are presented.

Manufactures and Supplies

ROLLING STOCK

Aurora, Elgin & Chicago Railroad, Chicago, is in the market for 25 sets of double trucks.

Seattle Electric Company, Seattle, Wash., expects to purchase 20 cars in the near future.

Yarmouth Street Railway, Yarmouth, N. S., intends to purchase several open cars. B. G. Burrill, president.

Norfolk City & Suburban Railway, Norfolk, Va., expects to purchase soon one two-motor car equipment.

Marshall F. Tennis, Pittsburg, Pa., is reported to be asking prices on five double-truck cars for electric railway service.

Omaha, Lincoln & Beatrice Railway, Lincoln, Neb., is in the market for two 32-ft. motor box cars. E. C. Hurd, secretary.

Washington, Baltimore & Annapolis Electric Railway, Baltimore, Md., is reported to be in the market for 10 or 12 double-truck cars.

Los Angeles-Pacific Company, Los Angeles, Cal., is reported to be planning to add to its equipment several oil-tank cars. R. P. Sherman is general superintendent.

Union Traction Company, Sistersville., W. Va., is in the market for two second-hand summer cars. This company is the successor to the Wetzel & Tyler Railway. E. L. Robinson, of New Martinsville, is general manager.

Rahway Valley Railroad, Kenilworth, N. J., has requested the Strang Gas-Electric Car Company to prepare specifications for the building of two cars. The Strang new all-steel railway motor car Irene was operated over the Rahway Valley Railroad on May 9 and 10 in place of the steam trains of that road, covering all of the schedule on both days and three extra round trips on one day. The patronage during the run with the gasoline car was in excess of the regular passenger traffic.

TRADE NOTES

National Railway Materials Company, New York, has elected Richard C. Hall secretary of the company.

Allis-Chalmers Company, Milwaukee, Wis., has opened an office in the First National Bank Building, Birmingham, Ala., in charge of Seldon Jones as district manager.

W. R. Brixey has removed from 203 Broadway to the Hudson Terminal Buildings, 30 Church Street, New York. The Watson Insulated Wire Company, Railway Exchange, Chicago, is acting as Western representative of Mr. Brixey.

The Glacier Metal Company is erecting at Manchester, Va., a number of molding furnaces and will require a number of furnaces for the manufacture of babbitt metal, brass, etc. The company expects to employ pots containing from 1000 lb. to 2000 lb. each.

Zelnicker Crayon Works, St. Louis, Mo., is offering a new crayon, 5 in. long and ⅝ in. in diameter, made in four colors —blue, red, yellow and black. The crayon is waterproof and is suitable for general uses, including marking on leather, paper, glass, china, tin, castings, boxes, sacks, etc. The company has adopted for the crayon the title "Shure-mark."

Borne-Scrymser Company, New York, after much theoretical and practical demonstration, is prepared to furnish an oil especially adapted for the lubrication of high-duty gas engine cylinders. The oil is known as "W" gas cylinder oil, gives excellent lubrication with low consumption and is very low in the percentage of taint contamination, i. e., fixed carbon as directly due to the oil itself or other than the mixture of the gases. This oil is in general use in some of the largest gas-engine units in operation and is giving satisfaction.

Paul B. Patten Company, Salem, Mass., reports that after trial orders had been given by a number of roads in the United States and Canada which had never used the Patten ticket destroyer, its value had been recognized and repeat orders have been received. From time to time improvements of the machine have been made. Roads which follow the custom of burning their tickets and transfers before they are ground and destroyed take chances in having them duplicated or used again. Neither of these contingencies can occur if tickets and transfers are run through a Patten destroyer. Its utility to railroads is therefore obvious.

Charles N. Wood Electric Company, Boston, announces that John F. Stout, for more than 15 years with Wm. Hall & Company, of Boston, has joined the sales force of the Wood Company. Mr. Hall made many friends during his connection with the supply business and his acquaintance should assure his success with the Wood Company.

Bird-Archer Company, New York, announces that Col. Nat T. Lane has severed connection with the Geo. W. Lord Company, Philadelphia, and joined the sales organization of the Bird-Archer Company. The Bird-Archer Company, manufacturing chemist, is well known to steam engineers through its boiler compound. Colonel Lane has recently returned from an extended trip to Cuba, Central America and Mexico in the interest of the company. Agencies have been established in the principal cities visited in those countries in charge of active representatives. Colonel Lane was formerly connected with electric railroad work, and his wide acquaintance should be valuable to the company with which he is now associated.

