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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.

During 1907 the Street Railway Journal printed and circulated 427,250 copies, an average of 8216 copies per week. Of this issue 7500 copies are printed.

The Washington, Baltimore & Annapolis Single-Phase Railway

Last week the first electric car to carry passengers was operated between Annapolis and Washington, and the owners of the Washington, Baltimore & Annapolis Railway anticipate that before the end of next month the through route between Baltimore and Washington will be ready for operation. In many respects the system is a very interesting one. It is the most ambitious attempt made up to the present time, by any electric railway company to compete in speed with a good steam railroad service over distances of 40 miles or more, and in its Baltimore-Washington service the company will operate cars on a shorter headway than any other single-phase line with which we are acquainted. It is also the only single-phase railway which has to provide for two systems of direct-current operation as well as for single-phase service, and it is the only single-phase line whose cars run over a double trolley d. c. system. The plans of the company contemplate the ultimate equipment of the cars with the conduit plow as well, which will add another feature to the unique character of the project.

No attempt will be made here to summarize the information upon this road which is published in the descriptive article elsewhere in this issue, but congratulations are extended to the owners, engineers and all who have contributed to the construction of the road for the care with which all of the details seem to have been worked out and the pioneer work which they have undertaken.

Car Lubrication Again

The consumption of lubricants per car in a given period is a figure well worth studying in every car house or distributing center where large quantities of oil are handled. We venture to say that some managers would be greatly surprised if they should see the difference which often exists between the oil consumption of cars on the same system, operating on the same division and under very much the same conditions of traffic. The same kind of oil must, of course, be used in each instance, and the only apparent reason for a larger figure in one case than the other is leakage or lack of care in filling cans and journal box reservoirs. The number of cars in daily operation and not the total number stored at each car house or division point is the figure to use in getting at the oil consumption per car month, or whatever time may be selected.

Even in two car houses operating the same number of cars per day on the same general system, experience shows that the oil used per car may be three times as high in the one case as in the other. An instance occurred recently in which one car house used 1.3 gals. per car per month, and another house on the same system, operating one less car per day, used 9.5 gals. There may be a reason for considerable differences, on the same system, but if there are such the causes ought to be hunted down promptly, and remedied if possible. Lubricants have to be used on the cars and in the power station; but the money value of first-class oil is to-day too great to permit of excesses in its consumption in either place on any large trolley system. The most satisfactory way to determine whether there is a waste of oil is to keep records of the kind suggested at each car house and tabulate the results.

Working Conditions in Small Plants

There is no disguising the fact that the average small power plant is a difficult place to work in. Companies of limited means and small traffic cannot afford the organizations of operating specialists which produce the records of economy in great generating stations; the machinery of the small station is usually of a less expensive type, relatively; repair facilities are often crude; hours are long, and money scarce for modernized equipment. In view of the fact that the financial value of the system, and particularly of the station itself, is moderate, the wages paid in the average small plant are also modest. The cost of living is usually considerably lower in the smaller communities, and it is not unfair to pay the man in charge of a 1000-kw station less than the one responsible for ten or twenty times that capacity of valuable machinery.

It would be idle to enter into a general discussion of the salary question, but it is well to remember that a cheap engineer is dear at any price, even on a ten-car road. To pay a reasonably good salary to a first-class man, and to back up his wise recommendations in the line of repairs and supplies, is a most excellent policy, and it is a fact that ten or fifteen dollars a month will often measure the difference between an engineer alert and interested in making the most of his equipment and one who doesn't care a snap of his finger for station economy or who is not able to detect symptoms of trouble.

We have ofted pointed out how power-station life can be made more comfortable by very modest expenditures for cold and hot water, decent sanitary facilities, the use of ventilating fans in hot weather, a shower bath or two, a technical journal or so and a genuine table or desk on which record blanks can be filled. The change of a day off now and then, a small raise in salary at some specially good stroke of work in reducing fuel and repair costs or handling emergencies, the allowance of free transportation over the company's lines—these are only a few of the ways in which the inevitable strain of multifarious responsibilities in a small station can be lightened. Promotion within the station itself is helpful when the qualifications are clear. In the variety of duties which falls to the engineer of the small plant can be found most valuable experience, and often the opportunity to try out special schemes of apparatus arrangement in the interest of economy. The small company should try, no less than the large one, to encourage the practice of individual initiative, and to arrange the operating shifts so that congenial men will work together. It is not always the largest plant which turns out the cheapest power, but where a penurious policy exists the small plant has but a poor chance to make good records of low operating costs.

Lastly, the provision of safety appliances in the small plant encourages the staying of the reliable engineer. The same care bestowed on the insulation of high voltage circuits, prompt remedying of dangerous conditions, inspection and reduction of fire risks, purchase of new pipe fittings, elimination of all possible belts, maintenance of perfect plumbing, and supply of fresh air and light as in the larger plant, is well worth what its costs. The personal equation counts perhaps even more in the small station than in the large station.

Operating Economy in Power Plant Extensions

The cost of power in modern large street railway systems never deserves careful study more than in times when legitimate efforts are being made to cut down all excessive expenses of operation. The whole subject of power generation can be looked upon from so many different points of view that as long as the manufacturers of station equipment improve their products and as long as operating engineers endeavor to get the largest outputs at the lowest cost the question of cheaper production can never become threadbare. A phase of the cost of power on a large city system recently emphasized by the extension of a modern plant suggests the advantage of closely studying the performance and inter-relation of stations on all properties where more than one generating plant is involved in the process of power production.

On the particular system in mind, which need not be named on account of its central station affiliations, and the possible misinterpretation of power costs by non-technical readers, a plant was installed about eleven years ago to handle the railway load. The equipment consisted of three 200-kw, 550-volt generators and one 500-kw unit, all built for direct-current trolley service. Reciprocating engines of the slow speed compound condensing type drove this machinery, aggregating 1100-kw normal capacity. The operating force consisted of three engineers, three oilers, one pipe fitter, one helper, three firemen, two coal passers and one lugger or general roustabout. The normal output of the plant was about 14,000 kw-hours per day; the payroll amounted to some $900 a month; the fuel consumption was low enough to bring the total cost of generating each kw-hour down to a little under one cent, and altogether the plant was a thoroughly profitable installation. The load soon increased to a point where during the peak the machinery had to run at 75 per cent above normal rating, but by close attention to overhauling at regular intervals to forestall trouble the business was handled successfully until the increased traffic made necessary the building of a new plant possibly a thousand feet away from the first station.

The second station contained one 800-kw and two 300-kw engine-driven railway generators, and the plant was placed in service about nine years ago. The two stations handled the load successfully from this period, until about two years ago it became apparent that more capacity was necessary, and the more modern plant was therefore extended by the addition of two 1200-kw engine-driven generators. When the extension of the second station was completed it was found that the original plant could be shut down and held as a reserve at a saving in operating expenses of over $30,000 a year. This plan was therefore followed, and the staff of the first station was reduced to one day man and one night man who keep the fires banked under one boiler, watch a portion of the load looped through the old switchboard temporarily, and maintain the old equipment in working condition. The above saving is in excess of the wages of these men and the cost of burning about 1500 lbs. of coal per day in the banked fires. Steam has to be maintained in connection with the fire pumps of the property, but it is probable that this expense will soon be cut out by the substitution of a motor-driven fire pump

installation. The saving through the use of the extension in place of the first plant accrues both in the reduced cost of labor—it has been found that practically no extra labor is involved in the transfer of the load from the first to the second plant—and in the lower fuel consumption of the larger and more efficient units per hp-hour.

In endeavoring to obtain first class economy from an extension the new equipment must, of course, be operated at a good load factor. If this can be done without subjecting the older and as a rule lower capacity equipment to operation at its less efficient outputs for long periods, the full advantages of a power increase should be felt in the coal and labor charges no less than in the statistics of available capacity. To hold old equipment in reserve, is often desirable if that equipment be maintained in first-class mechanical and electrical condition, but it should not be overlooked that the fixed charges are going on all the while. In the plants above considered, the superintendent of power keeps a notebook schedule of the dates on which certain portions of the equipment should be overhauled; in this way the cost of maintenance is not excessive in any one month, and the company has a reserve ready within two hours' notice that is to-day just as capable of turning out its rated load and more as it was in the days of its first commercial service.

Selection of Fuel

The cost of fuel is the principal item in the operating expenses of the power station and a most important one in the total expenses of an electric railway. The greatest care, therefore, should be exercised in the selection of the proper class and grade of coal for power-station use. The location of the plant with respect to the mines will determine the transportation charges, and will often finally fix a decision as to the class of coal to be used, irrespective of the desires of the management. It does not, however, differentiate between various coals of the same class from the same general locality. This decision must be made by the management, and although various coals differ widely in economic value, even when of the same general class and from the same general locality, the methods of arriving at a choice between them are varied.

Often the choice between coals is made purely on the price. While this method of eliminating all but the one factor is the simplest, it is generally, of course, far from being the most economical. In this engineering age it seems a pity that we are compelled even to enumerate this method, although it is probably followed, especially in the case of smaller plants, much more generally than might be supposed. A very common method of choosing between coals is based on the past reputation of a particular coal, either past personal experience with it or a recommendation from a neighboring plant. This plan may or may not result in an economical choice. Closely allied to this method is the purchase of coal on the recommendation of the operating engineer or fireman, or sometimes even upon that of the coal dealer or his representative. Here the personal element enters, and although any one of the three may be honest, the matter of ease of firing or increase of profits may unconsciously influence the recommendation, to say nothing of wilful misrepresentation which may at times be practiced.

To say the least, the processes of arriving at a choice which have been mentioned are all unscientific, and are quite likely to lead to a wrong decision. The fact that these courses are rarely taken in any but the small or moderate size plant indicates that a more scientific method is required. Neither of the two usual technical methods of testing coal can be considered troublesome or expensive when compared with the economies obtained by it, provided the proper precautions are taken both in making the tests and in using the results. The problem may be solved by either chemical and calorimetric tests or actual evaporative tests, or, better still, by a combination of the two methods.

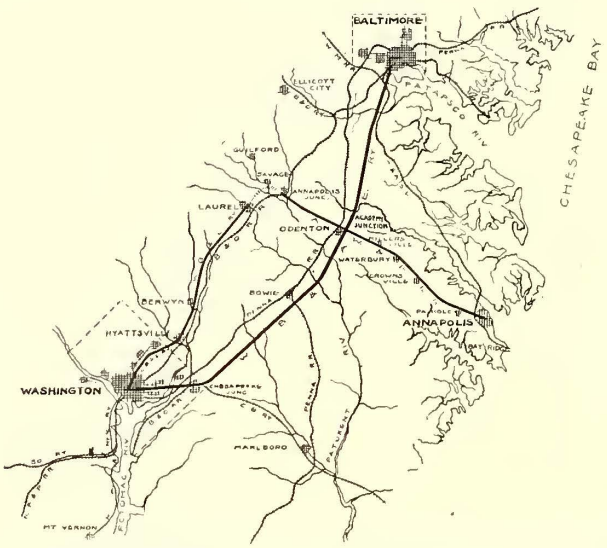
If but one of these methods is used it should be the actual evaporative test, under the plant's own boilers and under actual load conditions. Chemical and calorimetric tests will show the chemical constituents and the heating value of the sample tested, but great care should be taken that the sample or samples are precisely representative of the coal to be burned. The method of taking the sample is of quite as much importance as is the apparatus used or the care exercised in making the tests. The results of such tests should also be used judiciously. For instance, it is important to know not only the amount of ash, but its chemical constituents, so far as they determine its fusing temperature. Two coals containing the same amount of ash may give quite different practical results, owing to the lower fusing point of the ash, in one case causing the troublesome formation of clinkers, a fault which may be absent in the other. While the calorific value of the coal is important, it should not be considered alone, nor simply in connection with the amount and quality of the ash, unless one takes account of other points, which even evaporative tests may not bring prominently to the front. As between two coals evaporating 8 and 9 lbs. of water per pound of coal, respectively, the first may be the more economical on account of "weathering qualities," differences in cost of labor for firing or handling coal or ashes, liability to spontaneous combustion, etc., when considered in connection with the price on board cars, transportation charges and sureness of delivery.

In making evaporative tests it should be remembered that there is quite likely to be a change in boiler efficiency between tests of two coals. This may be due to any one of a number of common causes, principal among which may be mentioned the personal element of firemen and the conditions of load and of draft. Great care should be taken that one be not misled by such changes in conditions between one test and another.

In some stations only the very best quality of coal can be burned. This may be due to the design of the station—insufficient boiler capacity or draft, or the adoption of an improper ratio between grate area and heating surface. In many such cases a scientific investigation of the conditions may lead to the recommendation of changes more or less expensive to make, but which will show a great return on the investment in the ability of the plant to burn a much cheaper coal for the same steam output.

THE WASHINGTON, BALTIMORE & ANNAPOLIS SINGLE-PHASE RAILWAY

A great deal of interest has been felt in the progress of the Washington, Baltimore & Annapolis Railway, not only because it is a single-phase, high-speed railway of considerable length, but also because it connects three cities, two of which, Baltimore and Washington, are now supplied with a good and frequent intercommunication by two steam railroads. Nevertheless, it is believed by those who have studied the project, that there is ample oppor-



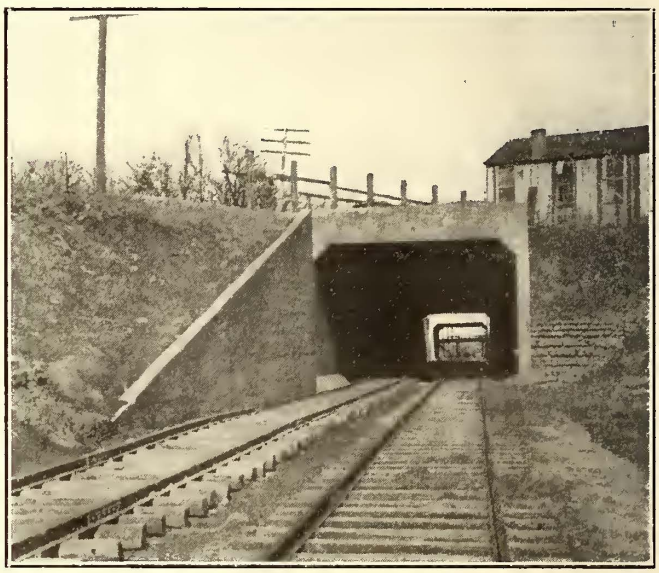
MAP SHOWING ROUTE OF THE WASHINGTON, BALTIMORE & ANNAPOLIS SINGLE-PHASE RAILWAY

tunity for an independent railway which will connect the two cities and furnish a service which neither of the existing lines can at present supply. The Washington, Baltimore & Annapolis Railway has been built with this idea of high

CROSSING OVER TRACKS OF B. & O. AT BALTIMORE.

speed in mind. It consists of two sections; the main line and the Annapolis Branch. The main line is double track and connects the retail center of Baltimore with the corner of 15th and H Streets, N. E., Washington, the corporate limits of the city. In Baltimore the road enters the city over a private right of way up to a point about 1½ miles from its terminal at the corner of Liberty and Marion Streets. It then passes on to Scott Street, Baltimore, where it runs over its own tracks for about three-quarters of a mile. It then uses the tracks of the United Railways & Electric Company, of Baltimore, to its own terminal building. In Washington the tracks of the Washington, Baltimore & Annapolis Railway stop at the District of Columbia boundary. From this point the cars operate to the corner of 15th and H Streets, N. E., over the tracks of the Columbia line of the Washington Railway & Electric Company, a distance of about 4 miles. They then enter a special terminal station, where passengers can transfer to the conduit cars of the Washington Railway & Electric Company.

The second portion of the Washington, Baltimore & Annapolis Railway consists of a single-track road located practically at right angles to the main line and crossing it at Academy Junction, 15½ miles from the Baltimore terminus. This road is a converted steam line and was formerly known under the name of the Annapolis, Wash-



TUNNELS APPROACHING BALTIMORE

ington & Baltimore Railroad. Incidentally this road is one of the oldest railroads in the country, having been built about 1835. It has now been electrified between Annapolis Junction and Annapolis with the single-phase system. The road connects at Laurel with the Berwyn & Laurel Electric Railway, a direct-current line, by which passengers can travel by the Washington Railway & Electric Company's cars to the Treasury Building in Washington. The Washington, Baltimore & Annapolis Railway proposes in the future to complete the system by equipping all of the Annapolis, Washington & Baltimore Railway, including the section shown by dotted lines in the map, so as to give an alternate route from Academy Junction to Washington.

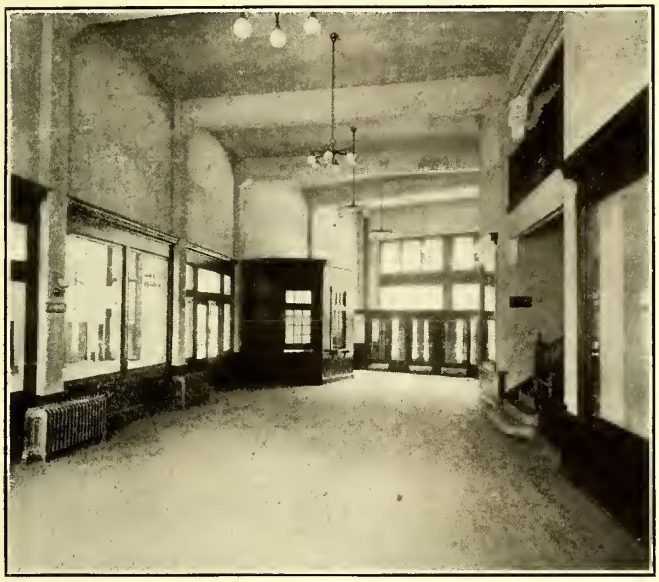
The total mileage of the system, measured as single track, is 96.33 miles, divided as follows:

Main Line	67.28	miles
A. W. & B.	20.5	miles
Berwyn & Laurel	9.	miles
Total	96.33	miles

This is exclusive of the Washington Railway & Electric Company's tracks from Berwyn into Washington, and of the tracks of the Columbia line from the District of Columbia line to 15th and H streets.

FARES AND SCHEDULES

The two steam railroads now connecting Baltimore and Washington are the Pennsylvania and the Baltimore & Ohio. The fare charged by both of these companies is $1 for a single trip with no reduction for an excursion ticket except on Saturdays and Sundays, when an excursion ticket is sold for $1.25, good up to Sunday night. The time taken by the trains from terminal to terminal is about an hour, although a few trains make the run in a shorter time. The extent of the traffic is indicated by the fact that 123 trains a day are operated between the two cities.

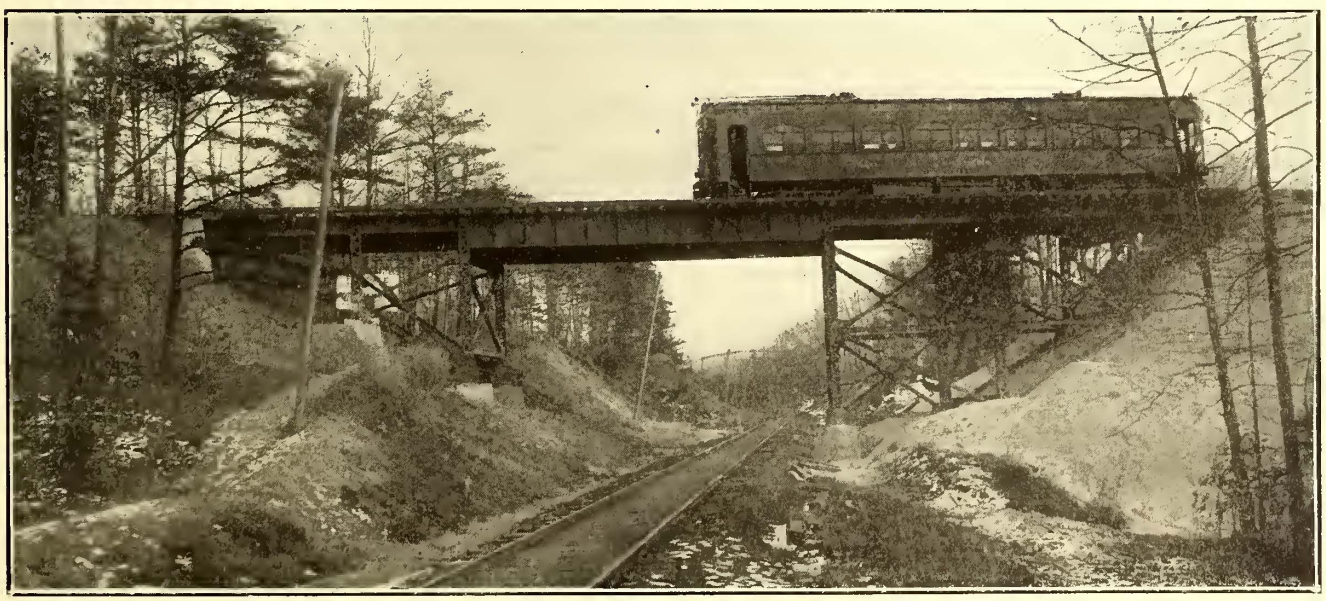


WAITING ROOM IN BALTIMORE TERMINAL STATION

EXTERIOR OF TERMINAL STATION AT BALTIMORE

The electric railway company has decided to establish a fare of 75 cents for a single trip and $1.25 for the round trip, the return coupon being good at any time. This will include a transfer on the lines of the Washington Railway & Electric Company. The running time decided upon is one hour from terminal to terminal, that is from the corner of Liberty and Marion Streets in Baltimore to Fifteenth and H Streets, N. E., in Washington. The traveler would require about 15 minutes more to make the trip by the local cars in Washington to the Treasury Building, making the through time from the retail center of Baltimore to the Treasury Building in Washington about the same as by the steam railroad between these two points. It is proposed to commence with a headway of about 30 minutes, to be decreased as the needs of the traffic require.

The service between Annapolis and Baltimore and that between Annapolis and Washington will be by way of Academy Junction. The present fare by steam train from Annapolis to either of these cities is $1.20 one way and $2 for the round trip. The fare on the electric line from Annapolis to Washington has been fixed at 75 cents for a single trip and $1.25 for the round trip, the distance being practically the same as that from Baltimore to Washington by the electric line. The fare between Baltimore and Annapolis has not yet been decided upon.

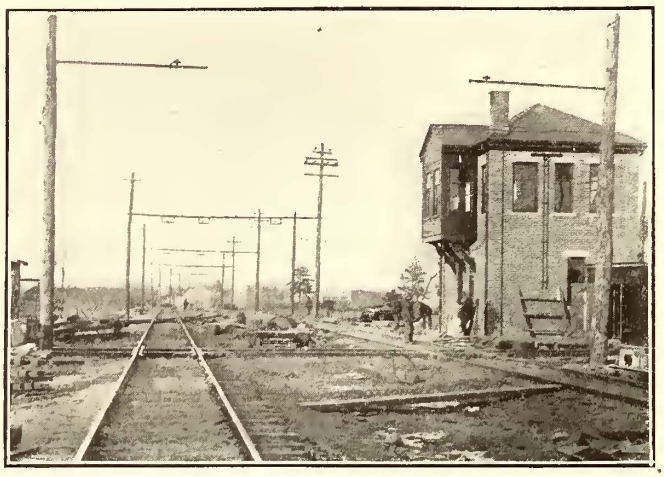


TRESTLE ACROSS POPE'S CREEK BRANCH

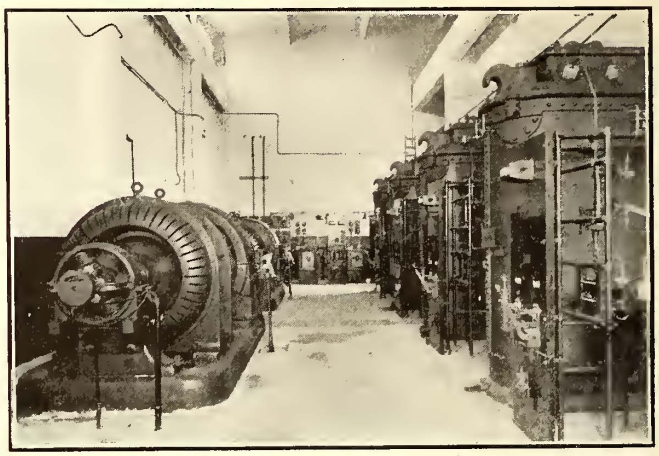
ORGANIZATION

The Washington, Baltimore & Annapolis Electric Railway Company has a capital stock of $4,000,000, which is owned largely in Cleveland. The officers of the company are: President, George T. Bishop; first vice-president, John Sherwin; second vice-president and general manager, J. N

Shannahan; treasurer and assistant secretary, C. F. Gladfelter; secretary and assistant treasurer, W. A. Kappler. The engineers in charge of the design and construction of the line are the Roberts & Abbott Company, of Cleveland. M. A. Munn has been chief civil engineer, J. C. Gillette engineer of line work and Bret Harter engineer of rolling stock. Simonson & Pietsch were architects for the Baltimore and Washington terminal buildings and for the local stations. The contractors for the greater part of the grading, track laying and line work were the Fidelity Construction Company, of Detroit, although Arnold & Wells did a part of the work.



ACADEMY JUNCTION, SHOWING SIGNAL TOWER



SUB-STATION AT ACADEMY JUNCTION

VIEW ON TANGENT, SHOWING OVERHEAD CONSTRUCTION AND METHOD OF TYING BRACKETS TOGETHER

THE PROBLEM STATED

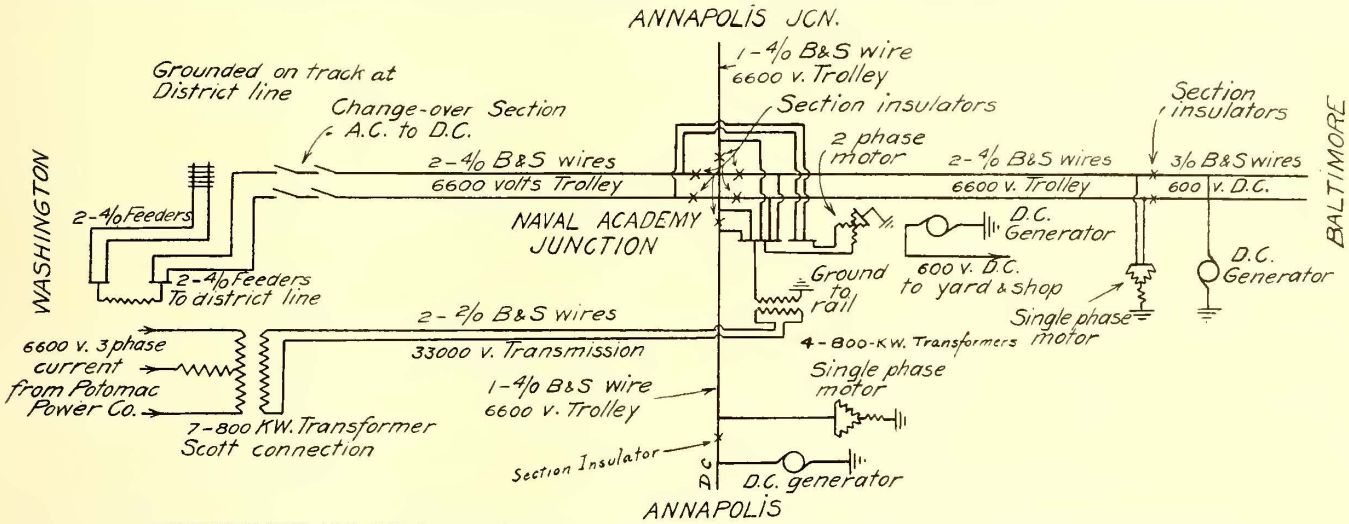
The plan of connecting Washington and Baltimore by a high-speed electric railway has been under consideration for ten years or more and was brought prominently before the American Institute of Electrical Engineers in 1902, when Mr. Lamme described the single-phase system at that time proposed for the line. During that and the following year considerable grading was done by the company then back of the project. The road afterwards passed into the hands of the present owners and the plans were changed in a number of particulars.

In many respects the situation presented in 1905, when the present owners and engineers took charge of the project, was most complicated. Although it seemed necessary to use the tracks of the local railway companies in each city a serious problem was presented owing to the fact that the gage of the Baltimore tracks is 5 ft. 4½ ins., whereas that in Washington is 4 ft. 8½ ins. In methods of electrical distribution the practice of the local companies in Washington and Baltimore also differ, as the system in Baltimore uses the usual rail return, whereas the downtown lines in Washington employ the conduit and the suburban lines the double overhead trolley. The use on the interurban section of the single-phase system meant, then, the equipment of the cars with motors and control capable of utilizing high-voltage a. c. and 500 volts d. c. It also necessitated current collectors for a single overhead wire with the usual city clearance, a double overhead trolley wire, underground conduit conductors and a single-phase catenary with interurban clearance.

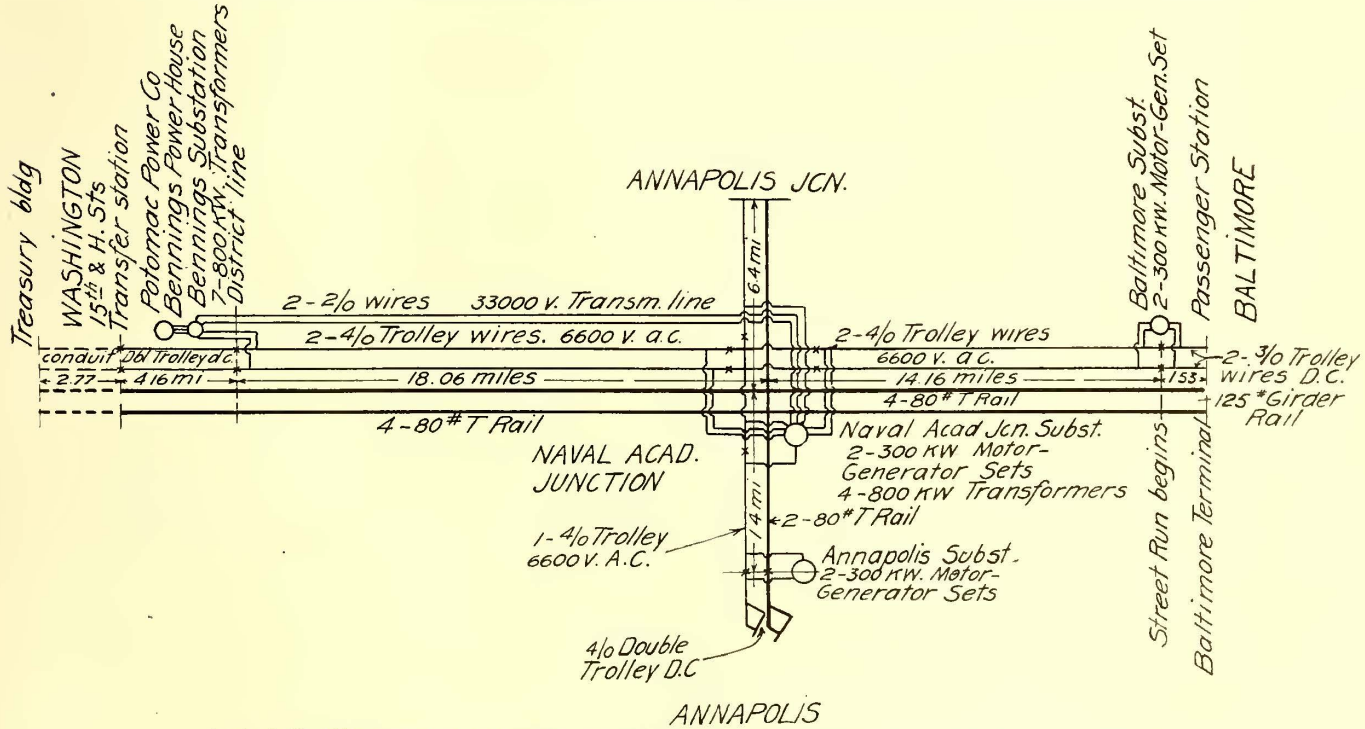
Before deciding upon the ultimate system alternate plans were prepared for direct current distribution at 600 and 1200 volts and a. c. distribution at 3000 and 6000 volts. The latter was finally adopted after a study of all the conditions. One of these was that the road passes the Bennings race track and during the racing season will undoubtedly carry many passengers to and from the races. If direct current were used very large sub-stations would be required during a few weeks only of the year.

The engineers also prepared alternate plans for a power station to be located at Academy Junction and equipped with gas engines, reciprocating engines or turbines, with a sub-station near Washington for use under special conditions. Before these plans were completed, however, a contract was entered into with the Potomac Power Company, of Washington, for the purchase of all of the power necessary for the operation of the line, even to the supply of direct current in the Baltimore terminal for use on the city tracks in Baltimore.

The operating conditions of the road were fixed by the decision to provide a running time between the commercial centers of Baltimore and Washington which would not materially exceed that of the steam lines and the desire to have north and south bound cars pass each other at Academy Junction so as to permit a shuttle service between that point and Annapolis. The running time was consequently divided about as follows: From the Treasury Building, Washington, to Fifteenth and H Streets, N. E., 20 minutes; from this point to the District line, including change of cars, 18 minutes; the local run in Baltimore, 12 to 15 minutes. Deducting these times from that required for the whole run left it necessary for the cars to make the interurban run at 66 miles per hour.



DISTRIBUTION AND SUB-STATION DIAGRAM OF WASHINGTON, BALTIMORE & ANNAPOLIS RAILWAY



MILEAGE AND COPPER DIAGRAM OF WASHINGTON, BALTIMORE & ANNAPOLIS RAILWAY

In addition to its through service the company will also supply a local service on about a two-hour headway. Stub end sidings with trailing switches are provided for the local cars so that there will be no leading switches on the main line. Grade crossings with other railroads have also been eliminated on the main line and grade crossings with highways have also been practically abolished. Only one of any importance remains and that will be taken out soon.

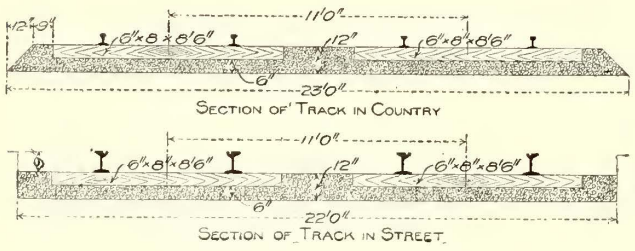
PRESENT CONDITION OF THE WORK

Passenger service was commenced between Annapolis

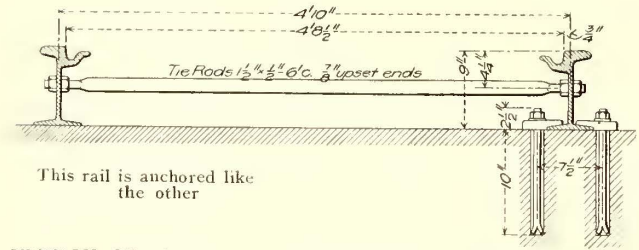
and Washington on Feb. 7, on which day a number of passengers were carried. The section between Baltimore and Academy Junction will not be opened for traffic until next month. The work is very nearly completed, however.

TRACK CONSTRUCTION ON MAIN LINE

The main line is laid with 80-lb. A. S. C. E. 33-ft. rails on 6-in. x 8-in. x 8-ft. chestnut ties, and is ballasted with gravel excavated from pits along the right-of-way. The maximum grade is 2 per cent, with one exception; this is the approach from the foot of Scott Street, Baltimore, leading to the elevated structure already mentioned. This approach is on a 5.7 per cent grade and is about 500 ft. long.



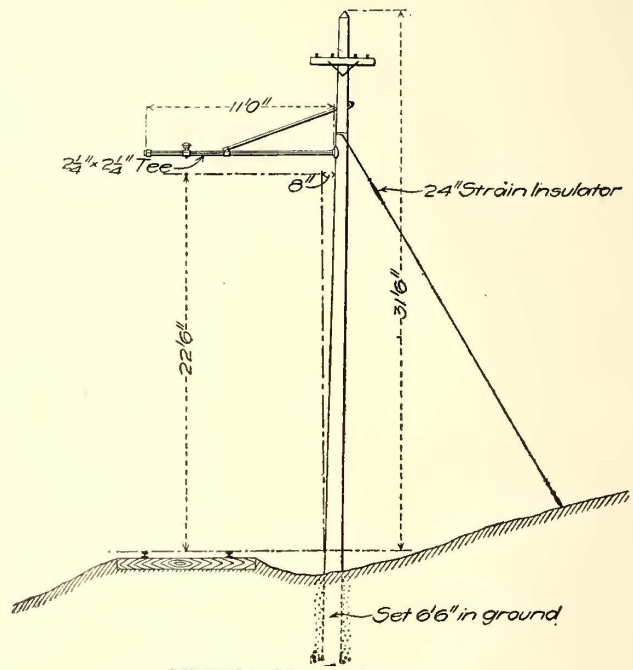
SECTIONS OF RUNNING TRACK



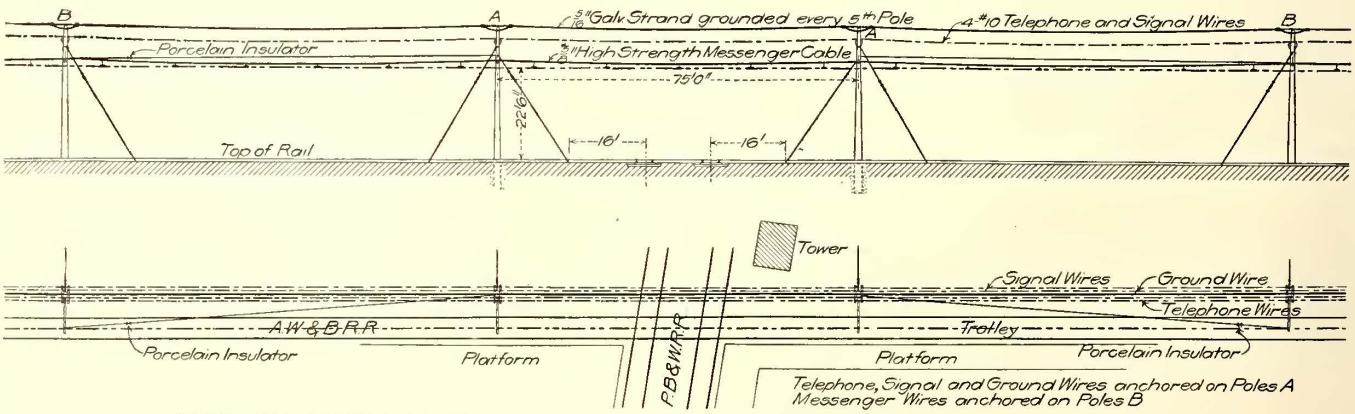
SECTION OF TRACK IN BALTIMORE TERMINAL, SHOWING METHOD OF ANCHORING TO CONCRETE

TRACK CONSTRUCTION IN BALTIMORE

In its Baltimore city construction the company uses the Pennsylvania Steel Company's 125-lb. section No. 273. This section has a groove of 1½ ins. which accommodates the 1-in. wheel flange. In paved streets this rail is laid in a broken stone ballast extending 4 ins. below the base of the tie, with concrete packed around the web of the rail and sand below the paving. The difference in gage in Baltimore is overcome by laying a rail inside one of the rails of the Baltimore local system.



METHOD OF GUYING POLE.



PLAN AND ELEVATION OF CATENARY CONSTRUCTION AT CROSSING OF P., B. & W. R. R.

List of Wires.
One 5/16-in. steel strand ground line.
Two No. 10 B.W.G. steel telephone lines.
Two No. 10 B.W.G. steel signal lines.
One ⅜-in. steel messenger wire.
One No. 000 solid h. d. copper trolley wire.

Data on Telephone Wire
Sag at 60 degs. F. = 26 ins.
Max. strain = 350 lbs.
Breaking strain = 925 lbs.
Safe load (2½ fac.) = 370 lbs.

Data on Ground Line
Sag at 60 degs. F. = 26 ins.
Max. strain = 1375 lbs.
Breaking strain = 3500 lbs.
Safe load (2½ fac.) = 1400 lbs.

Data on Messenger
Sag at 60 degs. F. = 10 ins.
Max. Strain = 3837 lbs.
Breaking strain = 10,500 lbs.
Safe load = 4200 lbs.

The maximum curve is 8 degs. There is only one curve, however, of this degree, the majority of the curves being 1 deg. or less. Seventy-nine per cent of the main line consists of tangents.

The country between Baltimore and Washington is rolling with the valleys crossing the line, thus necessitating a large amount of grading. Approximately 1,600,000 cu. yds. of excavation were required.

The bonds used on the main line are the American Steel and Wire twin terminal type. In city work the Lord soldered bonds are used; in Annapolis the crown bond is employed.

At a short distance south of the elevated structure, by which the line leaves Baltimore, there are two tunnels, of which one is at the head of a 40-ft. cut. The tunnels are rectangular in cross section and the sides and roof are of reinforced concrete. One tunnel is 88 ft. and the other is 270 ft. in length. They are connected by retaining walls 103 ft. long. and were constructed by making an open cut with a steam shovel. The concrete was then placed and the structures were back-filled upon completion. A resi-

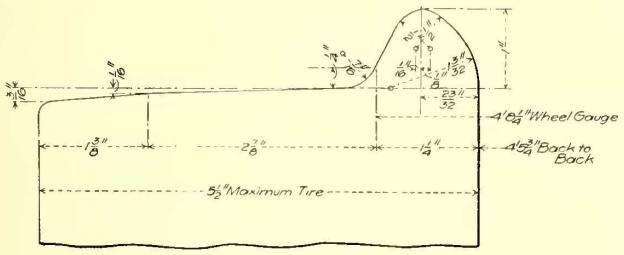
dence over the cut was supported temporarily during the construction.

TERMINAL STATIONS

The terminal station in Baltimore is illustrated in two of the accompanying engravings. The cars pass through the building which is provided with a waiting room on the ground floor and office rooms above. The company has also erected terminal stations in Washington and in Annapolis.

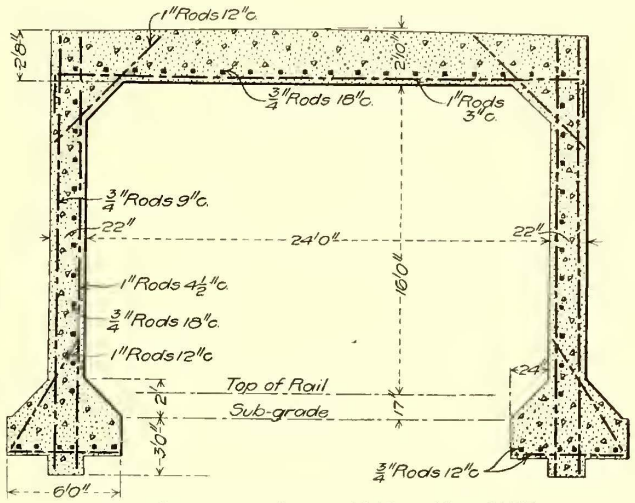
CATENARY CONSTRUCTION

Single catenary construction is used exclusively on the single-phase or interurban portions of the route. Although the poles along the double-track portion of the route are placed in pairs across the tracks, the side-bracket arrangement is employed throughout. The bracket adopted is the Ohio Brass T form, 2¼ ins. x 2¼ ins. and 11 ft. long. The bracket is secured in lugs on the poles and is held in position by a single iron rod braced from near the top of the pole. Where the track is double the two brackets on opposite sides of the track are tied together by an iron-wire cable containing a 24-in. wooden strain insulator at the center. This insulator has been inserted to insure safety to linemen when working with the wire over one track while the other is in use. All poles are guyed back with 24-in. wood strain insulators and Miller anchors so that the completed structure possessed great rigidity as to location, but the contact wire provides considerable element of flexibility by reason of the catenary suspension



SECTION OF WHEEL

The poles are spaced 150 ft. apart except on curves of more than 6 degs. and are painted with carbolineum. The messenger cable is ⅜ in. in diameter and of high strength steel. The trolley wire is No. 0000. Hangers, on straight line, are spaced 16 ft. 8 ins., which, with a 150-ft. span, gives nine hangers to the span. A half-turn gripping arrangement on the top of the hanger, combined with a clamping device at the bottom, allowed the hangers to be placed with great rapidity. In fact by the use of four platform box cars as much as 4 miles of line has been erected in a single day.



SECTION OF TUNNEL NEAR BALTIMORE

SECTION INSULATORS AT DISTRICT LINE IN WASHINGTON WHERE THE SINGLE-PHASE SYSTEM CONNECTS WITH THE DOUBLE TROLLEY DIRECT-CURRENT SYSTEM.

The trolley wire on the main line is carried at a height of 19 ft. 6 ins. above the head of the rails, but on the A., W. & B. branch this height has been increased to 21 ft. on account of the freight traffic. The messenger insulators are of the double cloaked brown porcelain type. The upper surface of the top petticoat is molded with four grooves at right angles, so that if an insulator is struck with a stone or otherwise it will break along the groove instead of through the insulator. At overhead bridges the supporting insulators with the messenger wire is surrounded by an iron trough which is permanently connected to earth.

The General Electric Company supplied the hangers and insulators for the messenger cables, the steady braces and the section insulators. The Ohio Brass Company furnished the brackets and the high voltage transmission insulators.

TROLLEY CONSTRUCTION

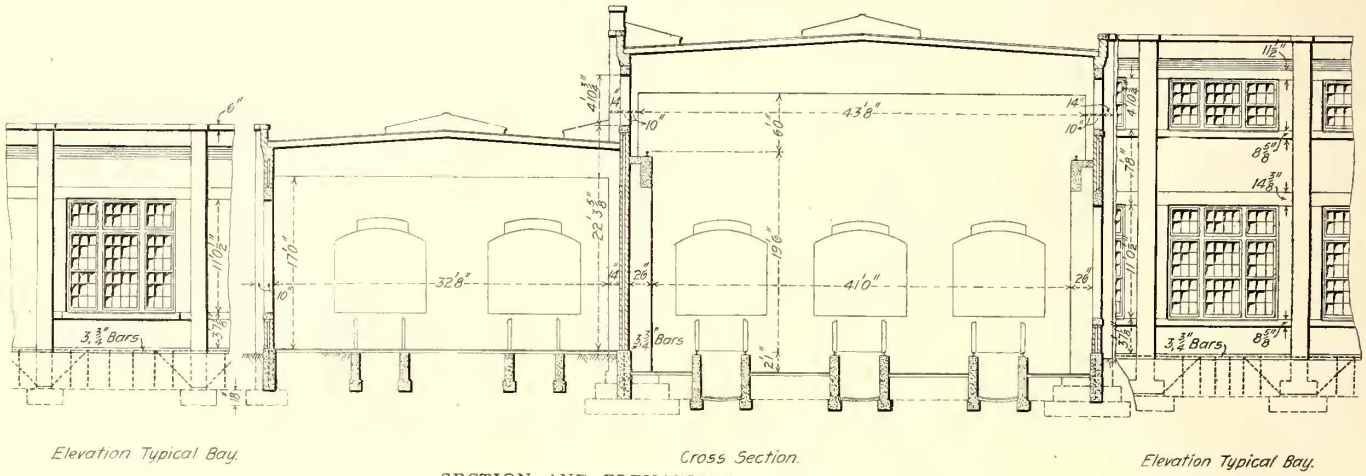
On the direct-current sections the trolley wire is suspended in the usual way except that the authorities in Annapolis required the company to install a double trolley system. The construction in Baltimore calls for no special mention except to say that the feed wire is carried on the cross-span between the two trolley wires. The local system in Annapolis is somewhat in the shape of the figure 9. On the tail of the 9 only three wires are used, the inside wire being negative and the outside wires positive.

The junctions of the low and high tension systems of course required special installation. Here an insulated section a few hundred feet in length has been provided in the overhead system so that cars may pass from one to the other without drawing down the trolley poles. This section can be connected to either the high or the low voltage by

a manually operated switch which is kept locked so that it can be thrown only by an employee. Later it is proposed to throw these switches from a signal tower. Each section insulator so employed is provided with an inner insulating runner which serves for guiding a wheel trolley, and two outer runners which were provided for use in case a pantograph is adopted later.

TELEPHONE AND OTHER CONDUCTORS

The railway company maintains its own telephone circuit.