Thomas F. Carey, Boston, announces that he has removed to 141 Milk Street, Boston, and that his business will hereafter be known as Thomas F. Carey Company. The company will have traveling representatives in New York, Philadelphia, Cleveland, Chicago and on the Pacific Coast and in Southern States. The company plans to handle a complete line of railroad equipment and supplies for street and interurban railways and steam and electrical machinery for railway and power service. The company has for sale now 40 new Brill semi-convertible easy access cars fully equipped with 4 GE-90 railway motors, 150-10-9-8 bench open cars, 50 20-ft. closed cars fully equipped if desired and a number of combination and express cars. The Carey Company will furnish details regarding the equipment it has for sale and it will purchase, sell on commission basis or exchange equipment and machinery.

ADVERTISING LITERATURE

Ohio Brass Company, Mansfield, Ohio.—The bulletin of this company for May contains a number of readable little jokes under the head "Clippings." For serious thought a description of the Tomlinson automatic radial car coupler is presented. The bulletin is illustrated with half-tones and line cuts.

American Carbon & Battery Company, East St. Louis, Ill. —"Brush History" and "Do You Know?" are the titles of folders just issued which deal with carbon brushes. In "Brush History" the development of the American brush is briefly reviewed, while in "Do You Know?" there are some pertinent reasons for using American brushes.

Crocker-Wheeler Company, Ampere, N. J.—Under date of May the company has issued Bulletins Nos. 102, 103 and 104. No. 102 has for its subject A C Switchboard Panels, Type 12, for 1150-2300 volts. No. 103 is entitled "The Sanitary District of Chicago's Hydro-electric Development on the Chicago Drainage Canal." Bulletin No. 104, which has for its subject "Direct Current Railway Generators," describes the details of the machines and is illustrated with half-tones of parts of machines and of generators in power-station service. Among the plants shown are the New Haven station of the Connecticut Company, Hampton station of the Hampton Roads Traction Company, Kennett Square station of the West Chester, Kennett Square & Wilmington Railway, West Somerville station of the Boston Elevated Railway. The booklet concludes with a list of dimensions of railway generators for different capacities.

Electrical Testing Laboratories, New York, N. Y.—A paper on the work of the laboratories prepared by Wilson S. Howell and read at the annual meeting of the Association of Edison Illuminating Companies at Hot Springs, Va., Sept. 10, 11, 12, 1907, has been reprinted for distribution by the Electrical Testing Laboratories. As an introductory the reason for establishing the association is stated briefly. The work of the laboratories is divided into two general classes, viz., Edison association contract work and general testing, part of which is done at the laboratory and part outside. The Electrical Testing Laboratories act for clients all over the country, among them being the Washington Water Power Company, Niagara Falls Power Company, Georgia Railway & Electric Company, Standard Varnish Works and many other large public service and industrial companies. Equipment is rented in cases where clients wish to conduct tests and experiments in private.

TABLE OF MONTHLY EARNINGS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement, "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit. ‡ Including Rapid Railway system, Sandwich, Windsor & Amherstburg Railway, and Detroit, Monroe & Toledo Short Line Railway.