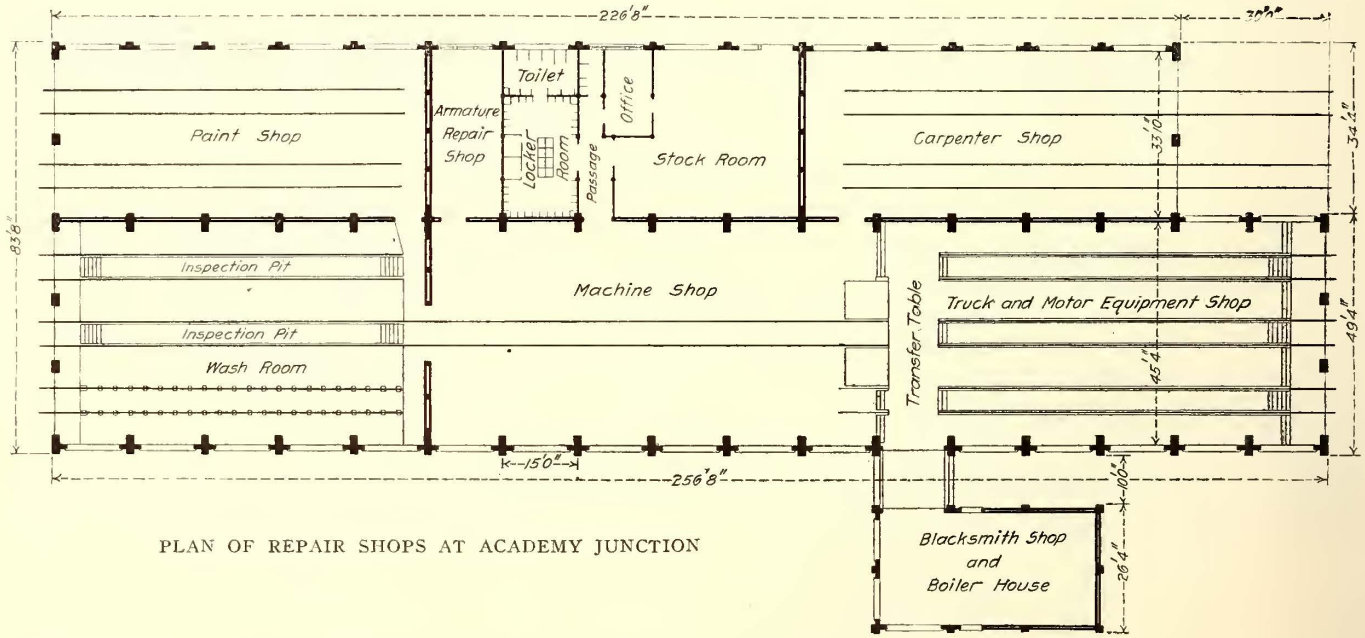
SECTION AND ELEVATIONS OF REPAIR SHOP

The telephone wires and the signal wires on the Annapolis branch are carried on a cross arm below the bracket. To provide against induction in the telephone wires the latter are transposed every five poles with single-pin transposition. Every precaution is taken to insure that a person using the telephone shall not be injured in case the telephone wire should come in contact with the trolley wire, or a low resistance path should be formed between the two. The telephone insulators are of brown porcelain 3 ins. x 3⅛ ins., and the circuit is insulated for a working voltage of 6000. There is no direct metallic connection between the telephone instruments and the telephone lines. Each instrument is inductively associated with the line, an insulating transformer designed to withstand 25,000 volts between coils being used for this purpose. The central e. m. f. point of both the line side and the instrument side of each transformer is permanently grounded, so that all danger of a potential rise at the instruments has been eliminated. Kellogg bridging 'phones are used with a 2000-ohm ringer and a 5-bar generator.

At the top of the poles a No. 10 steel wire, grounded at each fifth pole, is carried for lightning protection.

BLOCK SIGNALS

The Annapolis single track branch is equipped with Blake manually operated block signals, made by the Blake Signal & Manufacturing Company, of Boston. The crossing at the Academy Junction is protected by a block signal system installed by the General Railway Signal Company and operated from a tower. The railway company has not yet selected the block signal system to be used on the main line.



PLAN OF REPAIR SHOPS AT ACADEMY JUNCTION

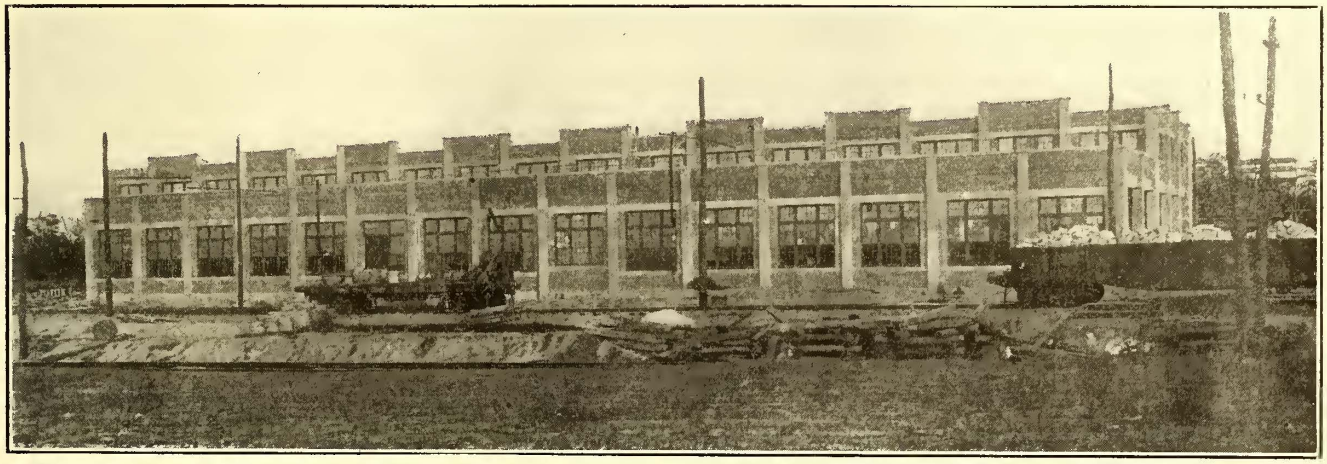
CARS

The company has 24 cars built by the Niles Car Manufacturing Company. These cars were fully described in the Street Railway Journal for October 12, 1907, so that no particulars of the bodies need be given here. A number of the features of the equipment, however, were not mentioned in that article and will be described.

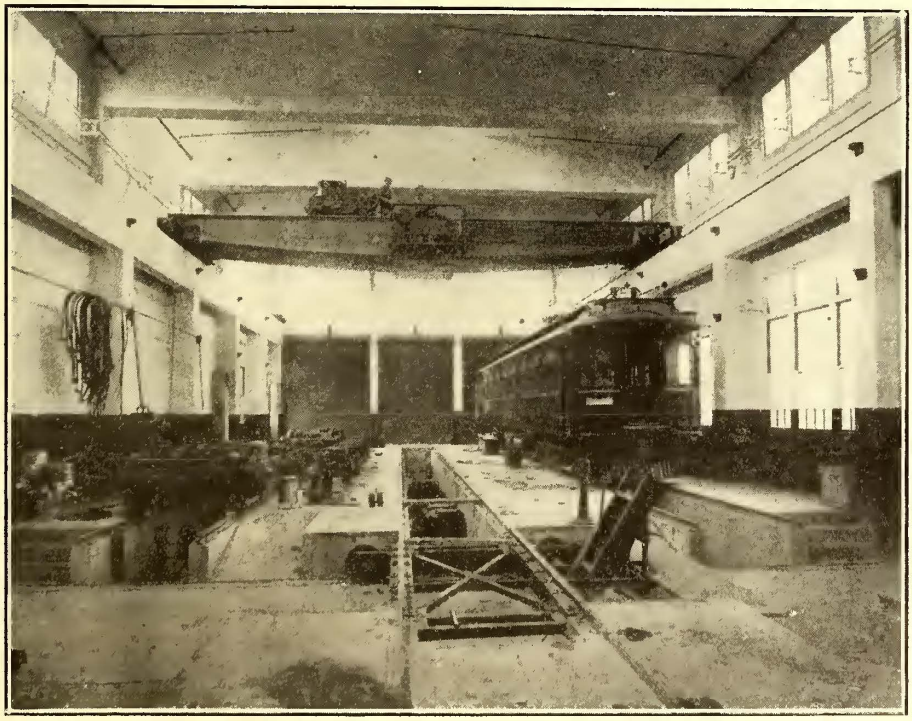
TROLLEYS

One of the most interesting parts of the car equipment is the arrangement of trolleys, of which there are four to each car, two for each direction of running. It is quite probable that later a pantograph may be used on the single-phase sections, but up to the present no difficulty has been

experienced at high speeds with the trolley wheels in use. One trolley pole at each end has of course to be insulated for high voltage. Partly to give greater space for the insulated base, and partly on account of the higher clearances on the high voltage sections, the high voltage trolley pole is 15 ft. in length, whereas the low voltage trolley pole is only 12 ft. in length. United States No. 10 and No. 11 trolley bases are used, the high voltage base being set 38 ins. back of the low tension base. When running on the double trolley system in Annapolis the high tension pole is used as the positive pole and the low tension pole as a negative pole. In Washington it is the practice of the Washington Railway & Electric Company to vary the potential, so that the short pole may be the positive pole. A 6-in. trolley wheel with a wide groove is employed.



REPAIR SHOPS AT ACADEMY JUNCTION



VIEW OF SHOPS, SHOWING TRANSFER TABLE AND PITS

It is quite probable that the cars will also be equipped later with conduit plows for use in the city of Washington, but no definite plans have been adopted to this end yet.

MOTOR EQUIPMENT

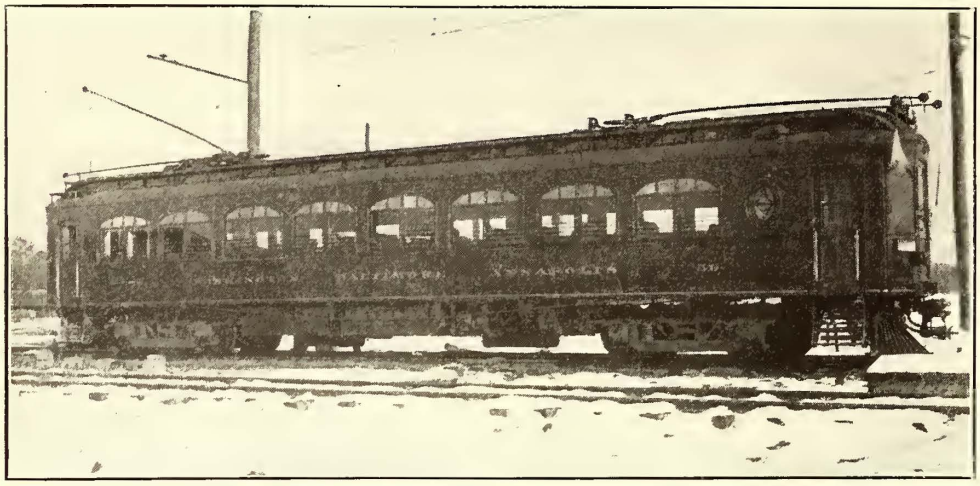
The motors are of the series-repulsion type, and differ in no essential detail from the machine described on page 82 of the STREET RAILWAY JOURNAL for January 18, 1908. They were built by the General Electric Company, are of the GEA-603 type and of 125-hp capacity each. Four motors are used per car on most of the cars. During direct-current operation the four motors are connected in series and subjected to plain rheostatic control. During alternating-current working the motors are controlled in two pairs, each consisting of two motors permanently in series. However, during the actual starting period with alternating current the machines are connected as plain repulsion motors and they are gradually converted to compensated-series motors as the speed increases. The motors are controlled by a General Electric No. C-57 controller. This controller has six running points.

Each pair of motors is supplied with energy from its own oil-insulated self-cooling auto transformers. In fact, the alternating-current equipment on each four-motor car can be considered as two two-motor equipments operated simultaneously from one master controller. The common circuits for the two equipments include a high-tension explosive type fuse, a choke-coil and a main circuit oil-switch with magnetically operated tripping and closing device; the latter device receives its energy from a special auxiliary transformer which remains active even when the main switch is open. The high-tension circuits leading from the trolley poles to the auto-transformers are placed in an asbestos-lined compartment which can conveniently be inspected at any time. The fuses and switches for the low-tension circuits are placed in a similar compartment in one of the vestibules.

The cars are also equipped with Westinghouse A. M. M. automatic air brake with General Electric compressor, Knutson trolley retrievers and International registers for city use. The cars are mounted on Baldwin trucks with a 7-ft. 6-in. wheel base and are fitted with wooden pilots.

TRANSMISSION SYSTEM AND SUB-STATION AT ACADEMY JUNCTION

Many unique schemes are embodied in the transmission system. Energy is obtained, as already described, from the Potomac Power Company in Washington at 6600 volts three-phase. By means of seven 800-kw T-connected



STANDARD TWO-COMPARTMENT CAR

transformers, the energy is converted into two-phase; the e. m. f. of one phase is 6600 volts, that of the other 33,000 volts. The former phase is connected to the catenary trolley system from Washington to Academy Junction, while the latter is connected to a single-phase 33,000-volt transmission line running to a motor-generator and transformer sub-station at Academy Junction. In the sub-station there are four 800-kw transformers which reduce the e. m. f. from 33,000 to 6600 volts. Energy is fed at the latter voltage to the trolley lines running to Baltimore and to Annapolis.

INTERIOR OF CAR

The revolving machinery in the sub-station consists of two 670-hp, 6600-volt, two-phase synchronous motors driving two 300-kw commutating-pole direct-current generators. The latter machines are compound-wound for an e. m. f. of from 550 to 600 volts. Each motor-generator set is provided with a direct-current generator for supplying exciting current to the synchronous motor. The motors are brought up to speed as two-phase induction motors at reduced voltage. It will be noted that one phase of the motor when operated two-phase receives energy over the track circuit from Washington, while the energy from the other phase comes by a more direct electrical route over the 33,000-volt transmission circuit. Even if no cars were in use along the railway between Washington and the sub-station, there would be a considerable unbalance in the load on the two circuits when the synchronous motor was heavily loaded, due to the difference in the effective impedances in the circuits of the two phases; the unbalance evidently becomes much greater when cars are in use. However, the synchronous motor possesses the advantageous feature of supplying a flexible coupling between the two phases, so that it tends to maintain the e. m. f. on the overload phase, to equalize the loads on the two circuits and to improve the power factor when the excitation is properly adjusted. The motors were not installed to perform these duties, and may seldom be used for the purpose. Their chief function is to drive the direct-current generators for supplying energy at low voltage to the cars throughout the shop yards at Academy Junction and to stationary motors used in the repair shops. At the present time the motors are run as single-phase machines after having been brought up to speed as two-phase machines.

SUB-STATIONS AT BALTIMORE AND ANNAPOLIS

Although there are no circuits which can be considered strictly as transmission lines to connect Baltimore and Annapolis with the Naval Academy sub-station, yet energy will be transmitted from the sub-station to both of these points. The transmission will be accomplished over the 6600-volt trolley-and-rail circuit, single-phase self-starting synchronous motors being used to drive direct-current generators in the sub-stations required at Annapolis and at Baltimore to operate the city systems located there. In each of these sub-stations there will be installed two 300-kw motor-generator sets, the former to supply direct current to the Annapolis No. 0000 double overhead trolley system and the latter to feed the Baltimore two single No. 000 circuits with track return. It is evident that the synchronous motors will assist in maintaining the voltage along the route.

THE SHOPS

This article would not be complete without an account of the fine shops of the company at Academy Junction. The cars are stored on tracks equipped with the a. c. system, but 500 volts are used in the tracks leading to the shops and in the shops themselves. Plans of the shop layout are presented so that the arrangement need not be described here. It might be said, however, that the pits are heated with hot air from an American blower. The ducts for the hot air to the pits are brought out in the pit step risers.

The interior view of the shops shows an ingenious form of transfer table for changing trucks. The shop is served by a 30,000-lb. capacity Whiting crane by which the car body is hooked up when the truck to be changed has been run on to the table. The truck is then taken to one side by the table and the new truck inserted.

The incandescent lighting system in the shops is on the a. c. circuit, while the arc lights are run from the direct-current circuit.

The shops are equipped throughout with International sprinklers supplied with pressure from an elevated tank. The fire fighting equipment also includes a Worthington fire pump. The ventilator sash in the monitor are operated by a Lovell fixture. Most of the tools were furnished by the Niles-Bement-Pond Company.

INSPECTION

Though the courtesy of the management a party of newspaper men, including representatives from this paper, was taken for a trip of inspection over the line on Feb. 7. The visitors were met in Baltimore by Messrs. Shannahan, Roberts and other representatives of the company and its engineers. The trip to Academy Junction was made on one of the steam trains of the company, as the overhead equipment of this section of the line had not been completed. After inspecting the shops and sub-station at Academy Junction they were taken to Annapolis by electric car and entertained at lunch at Carvel Hall Hotel. Later in the afternoon the trip was made by electric car to Washington. The management and engineering force of the company were the recipients of many congratulations over the success of the trip and the substantial character of the roadbed and equipment.

GASOLINE MOTOR CARS ON SMALL WESTERN ROADS

There are several small roads in the Middle West on which gasoline cars are being successfully operated. In most instances these roads are forerunners of electric lines. The gasoline car serves as a means of operating the road with least expenditure of money until traffic has been developed to a point where an electric installation is warranted.

Three roads are being operated by motor equipments supplied by P. H. Batten & Company, Chicago. The Sioux City, Crystal Lake & Homer Railroad operates 5½ miles out of Sioux City to Dakota City with two single truck cars. The line contains a 3½ per cent grade 500 ft. long. Each car is equipped with a 6-in. x 6-in. four-cylinder Whiting engine. The cars are 20 ft. 4 ins. over corner posts, seat 30 passengers and weigh complete ten tons. They operate over a portion of the Chicago, St. Paul, Minneapolis & Omaha tracks and are subject to train orders as are the steam trains. The fact that the steam road permits the use of the gasoline cars on its lines is an indication of their reliability.

The cars are mounted on Brill trucks and practically nothing was done to the truck in mounting the motor equipment except to cut new keyways in the axles. Each car makes 80 miles a day. About half an hour is consumed in making the single trip. One operates from 6 a. m. until 2 p. m. The other is then put in service until 11 p. m. The gasoline consumption is about one gallon to 5½ to 6 miles.

The Aurora, DeKalb & Rockford Traction Company operates from Aurora to DeKalb, 30 miles, with four galoline cars. Two cars are equipped with four-cylinder 6-in. x 6-in. Whiting engines. One has a four-cylinder 6-in. x 8-in. and another a four-cylinder 7-in. x 7-in. standard Batten engine. Two cars are required to maintain the schedule, the other two being held in reserve. Each car is operated as high as 120 miles per day. They seat 35 people. The road is gravel ballasted and has a good roadbed. The cars geared to 35 m. p. h. make the thirty-mile trip in one and one-half hours with the stops at intervals as usually encountered in interurban service. The consumption per mile of the two cars equipped with Whiting engines is about one gallon to 6 miles in winter and one gallon to 8 miles in summer. Those equipped with the Batten engines run about 5 miles per gallon.

Two gasoline cars are operated by the Illinois Central Electric Railway on a five-mile road which extends out of Canton, Ill., through a coal mining district to St. David, with about 500 people. One car has a Whiting four-cylinder 6-in. x 6-in. engine and the other a Batten 7-in. x 7-in. engine. Service is given from 6 a. m. to 11 p. m. at one-hour intervals. The fuel consumption averages about four gallons per mile with stops at frequent intervals. The engines on all these cars drive both axles by means of Morse silent chains and sprockets. A special planetary change gear is used for starting and for slow speed, and a multi-disc bronze and steel plate clutch running in oil for high speeds. The engine is held equidistant between the two axles in a steel frame which extends across the truck and is supported by the truck side frames. In mounting the engine nothing is done to the truck which would prevent the engine being taken off and electric motors mounted on it. The control apparatus extends to each end and consists of a lever for the spark and throttle control and a main controller with three positions of the handle, corresponding to low speed forward, high speed forward and low speed backward. The handles are removable and are carried by the engineer when he changes ends. The gasoline storage tank is of 20 gallons capacity placed under the seats.

The engine is cooled by water circulated through the jackets and cooled by radiators in the dash at each end. The radiators are protected by a wire netting. In winter a canvas is placed over the radiator to lessen the amount of air passing through, and the heated air is carried into the car and keeps the interior at a comfortable temperature. About 50 gallons of water are carried in the cooling system and it is necessary to add about 10 gallons per day. The engine is simple in design and all bearings are of large size and easily accessible. Lubrication is effected by a 16-feed force pump.

One system has never had a pull-in, while another has had as high as three in one day, due to the gasoline freezing. The cars are operated by two men, a conductor and an engineer, who is a man of no special training. Troubles necessitating pull-ins are seldom encountered on the road. About 50 per cent of the time required to keep the equipment up is spent in adjusting bearings, grinding valves and in taking care of the ignition outfit. After a run it is customary for the engineer to simply run the car in the barn and leave it without attention until a few minutes before he runs it out in the morning.

The Aurora, DeKalb & Rockford line has a regular repair shop and all repair work is taken care of by one man.

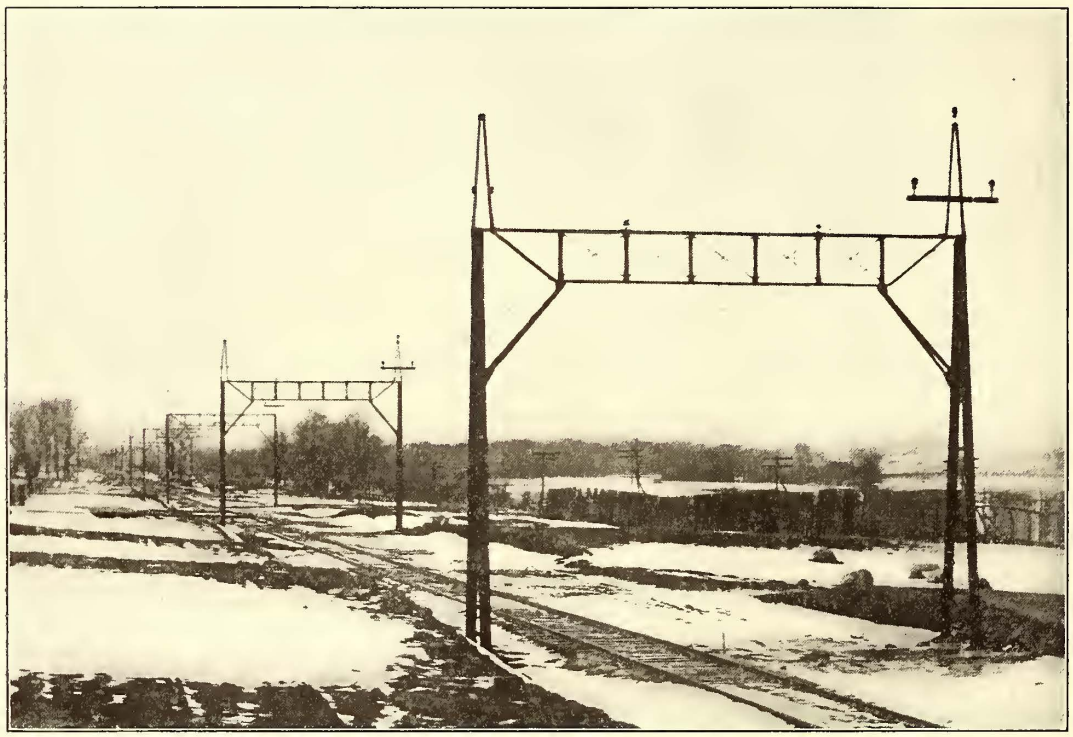
TRACKLESS TROLLEYS ABROAD

A report in the British Board of Trade Journal for Jan. 2 indicates that there are four trackless trolley lines now in operation in Germany. The first installation on this system was constructed and opened in the Biela Valley (Bielathal), Saxony, in July, 1901. It was in operation as an experimental line for about three years, when, owing to the insufficient traffic, it was removed to Wurzen, Saxony. Other lines are now in operation at Grevenbrück, Westphalia (length 1½ km.); Veischedethal, Westphalia (Grevenbrück-Bilstein-Kirchveischede), 9 km. in length, and Monheim-on-Rhine (length 4½ km.).

THE SYRACUSE, LAKE SHORE & NORTHERN RAILROAD

BY E. M. WHARFF.
Electrical Engineer of the Road.

The Syracuse, Lake Shore & Northern Railroad Company purchased from the Syracuse, Lakeside & Baldwinsville Railway Company, at a mortgage foreclosure sale, its electric railroad connecting Syracuse and Baldwinsville. The road was built mostly upon private right of way from Syracuse to Long Branch, a distance of 7.25 miles. From Long Branch to Baldwinsville, a distance of 6.25 miles, the road followed a winding highway. The new company has practically rebuilt the whole road, relaying the old road from Syracuse to Long Branch and from that point to Baldwinsville has secured new private right of way, shortening the distance by 3600 feet, besides getting rid of many curves and all grade crossings. The road is also to be extended north to Oswego, about 37 miles from Syracuse; a large part of the grading for this extension has now been completed to Fulton, 27.4 miles from Syracuse.



SIDE VIEW OF CATENARY CONSTRUCTION

Between Syracuse and Long Branch double track has been laid and many curves have been straightened; in some cases this involved the purchase of property and the removal of buildings. All of the old track as well as the new has been ballasted with 6 ins. of crushed limestone. This ballast was secured from the Solvay Process Company, whose works are located on this line.

The overhead work was changed from single poles with brackets to double poles with standard spacing of 90 ft. on the tangents and raked away from the track at an angle of about 8 degs. The old No. 00 trolley wire has been replaced by No. 0000 grooved, hard drawn, copper trolley wire furnished by J. A. Roebling's Sons Co., of Trenton, N. J., which has furnished all of the wire used since the line came into the hands of the present owners. This new trolley wire is supported by 5/16 in. galvanized strand cable, with a giant strain insulator placed approximately 4 ft. from each pole. The wire itself is supported by Ohio Brass Company's Type D hangers with ¾-in. studs and Detroit trolley clamps, Form 4.

Long Branch is a summer lake resort of Syracuse, and the farthest point to which the fifteen bench open cars are necessarily operated. This fact with other considerations, which include cost and a desire to test out the various claims for operation of cars by alternating current, led to the decision that from Syracuse to Long Branch the cars would operate with 600 volts direct current, furnished by rotaries installed in the original power house, while beyond Long Branch 6500-volt alternating current could be used on the trolley. Power is now purchased from the Oswego River Power Transmission Company at 21,000 to 23,000 volts, 25 cycles, stepped down from approximately 60,000 volts, at which potential it is furnished to the power company by the Niagara, Lockport & Ontario Power Company. At the railway power house this voltage is stepped down to a suitable voltage to give approximately 600 volts from the d. c. side of the rotary.

The power house, which formerly supplied the road, together with the car barn and repair shop, is located directly on the line of the road and about 5 miles from the center of the city, on the bank of Nine Mile Creek. A siding connects with the tracks of the D., L. & W. R. R. for the delivery of coal, etc.

To take care of the Niagara power the company has recently installed in a formerly unoccupied end of the engine room a complete Westinghouse sub-station equipment. This consists of a 500-kw, three-phase, 25-cycle rotary converter, operating at 500 r. p. m. and furnishing direct current at 600 volts. A Type C induction motor, mounted on the end of the armature shaft, is used for synchronizing this machine and getting it on the line. The three transformers are each 200 kw, 22,000 and 402 volts, oil insulated and self cooled. The incoming high tension line is protected by Westinghouse high potential circuit breakers, choke coils and low equivalent lightning arresters. The power consumed is measured by a Westinghouse polyphase intergrating wattmeter and a graphic recording wattmeter. A Westinghouse automatic synchronizer, having the electrically operated switches mounted on a separate, three-sided panel, is used for synchronizing the rotary. A single-phase synchroscope and the usual lamps are also installed for use if needed.

NEW TRACK CONSTRUCTION

The new "cut-off," so called, is approximately 4.15 miles in length and is laid with 70-lb. T-rails on ties, spaced 2 ft. between centers. The ballast is 6 ins. of crushed limestone. At present 9600 ft. of the line is double track and the re-

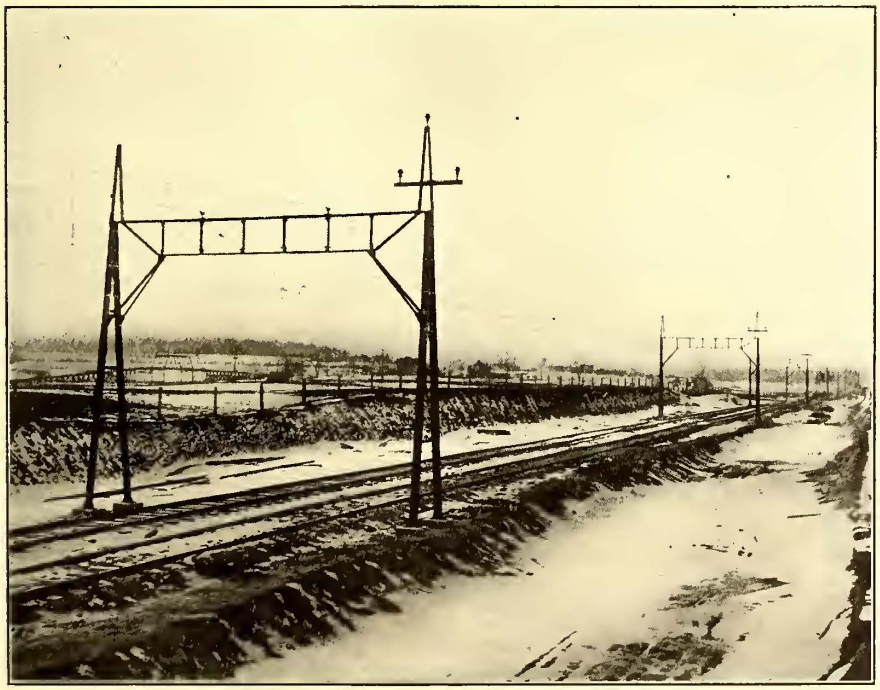
mainder single, but all will be double track in a short time.

The D., L. & W. R. R. is crossed, near Stiles Station, on a double track overhead bridge of sufficient capacity to allow the largest type of interurban cars to be used on this road. The bridge was furnished by the American Bridge Company and besides being well constructed is very attractive in appearance. The approaches are 360 ft. and 304 ft. 10½ ins., respectively, while the span is 141 ft. in length, making a total length of 805 ft. 10½ ins. The bonds are of the Shawmut soldered type and were applied to the ball of the rail by the makers. A test shearing strain of 2000 lbs. has been applied to them with no effect whatsoever to the bond. It seems to be practically impossible to knock one of them off with a hammer.

CATENARY BRIDGES

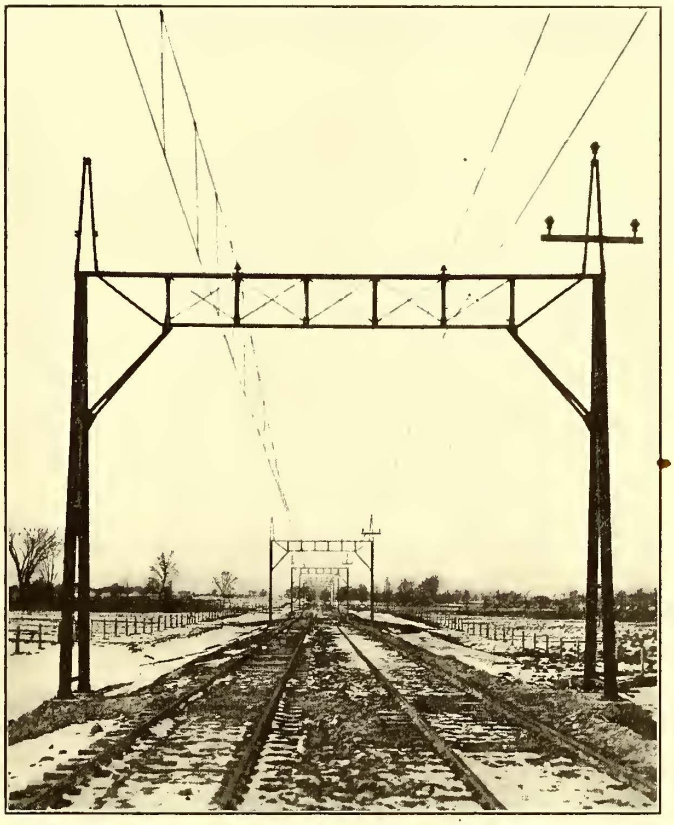
Probably the most interesting feature of this new line is the overhead construction. This is of the single catenary type supported by steel bridges spaced 300 ft. apart on the tangents. Crossing bridges and rounding curves necessitate 220-ft., 215-ft., 214-ft., 200-ft., 90-ft. and 70-ft. spans. For these many lengths of span (and some of them have one end higher than the other) it was, of course, necessary to calculate many lengths of hangers.

Each bridge consists of an "A" frame standing on each side of the track and connected by a truss. The "A" frames are made up of two 8-in. 11¼-lb. channels connected by 2½-in. x 2½-in. x ¼-in. angle braces and ⅝-in. round iron rods. The angle braces, both on the A frames and cross truss, are flattened on each end and bent at an angle of 90 degrees, then riveted to the channels. The feet of the A frame are 6 ft. apart at the base, converging to 8 ins. at the top. Each foot rests upon a separate concrete pier 2 ft. x 2 ft. and of varying depth, according to the nature of the ground. It is held to this pier by 1-in. x 3-ft. bolts imbedded in the concrete. The bridges are the product of the Archbold-Brady Company, engineers and contractors, of Syracuse, N. Y., which company installed the overhead work with the exception of setting the bridges in place.



SIDE VIEW OF CATENARY CONSTRUCTION

The cross truss is 30 ft. long, which is the distance between the centers of the A frames. The top chord of the cross truss is an 8-in., 13¾-lb. channel, set flanges down,



END VIEW OF CATENARY CONSTRUCTION

while the bottom chord is a 6-in. 8-lb. channel, set flanges up. As in the A frames, the bracing consists of 2½-in. x 2½-in. x ¼-in. angles and ⅝-in. round rods. The depth of the truss is three feet. To further stiffen the bridge there are corner braces which are made up of two 3-in. x 2½-in. x ¼-in. angles. The distance from the rail to the top of the truss is approximately 25 ft. The construction was designed for a wind pressure of 8 lbs. per square foot on the trolley and messenger cables covered with ½ in. ice, a somewhat lower ice load being assumed on the high tension cables. The structure is computed as a braced portal, the unit strains under the assumed wind and ice load being 22,500 lbs. per square inch reduced for compression members.

HIGH TENSION LINE.

Directly over the corner of each A frame is a smaller A frame made of two 5-in., 6½-lb. channels, which support the wooden crossarms and insulator for the 22,000-volt, high-tension line. The tops of the channels are bolted together over a casting in two pieces, which holds the pin for the top insulator.

The high tension line is of No. 2 hard drawn copper, carried on Ohio Brass, two-piece, triple-petticoat porcelain insulators calculated to withstand 33,000 volts. The diam-

eter of these insulators is 6½ ins. and the height is 3 13/16 ins. The wires are supported 60 ins. from each other. From Long Branch to the power house, a distance of 2½ miles, the high tension line is carried on the tops of the same poles that support the trolley span wires. On the standard 300-ft. spans these wires were strung with a deflection of 40 ins. at about 20 degs. F. and have a net clearance of about 24 ft. above the track.

MESSENGER CABLE

The messenger cable is a 7/16-in. galvanized strand cable furnished by J. A. Roebling's Sons Company. It is strung for a net sag of 6 ft. 6 ins. at 100 degs. F. At 20 degs. F. the sag is about 5 ft. 6 ins. At each bridge the messenger cable is supported over a porcelain insulator cemented to a casting which serves for the insulator pin and rests on and is bolted to the top chord of the bridge truss.

The dead ending of this cable was somewhat of a problem. The normal calculated strain on the messenger cable is 2500 lbs. and an equal amount is allowed for the accumulations of sleet and ice. The top chord of the bridges at the ends of the line are reinforced by another channel above the top chord and guy cables are run from the top corners of the bridge to an eyebolt imbedded in a large concrete pier. After experimenting with several types of dead-end supports the present scheme, using four Ohio Brass wheel type insulators, was devised. The mechanical strain is divided between two insulators in parallel, while the electrical strain is taken care of by two insulators in series. This strain is about 2700 to 2800 lbs. at 40 degs. F., and that in the trolley wire is about the same.

As the trolley may at some time be operated at 6600 volts single-phase, all the insulation of catenary, steady strains, etc., was designed to withstand this voltage. At present, however, the line is being operated at 600 volts d. c. As regards the lateral stiffness of the single catenary with supports 300 ft. apart, it may be noted that the line has been in operation about ten days and so far very little deflection or rolling can be observed under the action of the wheel trolley with a tension of about 25 lbs. During this time there have been temperature changes of 50 degs. and wind velocities of 45 miles per hour. These conditions seemed to make no difference in operation even before the steady strains were installed.

TROLLEY WIRE AND HANGERS

The trolley wire, which is No. 0000 copper, is supported 18 ft. above the rail. This makes the distance from the messenger, where it passes over the bridges, to the trolley wire 84 ins. On all spans the hanger rods are spaced every 10 ft., the first hanger being 5 ft. from the bridge. These rods vary in length from 77½ ins., the longest, to 4½ ins., the shortest, there being thirty to each span. On the spans other than standard, some of the rods are of necessity longer.

The hanger rods consist of a ⅝-in. galvanized steel rod threaded on each end. The lower part is provided with a malleable galvanized Form 1 Detroit clamp 4 ins. long and of the three-screw type. At the upper end of the hanger is a double hook clip which is placed over the messenger wire. As the hanger rod is screwed into the clip the upper end of the rod is forced up against the wire, securely clamping the clip in place. No wrench is required for this purpose, as the trolley clamp gives sufficient purchase to turn up the rod. These rods and clamps were furnished by the Ohio Brass Company.

It will be seen from these lengths that, in order to have the trolley wire level, there must be a deflection of approximately 80 ins. in the messenger cable. Since this wire was put up this winter it was decided to draw the messenger cable up so as to crown the trolley wire in the middle of the spans. On one day when this was measured it was found that the trolley wire was about 12 ins. farther above the rail at the center of the spans than at the support. It will be interesting to note the effect of summer temperature on this deflection.

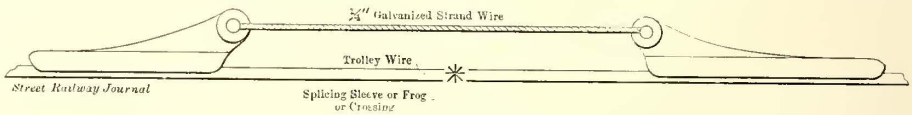
At each bridge the trolley wire is guyed to the bridge by a 5/16-in. cable attached at the bridge end to a special forging which fits over the channels, forming the legs of the A frames at the height of the trolley wire. The guy wire is attached to the trolley wire by a Form 4 Detroit clamp. A wheel type insulator is used between the two trolley wires and between each wire and the bridge, making three in each cross guy wire.

EXTENSION

After placing the order for the material for the trolley wire hangers, it was decided to double track the line 1600 ft. farther than was at first intended. In order to string trolley over this length of track every second hanger was left out for five spans, thus giving ten spans with hangers spaced 20 ft., the standard spacing being 10 ft. Besides providing trolley wire over all of the track this also permits investigating the advantages or disadvantages of hangers 20 ft. apart over hangers 10 ft. apart.

PROTECTION AT SPLICING SLEEVES OR FROGS

L. M. Levinson, manager of the Shreveport Traction Company, of Shreveport, La., has adopted the protective plan for his overhead construction illustrated in the accompanying sketch. Wherever an overhead frog, crossing or splicing sleeve is put on new or broken trolley wire the sleeve, frog or crossing is reinforced by two half-strain



SAFETY DEVICE FOR SPLICING SLEEVE

cars, which are placed about 28 ins. from center to center of eye-holes. They are then coupled with a ¼-in. strand wire. This practice has been in use for some six months and on at least four occasions has avoided temporary tie-ups of traffic. At an overhead frog two sets of ears are used, one for the main line trolley and the other for the branch-off. The idea was original with Mr. Levinson.

Vice-Consul-General Robert B. Jones, of Guayaquil, reports on the street car systems of that city as follows:

The board of directors of the Guayaquil Tramway Company, a mule car line, announces that on Jan. 1, 1908, its capital stock will be increased from $250,000 to $375,000 United States currency. Up to the present time this company has had a monopoly of the street-car business of this city, and for some years past has paid to its stockholders about 20 per cent annually in dividends. The increase in the capital stock will be effected by calling in and canceling the present certificates of stock and issuing new certificates to the holders thereof, who will receive three shares of the new stock for each two shares of the old. Work on the new electric street-car line has been resumed. It is expected that a portion of it will be in operation early in 1908.

ANOTHER BOSTON NEWSPAPER ADVERTISEMENT

In its campaign of education through newspaper paid advertisements the Boston Elevated Railway has recently had the following inserted once in each of the Boston daily papers:

Boston Elevated Railway Company

To Parents and Others Having the Care or Custody of Children

Safety of operation is the paramount aim of the management of this company in its efforts to make the service on its system satisfactory. A large portion of the accidents that occur, especially those to children, are due to causes—such as jumping on cars to "catch" a ride, running in front of cars, putting things on the rail and the like—causes which the company and its employes cannot control.

At best, every moving vehicle, whether carriage, wagon, automobile, or street car, is a source of possible injury to careless users of the highway. Moreover, streets in which the traffic is considerable or where rapidly moving vehicles are habitually run, are not safe playgrounds for children who, while engrossed in play, often run suddenly and unexpectedly into or directly in front of cars and teams and are injured or killed in spite of every effort that can be made to save them.

Parents and others concerned should require their children not only not to "catch" rides, etc., but to avoid roadways in which there is evident danger from passing street cars.

The Company is unsparing in its expenditures and unceasing in its efforts to promote the safety of its patrons and of others using the streets where its cars are run, but it cannot control the action of children and of other persons using these streets. This can be done only by individuals. The Company points out the danger and appeals to the public for co-operation in protecting the lives and persons of those whose tender years and lack of judgment render them but partly capable of caring for themselves.

Boston Elevated Railway Company

PROPOSED REARRANGEMENT OF SUBWAY TRACKS AT NINTY-SIXTH STREET, NEW YORK.

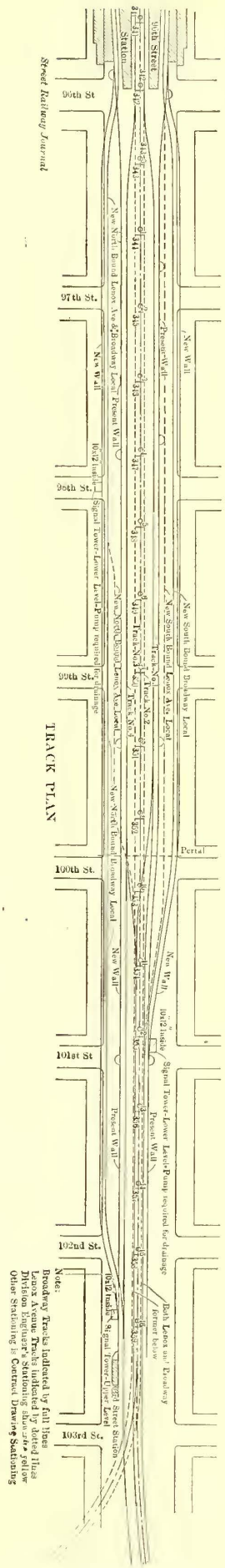
In the operation of the Interborough Rapid Transit Company's subway at Ninety-Sixth Street, New York, much difficulty has been experienced on account of the conflict of Lenox Avenue local trains with express trains of the Broadway division running from points north of this station, which is the junction point of the two divisions. Plans have now been prepared by the Rapid Transit Subway Construction Company and approved by the Public Service Commission for the rearrangement of tracks at this point. If this work is carried out the effect should be to improve the service materially.

The present location and a suggested rearrangement are shown upon the accompanying plan. Under the existing arrangement Lenox Avenue locals during rush hours are a constant hindrance to and a menace to the safety of Broadway trains which run express from points farther north, and during hours of heavy traffic much of the benefit of the express service is neutralized by the necessity of waiting for Lenox Avenue locals to afford a clear track. The present proposition is to construct two new tracks on each side of the existing tracks, those on the west being one each for Broadway and Lenox southbound locals and those on the east to be similarly devoted to the service of northbound locals of the two divisions. The Broadway local tracks will be in each instance outside of the Lenox local tracks. Space will be afforded by the construction of retaining walls on each side substantially underneath the curb. Broadway at this point is 60 feet wide and the distance between curb lines is 40 ft. Grades will also be changed so that at One Hundredth Street there will be a sufficient difference in levels of the tracks of the two divisions to enable the Lenox Avenue trains to pass underneath the Broadway lines, thus avoiding the present cause of interference, while the northbound Broadway local track will be carried independently as far as One Hundred and Second Street, returning to the existing track at a point such as to enable its trains to serve the local station at One Hundred and Third Street. At Ninety-Sixth Street the tracks of the two divisions come to a common level and the changes in grade will be confined to the Broadway tracks.

The expense of the whole improvement is estimated at $850,000. Its expenditure has been approved and the only matter remaining to be determined upon is that of details.

Dispatches from London state that in connection with the readjustment of the affairs of the Underground Electric Railway Company an advisory committee has been formed there consisting of Edwin Waterhouse, J. Spencer Phillips, chairman of Lloyds Bank, Marlborough Pryor, chairman of the Sun Life Insurance Company, Thomas Skinner, a director of the Canadian Pacific and of the Bank of Montreal, and John Akroyd, member of Parliament. The purpose of this committee is to act in conjunction with the board of directors, Speyer Bros., and Speyer & Company in working out a plan for dealing with the 5 per cent notes of the company, which mature July 1, and for meeting the other financial requirements.

Representatives of the municipality of Tokio and the company working the electric tramways of that city have come to an agreement regarding the municipalization of the enterprise. The amount of municipal bonds which will be issued at the end of March in effecting the transfer is approximately $38,750,000, subject to the consent of the municipal assembly and the shareholders of the company.



SUGGESTED PLAN OF SUBWAY TRACKS, 96TH STREET, NEW YORK

ELECTRIC CAR-TESTING PLANT AT WORCESTER POLYTECHNIC INSTITUTE

Worcester Polytechnic Institute, the first college in the country to establish a chair of electric railway engineering, was particularly fortunate in that this course was started early enough that space and equipment might be provided for it in its new electrical engineering laboratory. This laboratory has recently been completed, and brief mention of its electric railway equipment has been made in these columns. It comprises various electric railway motors, controlling, air brake and signaling systems, in addition to an electric car for experiments and tests and an electric car testing plant. The following description of the car testing plant has been given by Albert S. Richey, Professor of Electric Railway Engineering at the Institute, who is responsible for its design.

The plant, which is shown by the accompanying illustrations, is located in the west end of the main electrical engineering laboratory, and is connected by tracks and trolley with the Salisbury Street line of the Worcester Consolidated Street Railway Company. Primarily the plant is modeled after the locomotive testing plants at Lafayette, Ind., owned by Purdue University, and at Altoona, Pa., owned by the Pennsylvania Railroad Company. Fig. 1 shows the general scheme of holding the car under test over a set of supporting wheels which correspond to the track. These supporting wheels bear the weight of the car and turn with the car wheels, the car body being coupled to a rigid end post as shown. In a word, the car under test is placed on a "tread-mill." Wind resistance, linear inertia, etc., are provided in an effective manner by means of fly wheels and electric brakes, as will be described.

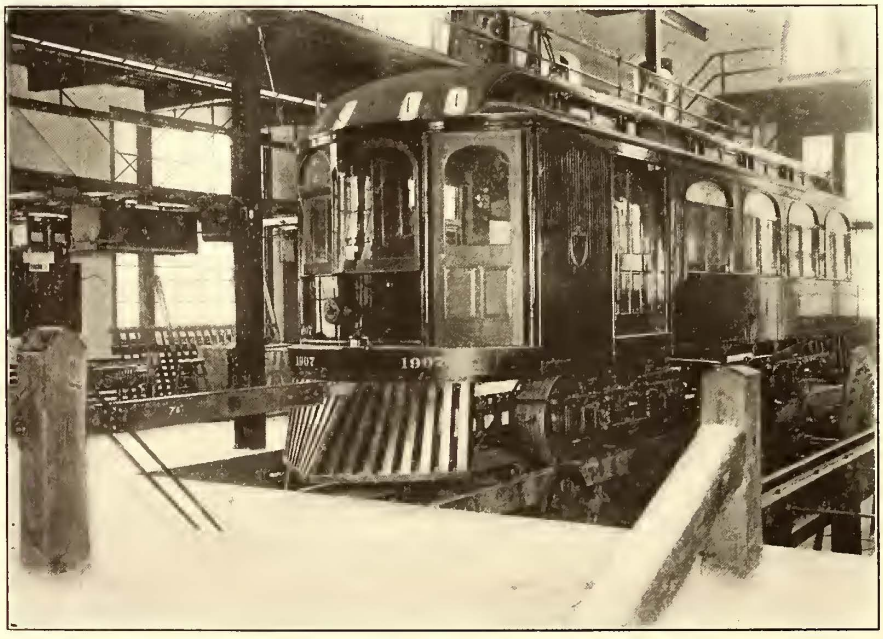


FIG. 1.—CAR IN PLACE ON TESTING PLANT

Fig. 2 shows the bare car testing plant. Four sets of stands are provided, each one carrying a pair of bearings and a supporting shaft. These four stands rest on and are bolted to parallel heavy I-beams which are embedded in the concrete foundation. Each of the shafts carries a pair of steel-tired supporting wheels. The bearing surfaces of the supporting wheels are turned to the same section as the head of a 100-lb. A. S. C. E. rail, and each pair of wheels is spaced on the shaft just track gage distance apart. The stands, with shafts and supporting wheels, may be shifted on the foundation I-beams to provide for cars of various truck and wheel base, a final fine adjustment being provided by a movement of the bearing pedestals on the stands by shifting screws, as shown. Thus far the arrangement is patterned directly after the locomotive test-

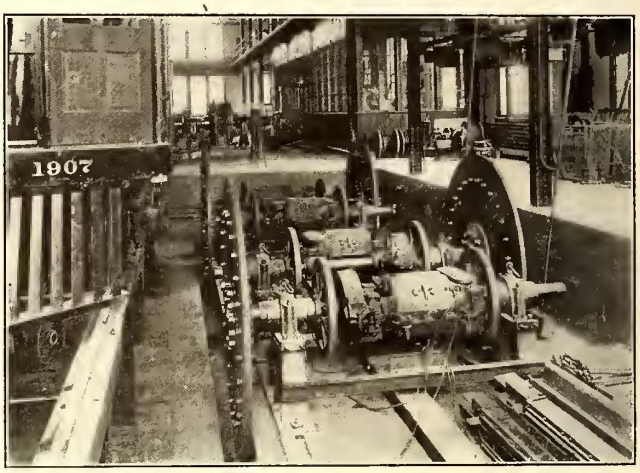


FIG. 2.—ELECTRIC CAR TESTING PLANT

ing plants which have been mentioned. The arrangements for imitation of inertia, wind resistance, etc., are entirely different, however.