Company	Period	Gross Income	Operating Expenses	Gross Income Less Operating Expenses	Deductions From Income	Net Income
AKRON, O. Northern Ohio Tr. & Light Co.	1m., Apr. '08	129,804	82,252	47,552	44,029	3,523
	1 " " '07	132,844	82,889	49,955	42,402	7,553
	4 " " '08	504,890	323,883	181,006	172,889	8,118
	4 " " '07	508,727	318,396	190,331	166,431	23,899
BELLINGHAM, WASH. Whatcom Co. Ry. & Lt. Co.	1m., Mar. '08	28,561	*17,223	11,338	6,767	4,571
	1 " " '07	26,556	*16,132	10,424	6,298	4,126
	12 " " '08	361,811	*215,497	146,314	78,744	67,570
	12 " " '07	295,994	*185,880	110,114	55,380	54,735
CHAMPAIGN, ILL. Illinois Traction Co.	1m., Apr. '08	318,867	*196,189	122,678	.....	.....
	1 " " '07	277,724	*160,100	117,624	.....	.....
	4 " " '08	1,269,654	*757,643	512,011	.....	.....
	4 " " '07	1,105,324	*630,019	475,305	.....	.....
CHARLESTON, S. C. Charleston Con. Ry., Gas & Elec. Co.	1m., Apr. '08	61,049	39,598	21,450	13,817	7,634
	1 " " '07	55,324	35,091	20,233	13,517	6,716
	2 " " '08	122,546	80,263	42,283	27,633	14,650
	2 " " '07	111,460	72,221	39,239	27,033	12,205
CHICAGO, ILL. Aurora, Elgin & Chicago Ry. Co.	1m., Mar. '08	95,774	*56,652	39,121	28,191	10,930
	1 " " '07	102,416	58,715	43,701	26,991	16,709
	1 " Apr. '08	97,934	57,378	40,556	28,330	12,225
	1 " " '07	101,198	58,494	42,705	27,588	15,117
	10 " " '08	1,156,467	641,509	514,958	277,723	237,235
	10 " " '07	1,080,254	591,016	489,238	264,897	224,341
CLEVELAND, O. Cleveland, Painesville & Eastern R.R Co.	1m., Apr. '08	20,115	*11,727	8,387	7,240	1,148
	1 " " '07	19,470	*11,389	8,121	7,213	908
	4 " " '08	74,261	*43,677	30,584	28,892	1,691
	4 " " '07	71,543	*41,489	30,053	28,851	1,203
Lake Shore Elec. Ry Co.	1m., Feb. '08	53,703	*33,625	20,078	25,634	†5,557
	1 " " '07	53,886	*33,511	20,375	23,526	†3,151
	1 " Mar. '08	61,864	*39,145	22,719	25,728	†3,010
	1 " " '07	64,111	*38,480	25,631	24,651	979
	3 " " '08	175,937	*111,458	64,479	76,854	†12,374
	3 " " '07	179,576	*111,600	67,976	71,223	†3,247
COLUMBUS, GA. Columbus Elec. Co.	1m., Mar. '08	28,701	*14,618	14,083	10,755	3,328
	1 " " '07	26,450	*14,172	12,278	9,806	2,472
	12 " " '08	349,828	*187,646	162,182	124,837	37,345
	12 " " '07	308,345	*161,530	146,814	108,532	38,282
DALLAS, TEX. Dallas Elec. Corp'n.	1m., Mar. '08	87,447	*67,157	20,290	20,044	245
	1 " " '07	89,493	*69,013	20,480	16,858	3,622
	12 " " '08	1,132,032	*812,466	319,566	233,534	86,031
	12 " " '07	1,050,119	*744,723	305,396	190,457	114,940
DETROIT, MICH. ‡Detroit United Ry. Co.	1m., Mar. '08	533,788	*338,294	195,494	134,714	60,780
	1 " " '07	553,680	*347,973	205,707	131,251	74,456
	1 " Apr. '08	551,161	350,426	200,735	134,249	66,486
	1 " " '07	543,578	349,039	194,538	130,472	64,067
	4 " " '08	2,069,471	1,360,240	709,231	540,133	169,098
	4 " " '07	2,083,184	1,366,047	717,137	508,188	208,949
DULUTH, MINN. Duluth St. Ry. Co.	1m., Mar. '08	67,455	44,219	23,236	18,417	4,819
	1 " " '07	64,357	31,292	33,064	17,617	15,447
	1 " Apr. '08	68,719	42,453	26,267	18,417	7,850
	1 " " '07	67,291	33,523	33,768	17,645	16,123
	4 " " '08	263,020	172,728	90,292	73,667	16,625
	4 " " '07	243,989	131,322	112,667	70,366	42,301
E. ST. LOUIS, ILL. East St. Louis & Suburban Co.	1m., Apr. '08	148,794	85,205	63,589	.....	.....
	1 " " '07	162,234	94,399	67,835	.....	.....
	4 " " '08	651,385	333,923	317,462	.....	.....
	4 " " '07	640,386	256,872	383,514	.....	.....
EL PASO, TEX. El Paso Cos.	1m., Mar. '08	43,641	*33,870	9,771	5,767	4,004
	1 " " '07	40,538	*31,969	8,569	4,665	3,904
	12 " " '08	526,859	*386,023	140,836	64,162	76,674
	12 " " '07	420,271	*308,576	111,695	49,634	62,062
FT. WAYNE, IND. Ft. Wayne & Wabash Valley Tr. Co.	1m., Mar. '08	97,760	58,256	39,504	.....	.....
	1 " " '07	92,500	58,844	33,656	.....	.....
	3 " " '08	298,235	172,433	125,802	.....	.....
	3 " " '07	267,018	165,914	101,109	.....	.....
FT. WORTH, TEX. Northern Texas Tr. Co.	1m., Mar. '08	91,651	*50,903	40,748	11,769	28,979
	1 " " '07	91,756	*52,551	39,205	10,313	28,893
	12 " " '08	1,064,116	*622,853	441,263	133,030	308,233
	12 " " '07	920,299	*580,020	340,278	120,508	219,771
GALVESTON, TEX. Galveston-Houston Elec. Co.	1m., Mar. '08	83,539	*55,030	28,509	13,871	14,638
	1 " " '07	82,292	*52,510	29,782	12,427	17,355
	12 " " '08	1,063,113	*669,835	393,278	159,013	234,265
	12 " " '07	949,503	*588,984	360,519	143,801	216,718
HOUGHTON, MICH. Houghton & County St. Ry. Co.	1m., Mar. '08	19,773	*13,109	6,664	3,957	2,708
	1 " " '07	20,415	*13,315	7,100	3,971	3,129
	12 " " '08	254,141	*154,195	99,946	47,496	52,450
	12 " " '07	237,051	*150,677	86,373	47,123	39,250
JACKSONVILLE, FLA. Jacksonville Elec. Co.	1m., Mar. '08	36,965	*24,677	12,289	5,703	6,585
	1 " " '07	34,206	*20,932	13,273	3,475	9,798
	12 " " '08	397,658	*265,122	132,536	56,469	76,068
	12 " " '07	349,684	*219,250	130,434	41,154	89,281
KANSAS CITY, MO. Kansas City Ry. & Lt. Co.	1m., Mar. '08	488,741	267,037	221,704	153,824	67,880
	1 " " '07	478,464	258,894	219,571	152,052	67,518
	1 " Apr. '08	492,472	267,657	224,815	151,016	73,798
	1 " " '07	472,666	245,720	226,946	149,826	77,120
	11 " " '08	5,620,390	2,926,330	2,694,061	1,683,912	1,010,149
	11 " " '07	5,226,282	2,631,668	2,594,614	1,613,890	980,724
KNOXVILLE, TENN Knoxville Ry. & Lt. Co.	1m., Apr. '08	45,992	*22,640	23,352	11,394	11,958
	1 " " '07	47,127	*24,666	24,461	10,571	11,890
	4 " " '08	174,009	*95,986	78,023	45,862	32,161
	4 " " '07	180,989	*102,270	78,719	40,991	37,728
LEXINGTON, KY. Lexington & Interurban Rys. Co.	1m., Mar. '08	46,735	31,335	15,382	.....	.....
	1 " " '07	41,739	25,476	16,262	.....	.....
	3 " " '08	128,710	87,947	40,762	.....	.....
	3 " " '07	116,719	78,914	37,805	.....	.....
LITTLE ROCK, ARK Little Rock Ry. & Elec. Co.	1m., Apr. '08	55,559	*27,607	27,952	9,566	18,386
	1 " " '07	49,139	*25,609	23,530	8,686	14,844
	4 " " '08	219,068	*109,046	110,022	37,066	72,956
	4 " " '07	195,054	*106,652	88,402	33,647	54,755
MILWAUKEE, WIS. Milwaukee Elec. Ry. & Lt. Co.	1m., Apr. '08	309,848	157,762	152,085	93,024	59,061
	1 " " '07	305,743	152,506	153,237	95,474	57,763
	4 " " '08	1,233,854	676,293	557,561	383,486	174,075
	4 " " '07	1,208,332	621,817	586,515	375,741	210,774
Milwaukee Lt., Ht. & Tr. Co.	1m., Apr. '08	100,492	27,312	73,181	57,673	15,507