No arrangement has been used with the locomotive testing plants for the imitation of inertia, as it would be exceedingly difficult to imitate safely the inertia of the entire mass of the moving train for the movement of which the locomotive is designed. As the motors on a single electric car, however, are generally designed to handle but the one car, flywheels may be designed which will correctly imitate such inertia, and this has been done in the present case. Each of the supporting shafts carries a flywheel, as is shown in the illustrations. These flywheels are made up of boiler plate in order to provide strength against the high values of centrifugal force at high speeds, and also in order to provide an easy method of changing flywheel weights to suit cars of different weights. Individual interchangeable boiler plate discs, varying in thickness from ¼ in. to ¾ in., are provided, spare discs being seen in Fig. 3. By making up flywheels of different thicknesses, it is possible to imitate correctly the linear inertia of single-truck cars weighing 8, 10, 12 or 15 tons, or double-truck cars weighing 15, 20, 25, 30, 35 or 40 tons. The flywheels enable braking tests to be made, as well as motor tests.

The form of friction brake which has been used in connection with locomotive testing plants has here been replaced by electric brakes, consisting of standard G. E. 57 motors mounted on and geared to the shafts between the supporting wheels. These motors act as generators, the fields of all four being in series and separately excited.

Their armatures, however, are connected in parallel to a resistance load. While this resistance load is variable, it is only varied to care for extreme changes which may be desired, as a better regulation is obtained, within limits, by varying the field of the exciting generator, this varying in turn the fields of the brake generators and their voltage. It may easily be seen that power to overcome wind resistance and resistance due to track grades may be taken up by the braking effect of these generators, at the same time being entirely separate from the power used to overcome inertia, which is correctly stored in the flywheels as kinetic energy as momentum is acquired, to be dissipated in friction as the car slows down either through drifting or braking. At the same time, the entire tractive effort is shown by the pull on the drawbar of the car under test.

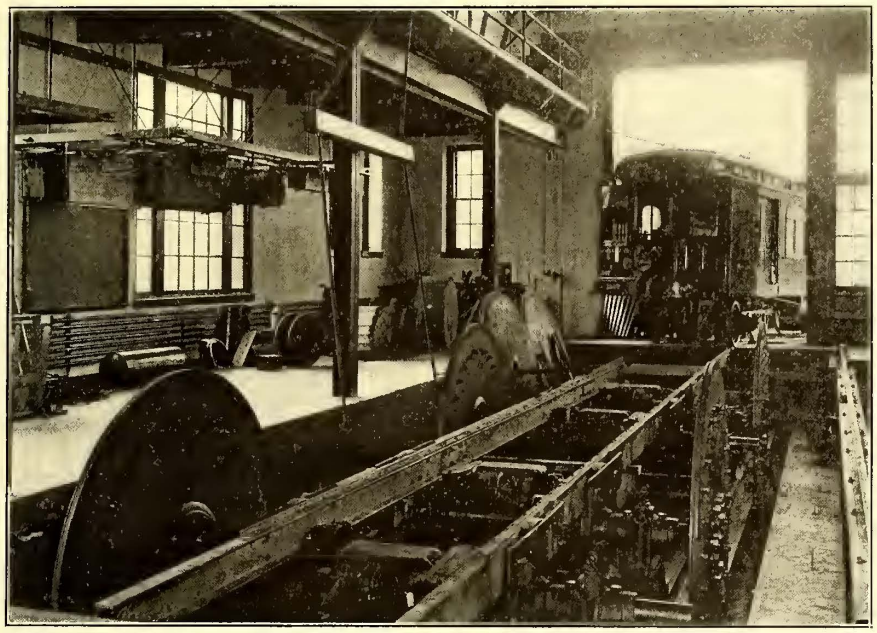


FIG. 3.—TESTING PLANT WITH TEMPORARY RAILS IN POSITION FOR RECEPTION OF CAR

The arrangement of brake generators above described performs another important function, that of keeping all supporting shafts rotating at similar speeds at all times. The electric car is not commonly provided with connecting rods between drivers, consequently some corresponding device must be used between the supporting wheels, else the various car wheels would be running at various speeds on test; especially would this be true while the car motors were in a series connection. The series connection of brake generator fields, separately excited, and the parallel connection of brake generator armatures, whether on or off the resistance load, solved the problem quite satisfactorily. Various schemes for bevel gear, connecting rod, belting or rope drive connection between the supporting axles were proposed and discarded, chiefly because of difficulties in shifting stands to accommodate various wheel bases.

The arrangement for shifting cars on and off the test stand is shown by Fig. 3. Channel iron supports for special rails are temporarily bolted to the inside of the supporting wheels and to the ends of the track rails at the door of the laboratory. These channels are supported by wedges which fit the hubs of the supporting wheels, and are also blocked up between stands for additional strength. These channels support special rails which carry the car on its flanges until the car wheels are over the supporting wheels, where the tread of the car wheel rests on top of the supporting wheel, the stands having been correctly spaced for the wheel base of the car and the height and position of the special rail having been adjusted to suit the flange section of the car wheel previously. Arriving at the proper position, the car is held rigidly in place by a coupling to an end post, as shown in Fig. 1. The channel irons are then unbolted from the supporting wheels, and the supporting wedges removed, allowing the full weight of the car to be borne by the supporting wheels. An arrangement is provided for supporting the channels independently and clear of the supporting wheels while a test is in progress, a quick shift bringing them back into position for carrying the car off the stand upon the completion of a test.

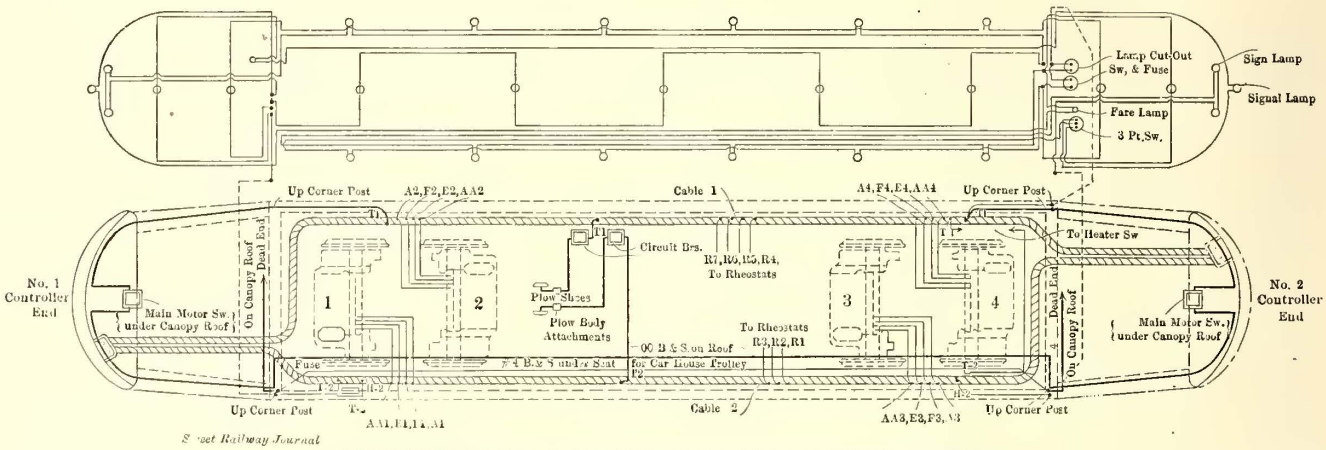
The draw bar and post arrangement for holding the car in position will be replaced, eventually, by a traction dynamometer for measuring the tractive effort of the car under test.

A number of experimental trial runs have been made on this test plant with uniformly satisfactory results. It is expected that the plant will be not only an invaluable aid in instruction, but commercially practical in testing various car equipments which may be brought into the laboratory over the connecting track with the local street and interurban railway system. Testing of car equipments may be made under ideal conditions, lacking only the cooling effect of the moving car, which probably may be imitated by an artificial circulation of air. If desired, absolutely the same conditions may be obtained time after time, either with the same car or with different cars between which comparisons are to be drawn, and these conditions may be varied at will. A series of runs, for instance, may be made under level track conditions, then repeated under conditions of various up or down grades, simply by changing the resistance load on the brake generators. Such a variety of tests, of course, is not possible on any stretch of test track, and the desired conditions would at times not otherwise be found except on the piece of track where the car is to go into actual service, where traffic conditions might seriously interfere with the particular tests desired.

The photographs show, incidentally, the car for experiments and tests, which is also a part of the equipment of this laboratory. The car is 40 ft. in length over bumpers, and is equipped with Baldwin M. C. B. type trucks, air brakes, G. E. 80 motors and K-28 control. It is being equipped with a very complete set of recording instruments for tests of various descriptions. While this car is in position on the test stand, as shown by Fig. 1, it may be operated either from its own K-28 control, from a General Electric, Type M, automatic control, or from a Westinghouse electro-pneumatic control. The two latter-named control systems are installed at the side of the testing plant, outside the car, but may be connected to the car motors by means of cables provided for the purpose, connecting to a slate terminal board inside the car to which are brought leads from all motor terminals. The apparatus used with these systems of control is shown on the frame at the left in the engraving.

EQUIPPING NEW YORK'S PAY-AS-YOU-ENTER CARS

The motive power equipment of the 155 pay-as-you-enter cars which the New York City Railway Company is to use on its Madison Avenue line has now been installed, and daily trial runs are being made in the vicinity of the Kingsbridge car house, where this rolling stock was equipped. The car wiring represents the latest practice of this company and practically every bit of wiring is fire and moisture proof.

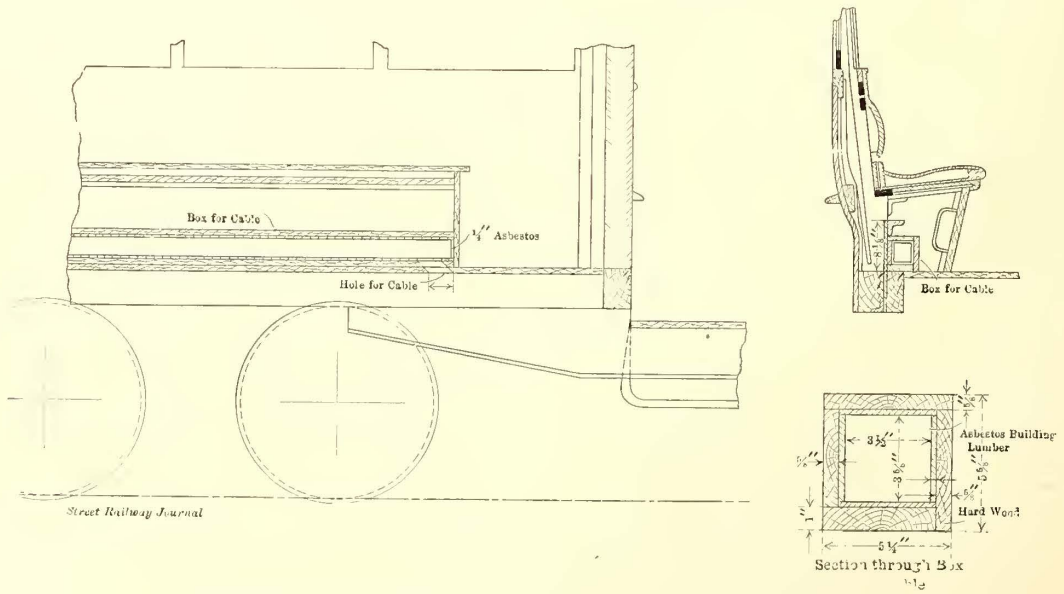


MAIN WIRING PLAN OF NEW YORK PAY-AS-YOU-ENTER CAR

The cables to the controllers are covered with double asbestos, which in turn is wrapped in another fireproof covering. All of the motor leads, trolley leads, plow leads and heater circuits are carried in loricated conduit. The trolley wires from the cables are carried in 1-in. conduit, while ¾-in. conduit is used for the resistance and motor lead wires. The wires, before being pulled through the conduit were smeared with a clay compound which has been found better than grease or soapstone, and does not injure the insulation. Standard bell mouths were used underneath the cars throughout.

Each cable is laid in a transite lined box inside the car, placed as shown in the sectional illustration, and from this box the cable is brought underneath the platform to the controller. The second cable, which the plan shows crossing the car to get to the controller side, is brought above the knee timbers in a groove covered by an iron plate with a rubber gasket to prevent the entrance of water. T. & B. bushings are used inside the car where the wires coming from the cable box enter the conduit. The cables were so stiff owing to the size and number of wires in them that it was necessary to use a jack to get them in place for cleating under the platform. The exposed portion of each cable between the resistance and the transite lined box mentioned is protected from wheel wash by suitable guards, and there is also a splash board which goes clear up to the floor to prevent water from getting into the resistances.

Among the interesting features of the wiring circuits novel in this company's practice are the wiring for colored destination lamps, a platform farebox light and bell circuit for passengers' push buttons. The light wiring is asbestos covered and was installed by the J. G. Brill Company, but the sockets were put in by the power wiring contractor. The following wire gages were used for the main circuits: No. 00 for the trolley, No. 4 for the motor leads and No. 2 for the resistance wire. The size of resistance wire mentioned is believed to be the largest which has ever gone into a surface car controller.



DETAILS OF FIREPROOF BOX FOR CABLES TO THE CONTROLLERS

Owing to the fact that the Kingsbridge structure possesses no shop facilities, devices for doing the work had to be made of materials on the spot. The pipe for the car wiring was cut with the aid of an air motor which had once seen service on the old Third Avenue system. The saw attached to this motor consisted merely of a sheet iron disc,

⅛-in. thick, sandwiched by two ½-in. cast steel plates. The combination was mounted on a wooden frame furnished with a movable block, the inner side of which had a groove to allow the pipe to be pressed against the saw by pushing the block. This simple contrivance enabled one man to do three times as much as with an ordinary pipe cutter, and the pipe was cut so clean that no grinding was required before the hand reaming and the threading. The bending was done by hand with circular bending blocks mounted on an old flat car to avoid injuring the cement floor.

The mounting of the motors was unusually difficult because of the absence of pits. The motors were brought in on a two-wheel U-axle cart which was furnished with a long pole. The back end of this pole had a hook for lifting the motors from the floor, and then three men raised the front end to draw the motors to the installation track.

The rigging for mounting the GE-80 overhung motors consisted of a 10-in. I-beam about 20 ft. long, suspended from the roof beams at right angles to the mounting track. This I-beam carried a hand-operated chain hoist with which the motor was picked up and swung over the axles. The commutator side axle cap then was fastened temporarily and the top gear case put on. After this the motor was turned half way over and the bottom gear case and the pinion side axle cap put on. Following this all bolts were tightened and then the motor was turned into place and the truck suspension bolts secured. The suspension bars were fastened to the motors before the latter were mounted. The best record made with this outfit was the mounting of 25 motors by three men in 9 hours and 45 minutes.

To avoid pushing trucks about by hand one of the motor trucks was equipped with a controller and by means of this and resistances placed on a switching table the truck could be used for pushing or pulling four to five trucks at one time to any desired point.

The mounting of the motors and the installation of the main circuits was carried out under contract with I. R. Nelson & Company, of Newark, N. J., who devised the special contrivances for this installation. The work, which also included changing over the leads of 200 motors for the General Electric Company, was in charge of a force of 30 to 60 men under H. C. Prather. Everything done was subject to the final approval of electrical inspectors of the New York City Railway Company. The contract was carried out in remarkably fast time, despite the lack of good light and shop facilities. The award for the work was made on Nov. 4, 1907, and the first material to complete a car did not arrive until Dec. 2, despite which the entire 155 cars were ready on Jan. 20, 1908. During the last two weeks five cars were completed daily.

Nelson & Company have also received a supplementary contract from the New York City Railway Company covering the installation of the Parmenter fenders to be used on these cars. The fenders are now being attached at the rate of twenty a day.

SHELTER DESIGNS OF THE NEW ORLEANS RAILWAY & LIGHT COMPANY

The New Orleans Railway & Light Company has recently designed several shelters for the use of its passengers at points on the system where the weather conditions or the headway maintained render it desirable to avoid waits for cars under exposure to the sun or rain. The company believes that there is a large field for the construction of ornamental shelters in street railway work at moderate cost. There is no question about the wisdom of such a policy in its influence upon public sentiment, and from the architectural side there is no reason why a shelter should not be pleasing instead of unattractive in appearance.

Fig. 1 illustrates a shelter which has been erected at the corner of St. Charles and Jackson Avenues at a cost of about $100. The shelter consists of a corrugated iron roof 20 ft. long and 5 ft. wide supported on four shortened trolley poles 5 ins. in diameter at the bottom and 6 ins. in

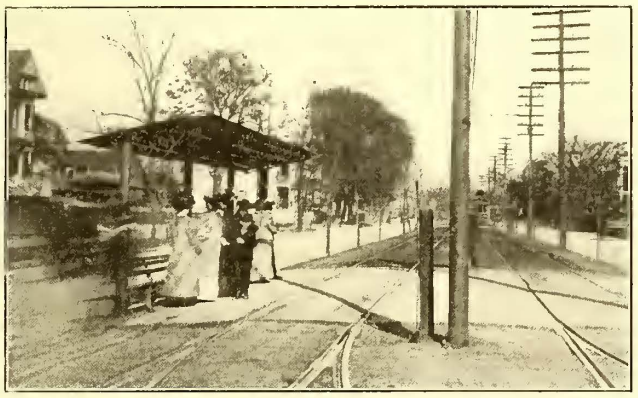


FIG. 1.—SHELTER AT ST. CHARLES AND JACKSON AVENUES

diameter through their upper halves. The roof is built on an angle iron framing of rafters and purlins, and is installed to give about 6 ins. overlap above top of the car stopping on the nearest track, so that alighting passengers are completely covered from the elements. A bracing of iron scroll work is provided at the top of each post. A concrete platform connects the tracks at this transfer point. The low cost of this shelter, which had to be designed for an extremely limited space between the north bound rails and the north side of St. Charles Avenue, was largely due

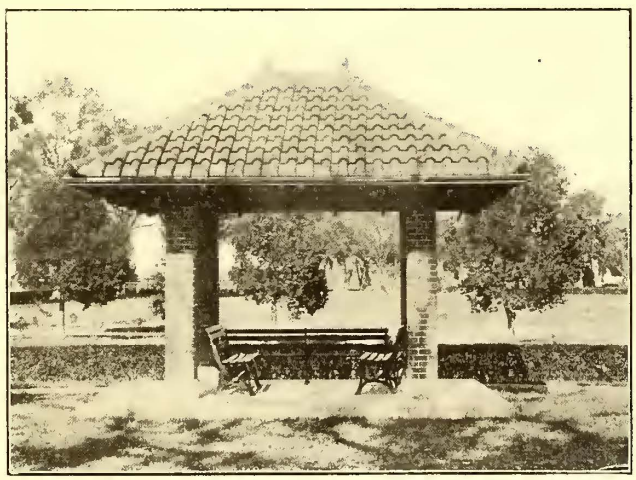


FIG. 2.—SHELTER ON METAIRIE ROAD

to the facts that the concrete platform was already in place and that the steel posts were second hand.

Fig. 2 shows another and more ornamental type of shelter located on Metairie Road, New Orleans, where space is sufficient to allow the shelter to stand back a few feet away from the track on a small piece of lawn. Three seats are provided here instead of one as in Fig. 1, on account of the longer headway between cars. The Metairie shelter cost about $250 and it consists of a granolithic platform 12 ft. long and 10 ft. wide set about 5 ins. into the earth and carried 6 ins. above ground. Four pressed brick columns with rounded corners carry the roof, which is of red Spanish

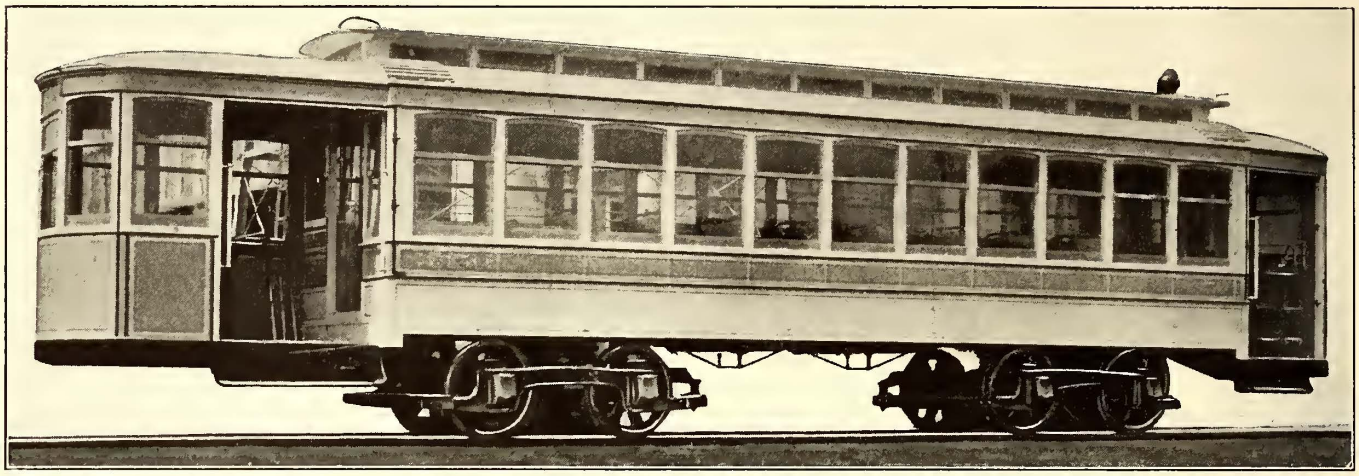
tile supported on open pine rafters with dressed sheathing. Each column is 12 ins. square and the roof is carried 10 ft. above the platform level. Marble caps and bases are provided for all four columns, the columns being 7 ft. apart on centers. The company has erected three of these shelters so far, and can easily put one up in five or six days. No enclosure is required in the mild climate of New Orleans.

The shelter shown in Fig. 2 is now the company's standard for conditions where the space is not so restricted as to require special construction. The designs were prepared by A. L. Black, engineer of the company.

SEMI-CONVERTIBLE CARS FOR CLEVELAND

The St. Louis Car Company recently delivered to the Forest City Railway, of Cleveland, Ohio, fifty semi-convertible cars having an unusual design of platforms and underframing. The cars are only 30 ft. 6 ins. long over body corner posts, but are 44 ft. 10 ins. long over all, the front and rear platforms being of exceptional length. The front platform is partitioned off to form a completely enclosed motorman's cab on the left side with an entrance for passengers through the front door next to the right-hand side of the car. This door is 31½ ins. wide and the front step is 47 ins. long, making the forward entrance quite easy of ingress or egress.

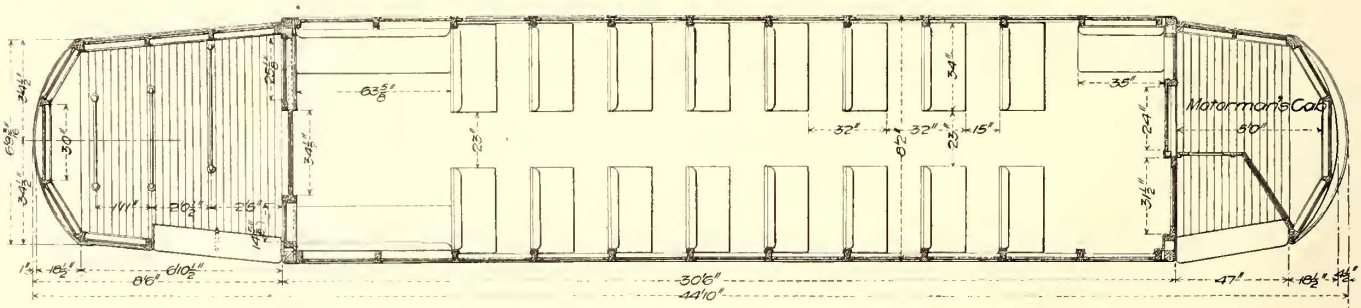
The rear platform is 8 ft. 6 ins. long with an entrance for passengers 4 ft. 5½ ins. wide on the right hand side. The remainder of the vestibule is enclosed in glass. The rear entrance to the car is 34½ ins. wide and is placed



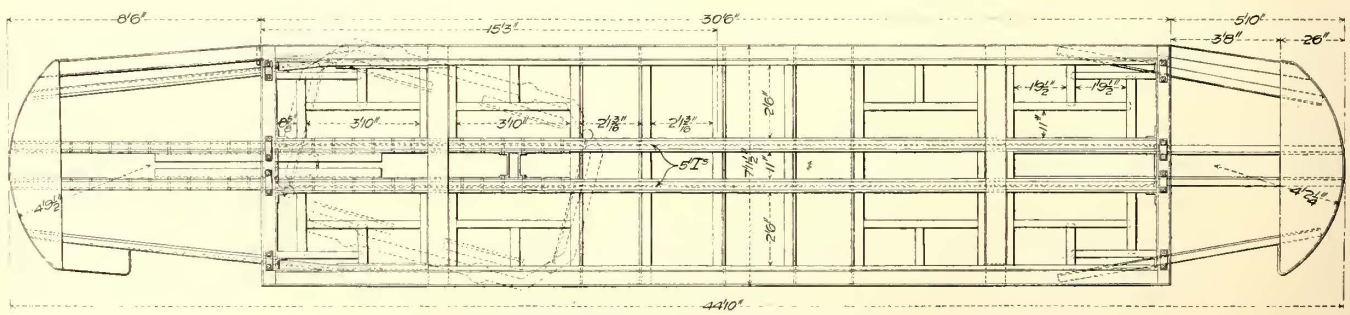
EXTERIOR LONG BACK-PLATFORM, SEMI-CONVERTIBLE CAR FOR CLEVELAND

5 ins. off center toward the platform step on the right hand side. Three wrought iron pipe railings divide the rear platform.