	1 " " '07	52,211	24,151	28,060	30,424	†2,363
	4 " " '08	394,183	115,757	278,426	226,853	51,573
	4 " " '07	208,695	102,606	106,089	120,570	†14,481
MINNEAPOLIS, MINN. Twin City R. T. Co.	1m., Mar. '08	484,623	252,824	231,800	123,386	108,413
	1 " " '07	479,301	233,731	245,570	115,258	130,312
	1 " Apr. '08	493,497	246,325	247,172	126,075	121,097
	1 " " '07	465,221	218,089	247,132	115,258	131,873
	4 " " '08	1,901,956	1,010,994	890,962	494,206	396,756
	4 " " '07	1,821,162	912,386	908,776	461,033	447,743
MONTREAL, CAN. Montreal St. Ry.	1m., Apr. '08	280,736	170,141	110,594	51,345	59,249
	1 " " '07	274,635	166,422	108,213	45,318	62,896
	7 " " '08	2,027,873	1,316,007	711,866	323,987	387,878
	7 " " '07	1,873,684	1,240,079	633,605	284,196	349,409
NORFOLK, VA. Norfolk & Portsmouth Tr. Co.	1m., Mar. '08	138,792	88,061	50,731	.....	.....
	1 " " '07	161,339	106,030	55,310	.....	.....
	3 " " '08	415,452	274,961	140,491	.....	.....
	3 " " '07	441,917	293,971	147,946	.....	.....
PENSACOLA, FLA. Pensacola Elec. Co.	1m., Mar. '08	19,205	*13,867	5,338	3,617	1,721
	1 " " '07	17,285	*10,988	6,296	3,125	3,171
	12 " " '08	228,927	*158,538	70,389	42,338	28,051
PHILADELPHIA, American Rys. Co.	1m., Apr. '08	214,239	.....	.....	.....	.....
	1 " " '07	223,082	.....	.....	.....	.....
	10 " " '08	2,395,439	.....	.....	.....	.....
	10 " " '07	2,344,748	.....	.....	.....	.....
PLYMOUTH, MASS. Brockton & Plymouth St. Ry. Co.	1m., Mar. '08	7,254	*6,768	486	1,907	†1,421
	1 " " '07	6,830	*5,827	1,002	1,820	†818
	12 " " '08	121,037	*92,033	29,004	21,661	7,343
	12 " " '07	113,323	*71,541	41,782	21,731	20,051
ST. LOUIS, MO. United Railways Co. of St. Louis.	1m., Apr. '08	865,691	*570,663	295,028	232,274	62,754
	1 " " '07	884,923	*583,039	301,884	230,892	70,992
	4 " " '08	3,327,451	*2,203,696	1,123,755	932,437	191,318
	4 " " '07	3,379,085	*2,305,634	1,073,451	924,627	148,824
SAVANNAH, GA. Savannah Electric Co.	1m., Mar. '08	48,161	*38,042	10,118	12,547	†2,429
	1 " " '07	47,167	*31,098	16,069	11,775	4,294
	12 " " '08	604,044	*442,372	161,672	146,867	14,804
	12 " " '07	605,031	*377,029	228,002	136,545	91,457
SEATTLE, WASH. Seattle Elec. Co.	1m., Mar. '08	353,462	*235,022	118,440	56,275	62,166
	1 " " '07	318,903	*202,075	116,829	44,060	72,768
	12 " " '08	4,268,701	*2,804,655	1,464,047	633,441	830,606
	12 " " '07	3,419,019	*2,042,697	1,376,322	498,420	877,902
TACOMA, WASH. Puget Sound Elec. Ry. Co.	1m., Mar. '08	127,448	*89,381	38,067	31,901	6,166
	1 " " '07	129,614	*83,378	46,236	26,446	19,791
	12 " " '08	1,689,304	*1,115,831	573,473	363,385	210,088
	12 " " '07	1,425,003	*949,115	475,887	287,095	188,792
TAMPA, FLA. Tampa Elec. Co.	1m., Mar. '08	43,121	*30,374	12,747	1,096	11,651
	1 " " '07	43,528	*29,263	14,265	1,225	13,040
	12 " " '08	531,949	*391,471	140,478	6,387	134,090
	12 " " '07	482,775	*309,054	173,721	4,603	169,119
TOLEDO, O. Toledo Rys. & Lt Co.	1m., Mar. '08	202,187	114,879	87,308	68,898	18,410
	1 " " '07	214,837	118,714	96,123	63,457	32,666
	3 " " '08	628,623	356,269	272,354	205,952	66,402
	3 " " '07	637,425	369,256	268,169	188,920	79,249