Because of the long platforms an extra strong composite steel and wood underframe is used in these cars. The center sills, which extend only to the end sills, consist of two 5-in., 14¾-lb. I-beams, spaced 16 ins. center to center of webs and filled with 2¼-in. x 5-in. wood fillers. A ½-in. x 18-in. steel plate sandwiched between an outside



FLOOR PLAN OF CLEVELAND CAR

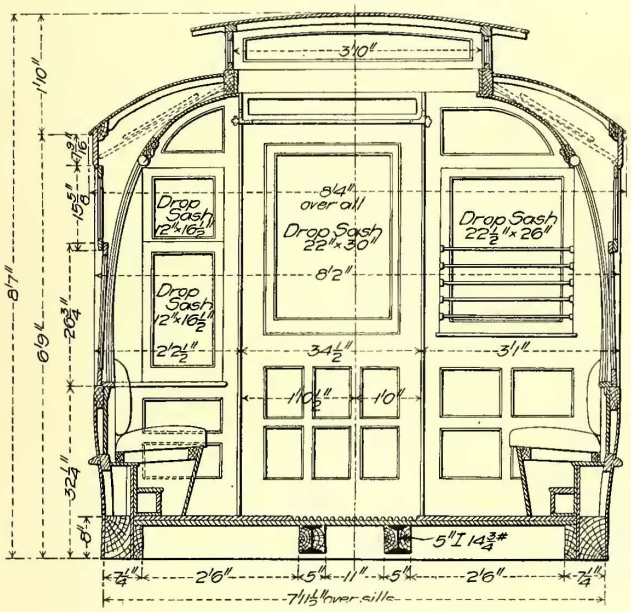


UNDERFRAMING OF CLEVELAND CAR

timber 5 ins. x 8 ins. and an inside timber 1¾ ins. x 8 ins. forms the side sill. This deep plate extends up in the side of the car behind the side panels. For body end sills 5¼-in. x 12¼-in. oak timbers plated inside and out with ⅜-in. x 8-in. steel plates are used.

The front and rear platform floors are 11⅜ ins. lower than the body floor, being 30⅛ ins. high from top of rail.

Because of this drop and the extreme length of the rear platform the method of framing adopted is interesting. The rear platform side sills are 7-in., 14¼-lb. channels carried back to the body bolster and bolted against the heavy sandwich plate in the body side sills. They are bent to give the required drop and at the bends are reinforced with 5-in. x ¾-in. plates. The center sills are built up of two 5-in. x 3½-in. x ½-in. angles arranged in the form



END ELEVATION, CLEVELAND CAR

of a Z-bar and reinforced with a 5-in. x ⅞-in. plate. A 3-in. x 5-in. oak filler is put in to square up the section. These center sills are carried forward 3 ft. 10 ins. beyond the bolster. Additional strength is provided by an auxiliary knee of ½-in. x 7-in. x ¾-in. x 6-in. steel plates built in closed wall of the vestibule on the left hand side. The front platform side sills are 6-in. x 3½-in. x ½-in. angles with 3-in. x 7-in. wool fillers. The center sills are 5-in. x ½-in. steel plates, to which are bolted 2¾-in. x 6-in. oak sills; they extend back to the body bolster.

The sides of the car are slightly convex and concave below the windows. Both the upper and lower sash are arranged to lift into pockets under the roof, thus giving a maximum width inside the car. The car body is 8 ft. 4 ins. wide over all and 7 ft. 7 ins. wide between inside linings.

There are eight stationary transverse seats 34 ins. long on each side of the aisle which is 23 ins. wide. There are also two longitudinal seats 63⅜ ins. long at the rear end and one longitudinal seat 35 ins. on the left hand side at the forward end. The cars are equipped with St. Louis Car Company's vertical geared hand brakes on the front platform, Pantasote curtains with Forsythe fixtures and automatic couplers. They are mounted on St. Louis Car Company's No. 47 short wheel base trucks.

SIMPLIFYING THE ORDERING OF PARTS IN BROOKLYN

The mechanical department of the Brooklyn Rapid Transit System is working out a method of style numbers and letters which will greatly simplify the work of ordering and stocking parts of car equipment. As there are fully twelve surface and four elevated shops on the Brooklyn system, a lack of a uniform specification for ordering material is sure to cause more than an ordinary amount of confusion to the purchasing department. The records will consist of a set of loose leaf sheets about 18 ins. x 18 ins. in size, one or more sheets being devoted to detailing the proper number, symbol, description and pattern of any given truck, controller, motor, etc. The form reproduced shows, for example, some castings of the No. 0-45 surface maximum traction truck. The letter "T" has been placed opposite the word "Class" to indicate a truck record; "M" will indicate motors, and in general the same scheme will be followed for other equipment. Abbreviations also are given at the bottoms of the sheet for cast iron, brass and the like. Where the same part is used on some other equipment there is no change in the order symbol, thus eliminating the practice of keeping like castings of different equipment in separate stock bins and under other style numbers. Items carried on hand regularly will be marked to distinguish them from special castings. Should any part be permanently discarded the main office will send out notices to that effect. These sheets will be multigraphed and sent to every foreman and storekeeper on the system. That part of the record headed "Remarks" is left blank for any notations desired by those using the blank.

LIST OF PARTS

FOR 0-45 SURFACE M.T. TRUCK CASTINGS — SHEET NO. 1 — CLASS T LIST NO. 50

NUMBER OF EQUIPMENTS OWNED, (200) Nov. 9, 1907

	Pieces One Equipt.	Symbol	Description	R.R. Co.'s Nos. Plan	R.R. Co.'s Nos. Pattern	Material	Weight	Stock to be Carried	Remarks		
1			—Castings—								
2	1	M-1020	Bolster Centre Filler	5309	7403	M					
3	2	M-1187	" Filler	5279	7404	M					
4	2	M-1179	" Spring Cap	5309	7562	M					
5	2	S-1160	" " Seat	5315	7571	S					
6	2	S-1222	Brake Beam Bracket (driver)	5279	7401	S					
7	2	S-1189	" " (pony)	"	7406	S					
8	4	S-1182	" " Fulcrum	"	7402	S					
9	4	S-1183	" Hanger Bracket	5309	7561	S					
10	2	M-1178	" Head	5281	7487	M					
11	1	C-1174R	" Shoe, 20", R.H.	5282	7486	C					
12	1	C-1174L	" " " L.H.	"	7485	C					
13	2	C-1173	" " 33"	2208	6350	C					
14	1	.....	Car Body Side Bearing, R.H.	5191	7041	S					
15	1	.....	" " " L.H.	"	7042	S					

MATERIAL:—C—Cast Iron, M—Malleable Iron, B—Brass, BZ—Bronze, S—Steel.

PORTION OF HISTORY OF TRUCK PARTS—RECORD KEPT BY THE BROOKLYN RAPID TRANSIT COMPANY

Mayor Bookwalter, of Indianapolis, Ind., has given out a statement that the increase in population of Indianapolis during the past few years is due more to the building of interurban roads with the city as the center than to any other cause.

CONSUMPTION OF POLES IN 1906

The Forest Service of the United States Department of Agriculture has recently compiled some statistics upon the consumption of poles during 1906. The Bureau of the Census has co-operated with the Forest Service in this work. The statistics are based upon the poles purchased, and information was obtained from more than 6000 companies operating telegraph and telephone lines, electric light and power systems, street railway lines and railroad companies which operate their own telegraph or telephone lines. The number of poles purchased during the year, as shown by these statistics, was 3,574,666, valued at $9,471,171 at the point of purchase. These figures do not include poles less than 20 ft. long. Shorter poles are used for local lines and for temporary work, but they constitute only a small percentage of the total.

TABLE I.—NUMBER AND VALUE OF POLES PURCHASED IN 1906

Kind	Quantity	Value at point of purchase	Average value per pole
	Number	*Dollars*	*Dollars*
Cedar	2,174,279	5,579,891	2.57
Chestnut	988,084	2,625,568	2.66
Pine	177,809	686,803	3.86
Cypress	111,657	256,950	2.30
Juniper	57,064	163,437	2.86
Redwood	24,760	87,189	3.56
Oak	9,924	13,951	1.41
Fir	9,601	21,637	2.25
All other	21,488	35,745	1.68
Total	3,574,666	9,471,171	2.65

WOODS USED

Table 1 shows, by kinds of woods, the quantity and value of round and sawed poles purchased in 1906. In both classes cedar ranks first and chestnut second. These two together furnish nearly nine-tenths of all the poles used, cedar supplying about three-fifths and chestnut over one-fourth.

In average value per pole at the point of purchase, pine stands highest. This is due not to greater intrinsic value of the wood, but to the greater proportion of large pine poles as compared with other kinds. Oak shows the lowest average value. The average price per pole for all kinds of timber in the United States was $2.65. Round poles brought an average of $2.63 and sawed poles $4.22 each. The higher cost of the sawed product is due chiefly to the additional labor and material necessary in their manufacture.

Cedar and chestnut are the principal trees cut for round poles; pine and redwood the chief ones sawed. Redwood is seldom found small enough to use for round poles. The sapwood of pine decays rapidly; consequently a sawed pine pole from which the sapwood has been removed will last longer than a round one. The average per pole values of the different kinds of wood are interesting in a general way, but cannot be used for exact comparisons because the different sizes of poles are not distinguished.

NUMBER OF POLES USED BY VARIOUS KINDS OF ELECTRICAL COMPANIES

Table II shows the kind, quantity and value of the poles bought by the four principal classes of consumers—telegraph and telephone companies, steam railroad companies, street railway companies and electric light and power companies. The street railways are grouped with the electric light and power companies, because not infrequently one company serves in a double capacity and separation was impossible.

The telegraph and telephone companies purchased about two-thirds of the total number reported and the street railway, light and power companies about one-fourth. The remainder is credited to railroad companies which own and operate their own telegraph or telephone lines.

SUPPLY

The regions of supply of the two principal pole timbers—cedar and chestnut—are fairly well defined and are, unfortunately, extremely limited. The present source of supply of cedar poles in the United States is confined almost entirely to the Lake States. The total purchase of cedar poles reported for the United States in 1906 was 2,174,279. The production of the Northwestern Cedarman's Association, which operates in the Lake States, as shown by the association statistics, was more than 1,700,000. The greater part of the production outside the Lake States can be credited to two sources—Maine and the adjoining States, including the Adirondacks in New York, and the Idaho cedar territory. From these districts cedar poles are shipped to practically every State in the Union.

The regions from which the supply of chestnut poles is drawn are even narrower. A small territory—embracing parts of Pennsylvania, Maryland, Virginia and West Virginia—furnishes nearly all of these poles. Cypress poles necessarily come from the South, probably the greater part from the Gulf States; juniper, from Virginia, the Carolinas and other South Atlantic States. Redwood comes wholly from California.

With the regions of supply so restricted, transportation becomes an important factor. The cost of the pole is sometimes doubled by freight charges. This difficulty is obviated, in a measure, by the use of local woods, cypress and pine in the Southern States, for instance, and chestnut and juniper in the Atlantic States. On the Pacific coast cedar is supplemented to a considerable extent by pine and red-

TABLE II.—POLES PURCHASED BY VARIOUS CLASSES OF CONSUMERS IN 1906

Kind	Total			Telephone and telegraph companies			Steam railroad companies			Street railroads, electric light and power companies		
	Quantity	Value at point of purchase	Average value per pole	Quantity	Value at point of purchase	Average value per pole	Quantity	Value at point of purchase	Average value per pole	Quantity	Value at point of purchase	Average value per pole
	Number	*Dollars*	*Dollars*	*Number*	*Dollars*	*Dollars*	*Number*	*Dollars*	*Dollars*	*Number*	*Dollars*	*Dollars*
Cedar	2,174,279	5,579,891	2.57	1,532,906	3,079,852	2.01	144,359	371,246	2.57	497,014	2,128,793	4.28
Chestnut	988,084	2,625,568	2.66	661,898	1,510,484	2.28	63,151	139,579	2.21	263,035	975,505	3.71
Cypress	111,657	256,950	2.30	21,395	36,559	1.71	11,976	20,271	1.69	78,286	200,120	2.56
Juniper	57,064	163,437	2.86	38,331	91,854	2.40	465	638	1.37	18,268	70,945	3.88
Pine	177,809	686,803	3.86	121,609	478,427	3.93	16,826	22,866	1.36	39,374	185,510	4.71
Oak	9,924	13,951	1.41	2,980	1,500	.50	2,736	2,549	.92	4,208	9,902	2.35
Fir	9,601	21,637	2.25	9	94	10.44	1,284	2,533	1.97	8,308	19,010	2.29
Redwood	24,760	87,189	3.56	7,140	24,390	3.42	9,871	21,920	2.22	7,749	40,879	5.28
All other	21,488	35,745	1.68	9,454	11,789	1.25	3,600	4,225	1.17	8,434	19,731	2.34
Total	3,574,666	9,471,171	2.65	2,395,722	5,234,949	2.19	254,268	585,827	2.30	924,676	3,650,395	3.95

wood. But such local supplies are insufficient, and cedar and pine are found everywhere.

There are no data available which show even approximately the quantity of cedar still standing in this country or Canada to meet the enormous demand of 2,000.000 poles each year. It is certain, however, that when the present supply is exhausted it will be gone forever, since the cedar, though it reproduces fairly well, grows so slowly that other kinds of trees, chestnut for instance, will be more profitable to produce by systematic management.

SUITABILITY OF VARIOUS WOODS

There are several qualities which timber must possess to adapt it to use for poles. The most important of these are: Durability in contact with the soil, minimum weight, straightness coupled with relatively small size and little taper. The wood must be soft, so that the spikes of a climber may enter readily, and at the same time it must have strength to support considerable weight. These qualities are admirably combined in cedar and in juniper, which commercially is a cedar. No other woods possess so many.

Chestnut and cypress are both durable; chestnut is not so straight as cedar and is liable to be knotty. The wood, though soft, is not as soft as cedar. It has greater strength, but this advantage is more than counterbalanced by its greater weight, which prohibits long shipments. Cypress frequently is too large for use as a pole and has greater value for lumber. Even when its general diameter is small enough the butt will often be so big that it adds too much weight. Pine, besides being heavier than cedar, is so much less durable that it cannot compete as a pole wood without preservative treatment. Redwood possesses durability, lightness and softness, but its size necessitates sawing, which adds to the cost.

PRESERVATIVE TREATMENT

One of the results of the increased cost of poles and the difficulty of obtaining a sufficient quantity of satisfactory stock has been an effort to increase the period of service of poles by preservatives, generally by applying a liquid to the whole of the pole or, more generally, to the butt, which is more liable to decay. Poles which have not been treated with preservatives may be expected to give from ten to fifteen years of service, roughly speaking.

Creosote is probably more extensively used than any other preservative, though ordinary paint is a common agent. For the butt tar is often employed, and charring by fire is found useful. The American Telephone & Telegraph Company is carrying on extensive experiments in co-operation with the Forest Service to determine the best methods and materials. Several experimental lines of variously treated poles have been erected and careful records of the behavior of each pole is being kept. By the comparatively new open-tank treatment the preservative is forced into the wood of the butt by a much simpler and more inexpensive method than was formerly used.

Successful preservatives make possible the use for poles of a great number of otherwise unsuitable timbers, many of them among the cheaper and more abundant woods.

The Philadelphia Rapid Transit Company has submitted a proposal to the city in which it agrees to haul away on its cars all street dirt for a period of nine months next year, extending from April 1 to Jan. 1, for $97,750, and covering the district bounded by the Delaware and Schuylkill Rivers, Green and South Streets. This sum is to be paid by street contractors, who will have to consider this proposal in their bids.

STREET RAILWAY CONDITIONS WITH REFERENCE TO RATES OF FARE IN MASSACHUSETTS

As the readers of this paper know, the subject of rates of fare and expenses of street railway operation have attracted a great deal of attention in Massachusetts during the last year. As a result of the increasing cost of operation and the increase in the length of ride given for a single fare, the companies in Massachusetts have been brought face to face with a serious problem and several companies, with the consent of the State Railroad Commission, have already increased their fare, while others are seeking the same rights. P. F. Sullivan, president of the Boston & Northern Street Railway Company and of the Old Colony Street Railway Company, has given special attention to this subject and has collected a number of valuable statistics in regard to the subject, which were presented in the form of a paper at a dinner of the Massachusetts Street Railway Association, at Young's Hotel, Feb. 12. A summary follows:

The report of the Massachusetts Railroad Commission to the Legislature shows, for the year ending Sept. 30, 1907, that 82 street railway companies reported. Of this number 3 companies were under construction, 17 were leased; of the leased companies 4 paid no dividends and 2 show a deficit. Of the 62 operating companies 16 paid dividends of 4 per cent or over, 6 paid dividends of less than 4 per cent, 20 showed some profit and paid no dividends and 20 showed a deficit. They operated 2855 miles of single track; their gross income from operation was $30,552,400, or $10,701 per track mile; their total investment, including premiums on stock and other obligations, was $160,104,000, or a ratio of investment to income of 5.24 to 1. In other words, for each dollar of income the investment was $5.24. They paid in dividends $3,793,618—$1,329 per track mile, or only 4.71 per cent on the capital stock and premiums.

The companies in Massachusetts may be divided into three groups or classes: The first class consists of the Boston Elevated; the second, the 15 companies which paid dividends of 4 per cent or over; the third, the remaining 46 operating companies. The leased companies are included in the operating companies. The receipts per mile of track and the profits and interest per passenger follow:

	Receipts per mile of track.	Mills per passenger. Profit.	Interest.
Class I.	$33,535	7.54	3.53
Class II.	8,272	7.01	6.37
Class III.	4,227	2.39	9.63

These figures show clearly that there is more business per track mile in the metropolitan district of Boston than in the smaller cities, and more in the smaller cities than in the rural districts, that it takes a greater investment for each dollar of gross income as one goes from each class into the next lower class, and that, therefore, profits are less and interest charges more for each passenger. It therefore follows that passengers cannot be profitably carried in rural districts for the same price as in more congested. That this condition cannot be charged to excessive capital may be learned from the fact that Class 2 has an investment of $44,500 per track mile; Class 3, $30,000. What is true as to the results of the companies in Class 3 is true of many of the rural lines of the Boston & Northern, Old Colony, Worcester and Springfield companies.

Notwithstanding the financial condition of street railways in this State, as has been shown, the Legislature of last year attempted to tax the bonds and notes of such

companies. Yet the companies in Class 2 last year paid $812,750 in taxes, nearly 50 per cent for each dollar paid their stockholders; Class 3, $135,700, or nearly three times as much as they paid their stockholders.

Ten years ago a wave of street railway development extended through this state by existing companies whose representatives were dazzled by the growth of gross income, and took no account of the day of restoring in the form of maintenance, and others who knew nothing of the business, and lines were extended and new companies formed. The people and the Legislature naturally looked upon the development as a great profit making business. In the last ten years the cost of every item which enters into the construction, maintenance and operation of an electric railway has increased; wages have increased from 15 to 20 per cent; the price of rails, 55 per cent; of ties, 60 per cent, and cars, their equipment and station machinery in like proportion. In that time the unit of fare has not been increased; on the contrary, through extension of lines and also of transfer privileges, the price of transportation has been reduced. The results are known to all men; the street railway investments as a rule are looked upon at least with grave doubt. Entirely apart, therefore, from the effects of increased cost through interest and taxes, there is the additional burden through increased cost of operation.

It has been charged that the companies hide their profits through excessive expenditures. If any charge can be made and sustained it is that some companies in their desire to make a good financial showing have not allowed a proper amount for maintenance. The companies in Class 2 expended last year $520 per track mile for maintenance of road, line and buildings; those of Class 3, $282 per track mile.

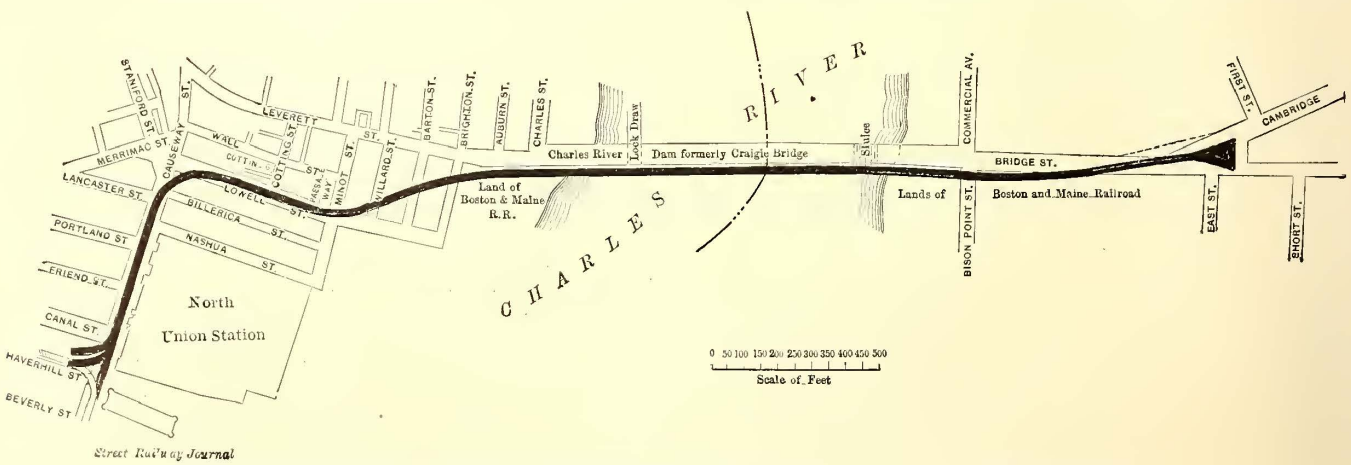
What is the remedy? It is not for the interest either of the public or the investor that this condition should continue. It cannot continue indefinitely. The 20 compauies which showed a deficit last year were $119,200 short of earning their interest. Or, putting it in another way, they lost 5 mills on every passenger carried. Yet these companies serve a public need to a greater or less extent and should not and cannot continue to do business at the present rate of fare. As for the older companies, the answer is to be found in their own experience. While in the past five and ten years they have increased their gross income, such increase has not been so great as the increase in the capital necessary to do the increased business. The fixed charges and operating expenses have been increased and the profits reduced; and last year out of 62 operating companies only 9 showed that they earned and paid 5 per cent for five successive years.

This brings us to the question of fares. In the whole history of investment there cannot be found a more unbusinesslike, more unscientific, more illogical practice than the 5-cent unit used for street railway fares. It has neither argument, equity nor any business in its favor, and nothing can be offered in its support except that it is a convenient coin which was used for street railway transportation under conditions which no longer exist. While the best street railway practice at present is conducted upon scientific lines, its very life blood, its income, is based upon false principles.

When the 6-cent fare was abandoned by local street railways a 5-cent fare was substituted, and it was a reasonable rate then, as the investment in street railways was low and length of ride short. The companies then as a rule made good profits and paid higher dividends than at present. When the change was made from animal to electricity as a motive power, increased capital, increased interest and increased maintenance were not fully considered, and if considered were not fully understood. The result was that lines were extended, length of ride made longer, transfers were issued more liberally and the public supplied with cheap transportation at the risk and expense of the investor. Assuming that a 5-cent fare was a reasonable fare ten or five years ago, conditions have changed through increased cost of doing business, and this being so, rates of fare should change accordingly on the same principle as the manufacturer or the merchant changes his prices according to his changed costs.

ROUTE OF THE EAST CAMBRIDGE ELEVATED EXTENSION

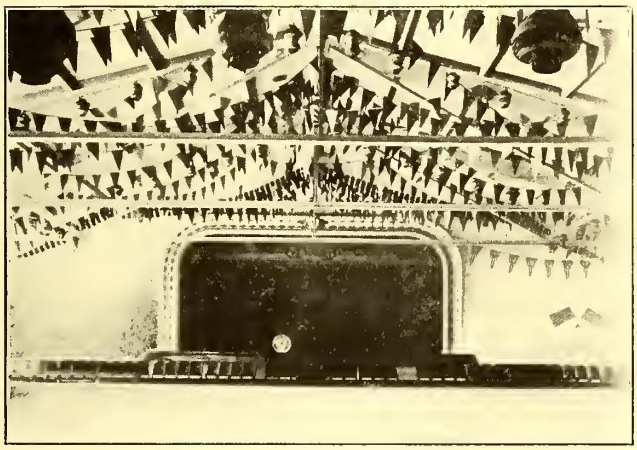
The Massachusetts Railroad Commission has approved the plans of the Boston Elevated Railway Company locating the tracks of the East Cambridge Elevated extension between the North Station and Lechmere Square. The route of this line, which will be a double-tracked structure, is shown in the accompanying map. It will be used for surface cars at first, and will provide a direct outlet with private right of way through territory which at present is extremely unfavorable to rapid handling of cars. The route is somewhat remarkable for the small distance traversed in the public streets. About 60 per cent of the line, which is about a mile long, is located outside the highways. The tracks will cross the Charles River by the Charles River dam and will terminate in or near Lechmere Square by means of an incline.



ROUTE OF BOSTON "L" LOCATION, BETWEEN NORTH STATION AND LECHMERE SQUARE

THE NEW CLUB ROOMS IN ST. LOUIS

The United Railways Company, St. Louis, has recently fitted up extensive club rooms for its employees on Grand Avenue, about two blocks from the company's offices and shops. The front portion of the building now occupied was formerly a residence. Behind this has been constructed a hall 100 ft x 101 ft. for concerts, dances and entertainments, while the grounds surrounding the building are sufficiently large to provide for outdoor amusements. In fact, the space on one side is now used as a ball ground.



INTERIOR, SHOWING STAGE AND DECORATIONS

The building sets back from the street a considerable distance and is approached by a concrete walk. A steel flag pole around which has been laid out a bed of flowers surrounded by a walk tends to distinguish the structure as a semi-public one. The lower part of the front portion of the building is used as a reading and reception room and for the baths; on the upper floors are the billiard and pool rooms. A boiler to heat the building is located in the basement.

With the exception of the brick work the hall in the rear was built by employees of the company. The roof is supported on steel trusses. The floor is entirely clear of posts or other obstructions and is of hard maple laid on cement. The stage has a 33-ft. proscenium arch and is 30 ft. deep. The dressing rooms and stage are separated from the auditorium by a brick fire wall, and the stage opening is provided with one of the largest and heaviest asbestos curtains in the city. The hall has ten exits.

About 3500 incandescent lamps are used to illuminate the auditorium and the stage, there being no less than 128 foot lights in three colors. The border lights are likewise in three colors. The lamps in the auditorium are concealed in the roof trusses. The hall is equipped with 1600 opera chairs and special facilities are provided for clearing the floor and storing the chairs in the basement when after entertainments it is desired to use the floor for dancing. A janitor is in constant attendance and the reading rooms, pool rooms and other features in the front portion are open until quite late.

The hall is used for regular entertainments given by the company and by the different organizations among the employees, including a band composed of fifty-five pieces and an orchestra of seventeen pieces, both of which the company has provided with instruments and uniforms and for which a competent instructor and a leader have been hired at $100 a month each. The band has rehearsals twice a week. The girl employees have three basket ball teams. During the summer season there were nine baseball teams composed of men.

Every two weeks a moving picture show is given, at which the best films obtainable are used. Immediately after the balloon races in St. Louis a film was obtained of the races at a considerable additional cost for the privilege of using it for the first time. The picture shows are usually enlivened by the band and the orchestra and are frequently followed by dances. The entertainments are always well attended. In one instance 2100 people were present.

EXTERIOR OF CLUB HOUSE IN ST. LOUIS

The club is run entirely by the railway company and its operation is under the personal supervision of General Manager Robert McCulloch. There are no club organizations or dues. All expenses are borne by the railway company, and the building and the entertainment features are free to all of the white employees. While the expense is considerable the company is being repaid in better service due to the fact that the men appreciate more fully their positions.

FINANCIAL INTELLIGENCE

Wall Street, Feb. 11, 1908.

The Stock and Money Markets

There are many things to account for the continued depression in the stock market, but of paramount importance no doubt is the political outlook, which has not only served greatly to curtail the volume of business on the Stock Exchange, but to bring about positive weakness in all classes of securities. In short, Wall Street is suffering from too much politics, even though the campaign of 1908 has not yet fairly well begun. Monetary conditions, it is true, are all that could be desired; that is, in so far as ease in rates for both call and time loans is concerned, but it is recognized that this state of affairs results more from the lack of demand than from any other cause, hence ease in money has ceased to be a factor in the work of sustaining security values. Moreover, there are signs of at least a slight hardening in money both in this country and abroad, and in consequence of this and the several disturbing elements in the situation there is in evidence some desire on the part of legitimate holders of stocks and bonds to liquidate the same. Thus far, however, most of the selling of stocks has come from professional bearish operators and there are indications that the market is gradually working into an oversold condition, from which it is argued there is likely to develop a substantial rally at almost any time. Generally speaking, though, the speculative community is in a thoroughly pessimistic mood, and until conditions change very much for the better it seems idle to look for anything more than temporary rallies from the existing level of prices.

Apart from the political outlook, the principal forces making for the prevailing pessimism are contained in the low level of the country's bank clearings, indicating a slackening in all lines of general business and the declining tendency of railway net earnings, which, it is contended, foreshadows reduced dividends in at least a few instances. Cuts in wages by a number of the leading manufacturing concerns of this country, especially the railway equipment companies, and the fact that fully 350,000 cars are now idle on the railroads, are straws indicating the direction of the wind, whereas about the only gratifying features of the industrial situation are the maintenance of steel prices on their present firm basis and the almost record-breaking tonnage of the anthracite coal companies. The banks of this city are much more strongly entrenched in the matter of surplus reserves than they have been for years at this particular period, but even in this instance there are indications of a recession, as witnessed in the statement issued from the Clearing House on Saturday last, showing a decrease in cash and reserves of over $10,000,000. The practically unprecedented flow of currency from the interior, which set in with the subsidence of the late panic, has now apparently ceased, and with the National Government drawing down its balances with the local banks it seems reasonably certain that the maximum of their reserves has now been reached for this season. However all this may be, there is no gainsaying the fact that the supply of stocks at this juncture is in excess of the demand, and with constantly recurring war scares, to say nothing of the attacks being made upon Wall Street by those in high political places, the prospect does not appear to be at all hopeful, that is, from a bullish viewpoint.

In common with the declining tendency of values, which embraced all classes of stocks, so that it is unnecessary to particularize, the local traction shares have suffered in greater or less measure. The introduction of legislation at Albany, looking to the creation of a five-cent fare to Coney Island has been made the object of a particularly bitter attack upon Brooklyn Rapid Transit, and even though it is felt in thoroughly well-informed quarters that this attempt, like others of a similar nature, will fail, its effect on that stock has been very decided. The Interborough-Metropolitan issues have exhibited relative firmness, presumably on account of the reports, thus far unconfirmed, that the company is likely to secure control of the only competitor of the Brooklyn Rapid Transit system in Brooklyn. Should this materialize, it would unquestionably bring about a most interesting state of affairs in the local traction situation.

Philadelphia

Although the volume of business in the local traction shares fell off materially during the past week, the general tone was firmer, and prices for practically all of the active issues displayed an advancing tendency. The demand for stocks at the low level was fair, but in the absence of any pressure to sell, the market moved up and prices closed with moderate gains over those prevailing at the close of a week ago. Philadelphia Rapid Transit, for instance, which held around 15½ the greater part of the week, moved up to 16⅝ on light trading, while Union Traction advanced to 49⅝. Philadelphia Company was strong at 40. United Companies of New Jersey was about the only issue to show any weakness, the stock selling at 238, a decline of a point.

Chicago

Trading in the Chicago traction issues also was comparatively quiet, but prices generally moved in an upward direction. South Side Elevated sold at 70, and Metropolitan Elevated preferred advanced to 49½. In the bond department Northwestern Elevated 4s rose ½ to 90. Chicago City Railway 5s held firm at 95½. South Side Elevated 4s sold at 96, and Metropolitan gold 4s at 84.

Other Traction Securities

The Boston market was extremely quiet and devoid of special feature. Boston Elevated held firm at 130, unchanged from last week. Massachusetts Electric preferred sold at 45; West End common at 83¾ and the preferred at 89. In the Baltimore market trading was practically at a standstill. Prices, however, were firm. United Railway 4s brought 86⅝ and the refunding 5s, 74½.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with two weeks ago:

	Feb. 5.	Feb. 11.
American Railways	43	42
Boston Elevated	130	130
Brooklyn Rapid Transit	46¼	37⅝
Chicago City	—	a150
Cleveland Electric	43½	—
Consolidated Traction of New Jersey	68¾	65
Detroit United	—	35
Interborough-Metropolitan	8½	7½
Interborough-Metropolitan (preferred)	21½	18
International Traction (common)	34	—
International Traction (preferred) 4s	63	—
Manhattan Railway	130	122
Massachusetts Elec. Co. (common)	—	11
Massachusetts Elec. Co. (preferred)	47	48
Metropolitan Elevated, Chicago (common)	17	17
Metropolitan Elevated, Chicago (preferred	45½	45½
Metropolitan Street	22	22
North American	48	43¾
Philadelphia Company (common)	37	37
Philadelphia Rapid Transit	15⅞	15
Philadelphia Traction	89	88
Public Service Corporation certificates	—	—
Public Service Corporation, 5 per cent notes	—	—
South Side Elevated (Chicago)	70	68
Twin City, Minneapolis (common)	83¼	78½
Union Traction (Philadelphia)	49½	49

a Asked.

Metals

Important developments in the iron and steel situation during the week included the resumption of operations by the Illinois Steel Company's big plant, which has been closed for some weeks, and which employs about 10,000 men, and also the reopening of the Republic Iron Works after being closed for several months.

The copper metal market continues stagnant. Domestic consumers continue to buy sparingly, and show no disposition to enter the market upon a large scale. Prices for all grades of the refined metal were further reduced ⅛ @ ¼c. a pound to 13⅜ @ 13½c. for lake; 13¼ @ 13⅜ for electrolytic and 13 @ 13⅛c. for castings.

THE TOLEDO RAILWAYS & LIGHT COMPANY

The report of the Toledo Railways & Light Co. for the fiscal year ended Dec. 31 last, published last week, was more interesting than have been the previously published yearly statements, as it contains considerably more data relative to the operations and financial condition of the company than the management has seen fit heretofore to make public. The report states that in January, 1907, the entire property of the Toledo Gas, Electric & Heating Co. was acquired which, it is understood, is a most important acquisition for the Toledo Railways & Light. The gas plant acquired at the time of the purchase of this property is equipped for the manufacture of both coal gas and carburetted water gas. President Everett says that the coal gas plant, at the time it was acquired, was much deteriorated and incapable of economical operation and that drastic measures were at once taken to reconstruct certain parts of the plant and that it is now in a position to produce gas at a materially reduced cost. The water gas plant, however, is said to be in first-class condition. President Everett is most sanguine in his belief that this newly acquired property will prove highly beneficial to the stockholders in the future.

The Toledo Railways & Light Company was incorporated on July 1, 1901, as a reorganization of the Toledo Traction Company. It comprises all the street railways in Toledo, also all the electric lighting and power business of that city, and has a contract with the city for street lighting until January, 1917. Since its inception the company has made rapid strides in gross and net earnings. For instance, in 1907 the total gross earnings, as compared with 1901, represented an expansion of $1,254,117, or over 95 per cent, and the gain in net earnings for the same period was $348,190, or about 51 per cent. The net surplus after interest charges in 1907 was more by $55,192 than in 1901, or approximately 21 per cent. The following table shows the gross and net earnings and surplus each year from 1901 to 1907, both years inclusive:

Inclusive.	Gross.	Net.	Surplus.
1907	$2,565,201	$1,022,867	$314,701
1906	2,047,611	975,837	466,230
1905	1,913,456	940,462	430,155
1904	1,752,834	829,625	329,750
1903	1,663,794	807,268	319,067
1902	1,459,091	732,312	273,275
1901	1,311,084	674,678	259,509

During the last fiscal year the ratio of expenses and taxes to gross earnings was considerably higher than in years previous; in fact, as compared with 1906, it represented an increase of over 7¾ points. This materially increased ratio naturally resulted in a considerably reduced percentage of surplus available for the capital stock, it being over 1½ per cent less than in 1906. President Everett, in his remarks to the stockholders, however, said that the net results for the year were unsatisfactory, owing to an unexpected combination of circumstances which he thinks will probably never occur again. He also states that he looks forward to a prosperous year in 1908, as he anticipates important reductions will be effected in operating charges, as well as considerable curtailment in expenditures for capital account. This is made possible largely, it is stated, through the extensive betterments to electrical, gas, heating and railway plants of the past, which leaves such capital requirements comparatively small for 1908. The following table shows the percentage of operating expenses and taxes to gross earnings, the capital stock outstanding and the percentage earned on same for the years given:

	p.c. op. ex. and tax. to gr.	cap. stock outstand'g.	p.c. earned on cap.
1907	60.13	$13,875,000	2.27
1906	52.34	12,000,000	3.89
1905	50.85	12,000,000	3.58
1904	52.67	12,000,000	2.75
1903	51.48	12,000,000	2.66
1902	49.81	12,000,000	2.27
1901	48.54	12,000,000	2.16

Despite the fact that the operating ratio to gross earnings in 1907 was considerably in excess of that for previous years and that the capital stock of the company was greater by $1,875,000, the earnings available for capital were within less than half of one per cent as large as those for the fiscal year 1904. With regard to the payment of dividends, which were suspended on Oct. 15 last, President Everett, in his report to the stockholders, says: "Owing to financial conditions, making it impossible to dispose of treasury assets and the large expenditures for betterments, it was the consensus of opinion of the board of directors to discontinue for the present the payment of dividends." Judging from the optimistic attitude entertained by President Everett, however, with regard to the operations of the company for the current calendar year, it is apparent that dividend payments will be resumed in the not distant future.

The franchises of the company, according to the report, are being operated under something like 100 ordinances. While the rights of the company to operate its street railway in certain streets will expire on Nov. 9, 1910, the larger part of the system is being operated under ordinances that do not expire until 1914, 1915 and 1916, and the demand for transfers from one part of the system to the other makes it practically certain, it is said, that no considerable change in the present operation or in fares will be made until about 1914.

The more important changes in the balance sheet of the company as of Dec. 31 last, compared with the year previous, were an increase of $5,296,441 in road and equipment and $1,547,876 in bonds, real estate, etc., in the column of assets, while those in the liabilities column were as follows: Capital stock increased $1,875,000; bonds increased $2,392,000; treasury bonds increased $825,000, and notes payable increased $1,185,479. The total increase in assets and liabilities was $7,491,767.

CHICAGO & OAK PARK ELEVATED REPORT

The Chicago & Oak Park Elevated Railroad Company has issued its annual report for the year ended June 30, 1907. The income account compares as follows:

Year ended June 30, 1907—

	1907.	1906.
Passenger earnings	$869,866	$863,637
Other earnings	22,703	23,146
Total earnings	$892,569	$886,783
Expenses	527,180	505,538
Net	$365,389	$381,245
Other income	.....	3,771
Total income	$365,389	$385,016
Interest, rents, etc.	429,334	477,795
Deficit	$63,945	$92,779

The interest on the notes given to the Chicago & Oak Park Elevated Railway Company on account of reorganization was $52,722. The per cent of operating expenses to gross was 59.07 per cent; maintenance of way and structures was $21,405; maintenance of equipment, $50,549; conducting transportation, $404,731, and general expenses, $50,493.

The general balance sheet of the Chicago & Oak Park Elevated Railway Company as of June, 1907, compares as follows:

ASSETS.

	1907.	1906.	1905.	1904.
Cost of road, equip., etc.	$17,889,568	$17,864,518	$17,834,214	$17,725,485
Stock and bonds owned	457,753	591,609	592,109	437,233
Cash and assets received.	119,416	21,484	10,984	134,116
Sundry assets	95,631	73,631	73,362	44,062
Profit and loss deficit	207,115	258,343	165,565	54,448
Total	$18,749,485	$18,809,585	$18,676,235	$18,395,347

LIABILITIES.

Capital stock	$10,000,000	$10,000,000	$10,000,000	$10,000,000
Funded debt	6,040,000	6,000,000	6,000,000	6,056,000
Debenture notes	350,000	350,000	350,000	350,000
Other notes payable	2,174,500	2,044,500	1,954,150	1,780,500
Real estate mortgages	5,238	5,238	8,363	8,713
Accounts payable	57,828	54,557	47,995	68,352
Car equip., contr. & oblig.	.....	67,299	87,985	.....
Interest accrued	114,316	115,791	62,741	114,165
Sundry	7,602	22,200	15,000	17,606
Securities borrowed	.....	150,000	150,000	.....
Total	$18,749,485	$18,809,585	$18,676,235	$18,395,347

President Knight, of the company, says: "Train mileage increased during the year 58,931; car mileage increased 100,660; the operating ratio was 59.07 per cent. This year the road will be extended west of Oak Park, which will add enough to passenger traffic to wipe out the deficit. An independent organization will complete this extension, but must give the Oak Park Elevated 5 cents per passenger."

THE CLEVELAND SITUATION

The discussion of franchises on lines outside the city limits was begun by F. H. Goff for the Cleveland Electric and Mayor Johnson early last week, after the reports of the count of passengers had been received. On a rough estimate it was shown that the average increase on lines lying wholly within the city for the past three years had been 28 per cent, and on those both within and without the city it had been 36 per cent. According to the rule made by Professor Bemis, the difference shows that the increase on the outlying portions is 8 per cent. Observation of the very rapid growth of the suburban towns would indicate that the increase to be credited to them is certainly much larger than this, as the population has been increasing very rapidly for the past several years.

Wednesday, Mayor Johnson proposed a simple rule for figuring franchise expirations and average earnings. He took as an example Detroit Avenue and Superior Avenue, each running 4 miles out from the Public Square. If the Detroit Avenue franchise expires Jan. 1, 1908, and the Superior Avenue franchise on Jan. 1, 1910, then it is evident that the average date of expiration of the two lines will be one year from Jan. 1, 1908. If, however, the Detroit Avenue line has been earning 30 cents per car-mile and Superior Avenue 25 cents, then the average life of the franchise will be somewhat less than a year. Changing these figures around, the life of the franchise should be more than a year. The Mayor thought that, by applying this simple rule, what looks to be a complicated matter in the way of franchise expiration and earnings may be arrived at easily. Of course, the dates of the expiration of franchises on all lines will have to be decided before an average can be figured.

The Mayor stated that when a line runs only a little way out of the city, he thought it fair to assume that the greater number of people would walk the short distance in order to use the 3-cent cars. President Andrews said that the Mayor should not figure on the 3-cent fare, as the Cleveland Electric would probably be able to secure renewals on some of its lines. Mayor Johnson, on the other hand, said that it should be considered in this way, because he is figuring on paying a certain sum for all the property of the company. He has certainly considered the point in this way, as he insisted that the count of passengers on the cars should be made at least 1000 feet beyond the city limits.

In discussing the percentage of operating expenses, President Andrews said that the books in the hands of Secretary H. J. Davies would show that 60 per cent will cover the operating expenses. He told the Mayor that he had heretofore stated that 62½ would be fair, and that rather than take anything less he would prefer to see it figured out. The statement was made that the tendency always is to decrease operating expenses with the growth of the city. It was admitted by all, however, that with fuel and some other items there is an increase.

At the meeting Wednesday the Mayor offered to concede that the franchise on East Fifty-fifth Street north of Broadway does not expire until 1914, if Mr. Goff would agree that the portion of the line south of Broadway has not commercial value after the expiration of the franchise in 1910, as claimed by the city. He also argued that the outlying portions of West Twenty-fifth Street, Madison Avenue and Burton lines have no commercial value after the expiration of the franchises of lines in the city which enabled cars to operate to the business section.

As to the Glenville grants, which have been in dispute, the Mayor said he was willing to say that there is a profit in the combined inlying and outlying lines which neither would realize if operating alone. In that case there should be some division of profit, he said, either according to the length of the haul or the volume of business. He suggested a compromise both on this and the East Fifty-fifth Street lines.

As the subject of competition has been continually coming up in these discussions, Mr. Goff suggested that all idea of a street railway war be put in the background and the talk be directed along lines of peace. He said that if the settlement is made with the idea of abnormal conditions in view that it can not be fair to the Cleveland Electric. The Mayor in reply stated that this is a matter of business and that no such ideas should enter into it. However, he has let his enthusiasm boil over occasionally by saying that the city could force the company to certain things, if it desired, and that it would be of little use to contend for better values than have been offered. These things, of course, tend to set negotiations at naught.

Mr. Goff said that the Clinton boulevard line will not show any profit. He said that this is one of the lines that has been playing the part for several years that the Mayor does not like —that of philanthropist. It can not be denied that the Cleveland Electric has anticipated the needs of suburbs in many cases and operated lines before there were enough people to pay. This is one of the ways that it has employed to aid and build up the city and for which it is given little credit by the Mayor and his council. But few companies have been so liberal in this way as the Cleveland Electric and in all cases it has granted the same fare as charged inside the city. So far as present negotiations are concerned this pioneer work has been ignored, although it has contributed very materially to make Cleveland a city of homes rather than one of tenement houses. For that reason conditions among the laboring classes and the poor are much better than in many other places, although its size would now cut a great figure, were the people limited to the confines of the city boundaries.

LEXINGTON AVENUE, NEW YORK, SUBWAY PLANS SUBMITTED TO BOARD OF ESTIMATE

Plans for the proposed Lexington Avenue system with its two Bronx branches were submitted to the Board of Estimate Friday, Feb. 7, by the Public Service Commission. The Board of Estimate will give a public hearing on the project at its meeting next Friday. The system which is to extend from the Battery under Greenwich and Church Streets to Vesey Street, thence to Broadway and Tenth Street, then under private property to Irving Place at Fourteenth Street to Lexington Avenue to the Harlem River into the Bronx to 138th Street, where one branch will extend through the eastern section of the Bronx along Southern Boulevard and Westchester Avenue to Pelham Bay Park and another westerly along Morris and Walton Avenues to Jerome Avenue and under that thoroughfare to Van Cortlandt Park, will cost, it is estimated, $60,000,000.

REPORT OF DETROIT UNITED FOR YEAR

At the annual meeting of the Detroit United Railway Company, held last week, Chas. M. Swift, of Detroit, and J. M. Wilson, of Montreal, were elected directors, succeeding Messrs. Holt and Wason. Other directors were re-elected. The officers are the same as heretofore except E. W. Moore has been made second vice-president and F. W. Brooks general manager.

In the report the improvements covering the constituent companies are all kept separate, as are also the balance sheets. The following is a summary of the business of the Detroit United Railway, the Rapid Railway System, the Sandwich, Windsor & Amherstburg, the Detroit, Monroe & Toledo Short Line for the years ending Dec. 31, 1906, and 1907, and the Detroit, Jackson & Chicago Railway from Feb. 1 to Dec. 31, 1907:

	1906.	1907.
Gross earnings	$6,063,182	$7,073,245
Operating expenses, including taxes	3,718,621	4,465,043
Net earnings from operation	$2,344,561	$2,608,201
Income from other sources	58,757	60,505
Gross income, less operating expenses	$2,403,318	$2,668,706
DEDUCTIONS.		
Interest on funded and floating debt:		
Detroit United Railway	$988,806	$1,106,548
Rapid Railway System	135,050	135,050
Sandwich, Windsor & Amherstburg Railway	18,000	18,000
Detroit, Monroe & Toledo Short Line Railway.	101,416	121,700
Detroit, Jackson & Chicago Railway	.....	172,950
	$1,243,273	$1,554,248
Dividends, Detroit United Railway	625,000	343,750
Charged off for depreciation	250,000	276,000
Total deductions	$2,118,273	$2,173,998
Surplus income	$285,045	$494,708

ELECTRICITY FOR WESTERN PACIFIC

The statement was telegraphed from San Francisco on Feb. 8 that upon the authority of Guy C. Earle, vice-president of the Great Western Power Company at Big Bend, on the Feather River, the Western Pacific Railroad now being built from the East to San Francisco will use electricity for motive power.

THE TENDENCY OF LEGISLATION IN OHIO

Two of Representative Stockwell's bills have been referred to sub-committees by the House committee on cities. One of them gives cities the right to construct street railway tracks and rent them to operating companies at a rate that will return at least 6 per cent on the investment. The other is the municipal ownership measure, empowering cities to own and operate electric light, natural gas, water and street railway systems, and issue bonds for the construction or purchase of such properties. Under this latter bill, municipalities will be enabled to issue bonds, no matter what the amount of debt already piled up against them. This provision would be necessary in Cleveland, as it has already reached the bond limit.

Judge Rufus B. Smith, of Cincinnati, made an argument before the House committee on cities a few days ago in favor of the Hunt bill, which is intended to provide for the construction of an elevated street railway system in the Queen City.

The Schmidt bill, which provides that a competing street railway company may purchase or build and operate roads on streets which have formerly been used by another company, without securing the consents of the abutting property owners, passed the Senate without protest. If passed by the House the low-fare lines of Cleveland will be able to secure franchises without going to the trouble of getting consents.

Representative Metzger, of Cuyahoga County, has introduced the amended Howe franchise tax bill, defeated in the Senate a few days ago, in the House of Representatives, with the hope that it may have another opportunity of passing before adjournment. It is said that the bill has little chance of favorable action in either house, as there has been no change of sentiment.

The Schmidt Senate bill, doing away with the necessity of securing consents of property owners where a railroad is built in a street that has already been occupied for that purpose, has been referred to the cities committee of the House for consideration. An attempt to send it to the railroad committee for permanent burial was defeated. It was passed by the Senate a few days ago.

Among other bills recommended for passage by special committees last week is the Foster bill, which requires that a list of the names and addresses of stockholders of all corporations be reported to the Secretary of State each year. The officers of corporations oppose this bill because they feel that in many cases this is forcing people to reveal their private business affairs and that they will hesitate to purchase and own stock if the fact is to become public property.

THE CHICAGO & MILWAUKEE ELECTRIC RAILROAD RECEIVERSHIP

Judge Grosscup has appointed H. A. Haugan as co-receiver in place of A. C. Frost, who withdrew. It is said there are now outstanding $15,000,000 of 5 per cent bonds and an authorized issue of $2,000,000 of 6 per cent notes. The Western Trust & Savings Bank, trustee under the note issue, is quoted as saying that only $100,000 of the notes were issued and about $179,000 of the Wisconsin Division bonds are held as collateral for these notes. One of the receivers is quoted to the effect that only about one-third of the $10,000,000 Wisconsin Division bonds have been sold to investors, the remainder being held as collateral for loans.

D. B. Hanna, third vice-president of the Canadian Northern Railway, is quoted:

"The statement was made upon the results of a three days' investigation of transactions covering years, and under conditions which could not show a complete analysis of the situation. * * * The bondholders must complete the road as projected, and as the representative of the largest concentrated interest I favor retaining Mr. Frost as operating manager under the receivership.

"We Canadians have had the property thoroughly inspected, and we are satisfied that it is one of the best propositions of the kind in existence. There is no better construction extant. There remain eight miles of road to complete into Milwaukee, and a recent inspection showed that 60 per cent of that construction is done. I see no reason why traffic between Chicago and Milwaukee should not be a reality by June 1 at the latest."

DATE SET FOR OPENING HUDSON TUNNEL

It has been decided to open the tunnel under the Hudson River from New York to Hoboken Feb. 25.

THE TREND OF LEGISLATION IN MASSACHUSETTS

Another effort will be made in the Massachusetts Legislature this year to pass a bill to compel the street railway companies to adopt flexible automatic fenders. The effort is led by Hugh H. O'Rourke, of Worcester, who secured the order directing the special tests conducted by the Railroad Commission two years ago. Mr. O'Rourke himself has put in two bills, one requiring all cars to be equipped with automatic fenders, and another requiring companies to equip their cars with lifting jacks and emergency tools by July 1 of this year. The fender bill fixes a penalty of $50 for each car unequipped.

Other bills now offered in the Legislature are as follows: From James T. Heron, to require "an improved and more efficient car fender than the one now in use," with $10 to $50 penalty; from J. J. Callahan, to require street railway companies to equip cars with heated sand boxes, lifting jacks and emergency apparatus; from Alonzo F. Hoyle, to require street railway companies to furnish, subject to the Railroad Commission's approval, suitable smoking compartments and proper toilet accommodations on all cars used on suburban lines; from M. E. S. Clemons, to require railroads and street railways to maintain distance signals at grade crossings of their respective lines, the railroads to pay for maintenance, but both companies to join in cost of installation, under a $50 penalty; from J. W. H. Myrick, to require passenger cars of steam and electric railways to be equipped with a ventilating system on the suction principle; from the Massachusetts branch of the American Federation of Labor, to amend the hours-of-labor law to provide that a day's work shall be nine hours in eleven, instead of ten hours in twelve; from Representative Charles A. Dean, to require railroads, or railroads and street railways, to pay the cost of abolishing grade crossings with highways to the exclusion of cities and towns; from John H. Carter, a resolve that the Railroad Commission investigate the giving of free passes by railroads and street railways and report recommendations; from J. H. Thompson, to allow cities of 75,000 inhabitants to make their own terms for granting trolley freight and express rights within their limits, conditional on a referendum where desired by the voters, but not subject to the Railroad Commission's approval; from Charles W. Wood, that street railways be authorized to transport milk and cream anywhere on their lines, subject to the Railroad Commission's supervision, but to no other board or law or existing charters; from Charles D. B. Fisk, to provide temporary locations for street railway companies pending repair or reconstruction of bridges involved in an existing location; from J. W. Carey, to provide for joint use of tracks by electric railroad and street railway companies, for proper handling of bulk and express freight, subject to the regulation of the Railroad Commissioners.

In addition, there is a bill to incorporate a Garbage Disposal Company, with authority to contract with railroad, railway or express companies for transportation and disposal of garbage, refuse waste, street sweepings, sewage and other substances of kindred nature, subject to the Railroad Commission's regulation. The incorporators named are: George P. Field, Frederick E. Atteaux, James F. Cavanagh, Charles H. Burnham, Jr., Martin W. Sands and Walter R. Mansfield. Four bills aiming to prevent the indirect control of street railway companies, or other railroads, by railroad corporations, have been introduced on petition of William B. Lawrence, former corporation clerk of the Boston & Maine Railroad, especially directed against the New York, New Haven & Hartford Railroad's merger policy. A bill aiming to establish a partnership among the customers, capitalists and workers of railroads and street railways is offered by Conrad Reno, bearing the special designation of "The Railroad Tri-Partnership Law."

The new State Railroad Commission, of Pennsylvania, announces that it has selected, with the approval of Governor Stuart, a secretary, in the person of Harry S. Calvert, of Pittsburg, and has appointed John P. Dohoney, of Harrisburg, as its marshal. Mr. Calvert is a native of Pittsburg, and began newspaper work on the Pittsburg *Leader*, eventually becoming its political writer, retiring about a year ago. Mr. Dohoney is a native Harrisburger, and began newspaper work on the *Patriot*, afterwards going to the *Star* as one of its founders.

DINNER TO H. H. VREELAND

On Feb. 7 the New York Railroad Club gave a testimonial dinner to Herbert H. Vreeland, the president of the club. Three hundred and seventy-nine members attended the dinner, which was a most enjoyable affair and indicates the host of friends Mr. Vreeland has made. The banquet was held at the Hoffman House, and during the evening Mr. Vreeland was presented a large silver loving pitcher, as a testimonial of the esteem with which he is held by the members of the club.

The toast-master was W. G. Besler, vice-president and general manager of the Central Railroad of New Jersey, and the speakers were John F. Deems, general superintendent of motive power, railway stock and machinery of the New York Central lines; William J. Wilgus, formerly vice-president of the New York Central, and George A. Post, president of the Standard Coupler Company.

In referring to Mr. Vreeland, Mr. Besler said:

"We are here this evening to tender by popular demonstration a reception and dinner to the honored president of our club. Mr. Vreeland began his career as a steam railroad man, and his ability and training were recognized when he was called upon to take charge of the problem of surface transportation in this great city. Surely his record of eighteen years with this club, sixteen on its Executive Board, establishes a place which justifies the members in their determination to recognize the same by something more than an ordinary demonstration, than a club dinner, and it has taken the form of this testimonial dinner.

"Mr. Vreeland, you have been singularly blessed, as the world goes, in there being allowed to you not only an abundance of the material things of life which tend for comfort and happiness, but you have been doubly blessed by nature in having been given a disposition which has attracted to you many and warm friends. It has been hard for your friends to select as a souvenir of this occasion a token commemorative thereof which may prove both acceptable and appropriate."

Mr. Vreeland said in part:

"Inexorable as the rule is that a man must do his own winning, there is little he can win without friends. They will not supply the elements of success—industry, integrity, ability—but even with all of these he must have friends. There must be those at hand who will say the right thing for him at the right time in the right place. No man's ability was ever great enough to give him fortune or power unless surrounding and sustaining him was the favor of a few loyal friends. It is the marvel of human nature that so priceless a jewel is so easily achieved. All that a man must do to make friends is to be sincere. We live in a practical world. It concerns itself with the present. It does not look far ahead nor far behind. It likes a man that can turn to and do things. It will accept leaders and let them make the pace, but they must lead in the direction where it wants to go. It is jealous of its comfort. It will consider reforms, but they must not be too inconvenient. It possesses a great capacity of righteous indignation, but it should not be provoked prematurely. The man who would avail himself of its strength, who would summon its affection, its valor and its resources to the aid of his ambition must be its sincere friend; must see with its eyes, feel with its heart, and speak the language of its hopes and fears."

The audience was a most representative one, and the enthusiastic manner in which it honored the guest of the evening was a strong testimony to the high personal esteem in which Mr. Vreeland's friends hold him, their appreciation of his work in the club and their regard for his friendship.

The dinner committee consisted of Frank Hedley, George W. West, Henry D. Vought, William B. Albright and Daniel M. Brady, chairman.

MORE SINGLE-PHASE LOCOMOTIVES FOR NEW HAVEN

Further confirming the statement of the New York, New Haven & Hartford Railroad, published in these columns last week, to the effect that since the beginning of the electrical installation the railroad company and the Westinghouse Company, which had charge of the installation, had worked together in harmony and that the electrical system as far as it had been tried had been a success, comes the announcement that the railroad company has placed an order with the Westinghouse Company for six additional single-phase locomotives, which are to be duplicates of the thirty-five previously furnished by the Westinghouse Company.

EXPOSITION OF SAFETY DEVICES IN NEW YORK

Announcement has just been made that an exposition will be held early in April in New York, under the auspices of the American Museum of Safety Devices and Industrial Hygiene. The exposition will remain open for two months and will consist of exhibits of apparatus for avoiding accidents to workmen and for protecting the general public. During the exposition illustrated lectures, by engineers, will explain industrial conditions and hazardous occupations and the most approved methods of safety. No charge is made for space, and manufacturers of safety devices in the street railway field are invited to participate. The chairman of the committee of direction is Charles Kirchhoff, and of the committee of exhibits, Prof. F. R. Hutton. Applications for space should be made to Dr. W. H. Tolman at the Museum, 231 West Thirty-Ninth Street, New York.

In addition to the exposition, which will show models of safety apparatus, and, where practicable, the devices themselves applied to machinery in operation, three solid gold medals are offered, under the auspices of the museum, for the best safety devices in the fields of transportation, mining, motor vehicles and motor boats. Two prizes of $100 each are also open for competition. One will be awarded for the best essay on "The Economic Waste Due to Accidents," the other on "The Economic Waste Due to Occupational Diseases."

STREET RAILWAY PATENTS

UNITED STATES PATENTS ISSUED JANUARY 28, 1908.

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

877,515. Vegetation-Destroyer; William R. McKeen, Jr., Omaha, Neb., and Frank S. Barks, St. Louis, Mo. App. filed Nov. 18, 1907. Aims to increase the intensity and efficiency of a device for burning vegetation and to utilize the heat therefrom for vaporizing gasolene in its passage to the burners.

877,530. Air Brake; Walter V. Turner, Wilmerding, Pa. App. filed April 9, 1906. Means whereby the brake cylinder pressure may be augmented by the pressure of the control pipe in both emergency and service applications of the brakes.

877,531. Brake; Walter V. Turner, Wilmerding, Pa. App. filed April 9, 1906. An air brake apparatus comprising in combination a brake cylinder, a cylinder reducing valve, a compressor and a connection from said cylinder reducing valve to the inlet or suction pipe to supply the compressor with pressure.

877,668. Registering Mechanism; Jacob Schinneller, Pittsburg, Pa. App. filed Nov. 15, 1906. The object of this invention is to so construct a register that it cannot be tampered with and so that the attendant is not aware of the true condition of the registrations shown by the same.

877,694. Railway-Joint; Brather W. Annas, Sawmill, N. C. App. filed July 11, 1907. Comprises a base portion formed with parallel slits, the said member being secured to the tie, the material between the slits being bent upwardly to afford a resilient integral fish plate, and the material on each side of the slits being extended and affording base pieces having their extremities inturned to engage the rail base.

877,708. Folding Step for Railway Cars; Anderson Fuller, Amsterdam, N. Y. App. filed April 19, 1907. Provides an auxiliary car step which automatically folds up when the car starts.

877,724. Device for Automatically Locking Doors of Railway Cars While the Train Travels; Wilhelm Mittmann, Essen-West, Germany. App. filed Aug. 14, 1907. Comprises a governor which is connected to one of the wheel axles of the car so as to be actuated by the rotation of the axle, this action being transmitted by means of an ingenious lever system to a separate locking bar provided on the doors.

877,804. Insulator for Heavy Conductors; Louis Steinberger, New York, N. Y. App. filed April 17, 1907. An integral saddle-shaped insulator for under-contact third rails; has a metallic reinforcing strip embedded therein.

877,817. Insulated Compromise Rail-Joint; Benjamin Wolhaupter, New York, N. Y. App. filed March 22, 1907. Has separate disconnected base sections respectively for the dissimilar rails, the base sections having a stepped relation and

each affording one rail end a support on both sides of the meeting point of the rail ends, and means for insulating one rail from the other.

877,844. Trolley; August W. Huhsman, Staunton, Ill. App. filed May 25, 1907. Spring-pressed T-shaped members having opposed projections or cams passing over the top of the trolley-wheel and provided with depending outwardly-turned portions to which the trolley cord is connected.

877,866. Automatic Pipe Couplings for Cars; William A. Robertson, Newbern, N. C. App. filed April 10, 1907. A pipe coupling head comprising a bifurcated body, having a pipe shoe provided with pipe connections, and a coupling arm lying opposite and in spaced relation to the inside coupling face of the shoe, said coupling arm carrying at its inner side a pressure spring.

877,877. Wire Retrieving Attachment for Trolley Wheels; William C. Althen, Columbus, O. App. filed March 22, 1907. A U-shaped frame is suspended from the trolley harp and is raised into position to guide the wheel on the wire when tension is put on the usual holding cord.

877,887. Controller Regulator; Cyrus P. Ebersole, Keokuk, Iowa. App. filed Sept. 1, 1904. Provides a regulator for an electric motor controller to prevent the operator from moving the handle too rapidly. Has vertically sliding pins which are displaced by a cam.

12,744. Electric Motor Controller Regulator; Paul A. Weyland, Maywood, Ill. App. filed March 18, 1907. Mechanism for preventing the too rapid movement of the controller handle. Includes a plurality of upwardly projecting inclined teeth which co-operate with a ratchet so as to procure a successively operated release thereof.

PERSONAL MENTION

MR. SAMUEL F. ANGUS, who held large interests in steam and electric railroads, died Feb. 6 at his home in Detroit.

MR. J. B. HANNA has resigned as president of the Chicago, Lake Shore & South Bend Railway, now under construction from South Bend, Ind., to Chicago, Ill.

MR. GEORGE R. BURROWS, for many years superintendent of the Newton Street Railway Company, Newton, Mass., in charge of the local divisions, has resigned.

MR. ROBERT H. LERCH has resigned as superintendent of the Easton Transit Company, of Easton, Pa., and the office of superintendent has been abolished.

MR. F. HUBERT CHAMBERLAIN, who acted as engineer of the Christchurch Tramways, one of the most up-to-date in the Australasian Colonies, and has acted as consulting engineer to the board, contemplates returning to Ameriea.

MR. JAMES H. RICHARD, JR., has been appointed attorney for the Rhode Island Company in Providence, R. I., in tort cases in Woonsocket and vicinity, now pending, succeeding Mr. John J. Heffernan, who retired a few days ago.

MR. J. H. HANSEN, of New York, has succeeded Mr. A. B. Shepard, of Cleveland, as president of the Toledo & Chicago Interurban Railway. Mr. Shepard was formerly with the General Electric Company. He continues as a director of the company.

MR. P. F. CASSIDY has been appointed claim attorney for the Uxbridge & Blackstone Street Railway Company. He is now claim attorney for the Woonsocket, Columbian, Providence & Burrillville, M., A. & W., and Uxbridge & Blackstone Street Railway Companies.

MR. F. W. COEN, who was recently appointed general manager of the Lake Shore Electric Railway and its subsidiary companies, has been elceted vice-president of the company. Mr. John Witt was elected secretary and treasurer, succeeding Mr. Coen, who held this office prior to his appointment as general manager.

MR. GEORGE H. SHAW, for eighteen years superintendent of the Southern Wisconsin Railway Company, of Madison, will become superintendent of the La Crosse City Railway Company, of La Crosse on March 1. Mr. shaw now is deputy United States marshal, which position he accepted about a year ago after resigning from the Southern Wisconsin Company.

MR. J. L. NASH, for many years general foreman of the armature department of the Boston Elevated Railway Company, of Boston, Mass., has resigned. Mr. Nash was formerly connected with the American Electrical Company, of New Britain, Conn., and later with the Thomson-Houston Company and with the General Electric Company in charge of experimental work.

MR. H. E. CHUBBUCK, of Ottawa, Ill., has been appointed superintendent of the Wichita Railroad & Light Company, of Wichita, Kan., to succeed Mr. W. B. Morrison, resigned. Mr. Chubbuck has been connected with the Illinois Traction System and the McKinley properties since 1897. During that time he has been general manager of the Western Railways & Light Company, which owns the plants at Wichita, Galesburg and Quincy, Ill., and the Illinois Valley Traction Company.

MR. THOMAS MELLON, of Pittsburg, is dead. Mr. Mellon was ninety-five years old, and for half a century had been associated with industrial and financial undertakings in Pittsburg and vicinity. While never active in street railway work, Mr. Mellon was interested financially and as a director in several of the constituent companies making up the Pittsburg Railways Company and also was interested financially in street railway development in Kansas City. His fortune is estimated at upwards of $100,000,000.

MR. THOMAS GREEN has been made superintendent of the Cincinnati, Newport & Covington Light & Traction Company, of Covington, Ky., it having been decided not to fill the position of general manager, made vacant by the death of Mr. J. R. Ledyard, three weeks ago. Mr. Frank Wampler has been made master mechanic and Mr. Jefferson Mains, general foreman, while Mr. W. H. Horton, Jr., will have charge of the tracks and the track employees. This, in effect, divides the duties performed by Mr. Ledyard among the other men.

MR. JOHN L. HEINS has resigned as president of the Coney Island & Brooklyn Railroad, of Brooklyn, N. Y. Mr. Heins became president of the company in the summer of 1897, succeeding Col. John N. Partridge, when the Coney Island & Brooklyn Company absorbed the Brooklyn City & Newtown Company, operating the DeKalb and Franklin Avenue lines. He was formerly superintendent of the Brooklyn City & Newtown Company, and served in that capacity while Col. Partridge was president. In all he has been connected with street railways in Brooklyn about twenty-five years.

MR. GEORGE THOMAS DUNLOP, president of the Capital Traction Company, of Washington, D. C., and for more than a quarter of a century identified with commercial Washington, died Wednesday, Feb. 5, at his home in Georgetown after an illness of about three weeks. Mr. Dunlop had been president of the company since its formation, September 21, 1895. He was born at Otterburn, Frederick County, Md., March 25, 1845, and began his career in Washington in 1860, at the age of fifteen years, as clerk in the agricultural warehouse of his brother-in-law, where he served for ten years. In July, 1870, he bought out the business, and, taking in a partner, proceeded to lay the foundation of his success under the firm name of G. T. Dunlop & Company. The partnership continued until 1878, Mr. Dunlop purchasing the interest of his partner, and remaining in business until 1890, at which time he retired. He had been for several years a director of the old Washington & Georgetown Railroad Company, and in 1893 was elected vice-president and manager of that road, and acted as president until January, 1894, when he was elected president of the company. The building of the present underground electric system of street railroads was accomplished under the management of Mr. Dunlop. When Mr. Dunlop took charge of the Washington & Georgetown Railroad, the Rock Creek Railroad, a suburban line, by an act of Congress of March 3, 1895, this company acquired the right to purchase any intersecting line of street railway in the District of Columbia. Mr. Dunlop succeeded in securing the consent of all the stockholders of both companies, and as a result on Sept. 21, 1895, the Capital Traction Company was formed, and Mr. Dunlop was elected president. Mr. Dunlop was a director in the Washington Title Insurance Company, the Union Trust & Storage Company, the Washington Gaslight Company, the Broad of Trade, and the American Security & Trust Company. He was also a large stockholder in many concerns, including the Biggs Bank, the Farmers & Merchants' Bank, the Merchants' Transfer & Storage Company, and others.

NEWS OF THE WEEK

CONSTRUCTION NOTES

Items in this department are classified geographically by States, with an alphabetical arrangement of cities under each State heading.

For the convenience of readers seeking information on particular subjects, the character of the individual item is indicated as follows:

* Proposed roads not previously reported.
o Additional information regarding new roads.
† Extensions and new equipment for operating roads.
Numerals preceding these signs indicate items referring to:

1. Track and roadway.
2. Cars, trucks and rolling stock equipment.
3. Power stations and sub-stations.
4. Car houses and repair shops.
5. Parks and amusement attractions.

*LITTLE ROCK, ARK.—The State Board of Railway Incorporators has chartered the Paris, Subiaco Traction Company. The capital stock is $60,000, and among the incorporators are D. J. Young, Conrad Elsken, G. G. Danridge and Chas. J. Jewett. The company proposes to build an electric railway five miles in length from Paris to a point near Subiaco, in Logan County.

oLOS ANGELES, CAL.—It is understood that E. R. Walker, representing a number of leading men of Hollywood, will soon apply to the City Council for a franchise for an inclined railway in Griffith Park. It is the plan of Mr. Walker and his associates to have their road, if they receive the franchise, connect with a branch line of the Los Angeles Pacific Company, which runs to a quarry in Sepulveda Canyon. Their line will be about half a mile in length and will be operated by cable.

*LOS ANGELES, CAL.—A petition was recently presented to the City Council by A. D. Houghton asking a bond election for the purpose of voting $1,000,000 for the construction of a municipal railroad between Los Angeles and San Pedro.

oRIVERSIDE, CAL.—It is stated that work on the Riverside-San Bernardino Electric Railway will begin shortly and that the road will be pushed to completion the coming summer. The right of way for the new road, which is said to be controlled by H. E. Huntington, was secured several months ago, but since then little has been done toward building the line. Now, however, it is reported that the contract for the grading has been let to Garnsey & Pitzer. It is understood that work on the roadbed will begin at the Riverside end of the line, and it is expected that from 50 to 100 men will be employed on the work. The new road will be about eight miles in length, and will extend from Riverside to Colton, passing Highgrove.

oSAN FRANCISCO, CAL.—Work on the Ocean Shore Railway is progressing rapidly. Between Pedro Valley and Green Valley 300 men are finishing and grading the roadbed, and trains will be running to Green Valley by April 1. The road is already graded from Green Valley to Halfmoon Bay, and the bed is in good condition for tracklaying. Promoters of the road expect tbat the entire line from San Francisco to Santa Cruz will be in operation by Jan. 1, 1909.

oHARTFORD, CONN.—The Railroad Commissioners have issued an order giving the Shore Line Electric Railway Company power to condemn certain pieces of land in the towns of Essex and Old Saybrook for a right-of-way for an electric railway.

1†WASHINGTON, D. C.—Gen. George H. Harries, vice-president of the Washington Railway & Electric Company, has announced that if a law were passed permitting the company to charge a straight five-cent fare the additional receipts of the companies from this change—the difference amounting last year to $335,000—would be put into improvements. General Harries said that his company would purchase about 75 new cars for service in the city, and 20 for use on the suburban lines, and would guarantee an increase of at least a million car miles a year.

oAUGUSTA, GA.—The Atlanta & Carolina Construction Company was granted a franchise Feb. 3 for the operation of an electric street railway through the streets of Augusta. The company will construct a line from Atlanta to Augusta, connect there with the line of the Augusta & Aitken Railway Company, and thence with the extension from Aiken to Columbia, which has not been constructed yet. The line must be completed in two years.

*JESUP, GA.—The Goose Creek Railway & Power Manufacturing Company has been formed, with a capital stock of $300,000, for the purpose of developing water power for manufacturing and industrial purposes. It is the ultimate intention of the company to build a street railway. The promoters are N. W. Whaley, F. E. Breen, S. E. Cohen, J. H. Wilkins, J. F. Breen, W. M. Roberson, J. T. Winn and D. M. Clark. D. G. Zeigler is architect and engineer.

3†MACON, GA.—It is reported that President W. Jordan Massee of the Macon Railway & Light Company has made a contract for new power house equipment. The new machinery will cost $53,000 and will be installed this spring. It consists of a new turbine and generator that will develop 2500 hp and will be able to carry a 50 per cent overload for four hours in case of an accident to the other machinery.

oSPRINGFIELD, ILL.—The Secretary of State has issued a license to the Mississippi Valley Interurban Railway Company. The object is to construct an electric railway from Springfield, through Petersburg, Virginia, Rushville and Mount Sterling to Quincy; from Mount Sterling to Pittsfield, Hardin, Jerseyville, Winchester, Jacksonville and Hillsboro; from Hillsboro to Greenville and Shelbyville through Owaneco and Vandalia, and from Greenville to Carlyle, Nashville, Pinckneyville and Murphysboro. The capital stock of the company is $1,000,000 and the headquarters will be at Springfield. The incorporators and directors are: James H. Ward, Butler, Ill.; George E. Watson, Hillsboro, Ill; H. R. Lakin, Rochester, Ill., and John E. Melick and F. A. Melick, Springfield, Ill.

oTAYLORVILLE, ILL.—The Taylorville Chamber of Commerce has appointed the following committee to assist in securing the right-of-way in Christian County for the proposed St. Louis, Terre Haute & Quincy Interurban Railway: South Fork—John Fesser, Jacob Craig, Henry Achenbach, Peter Achenbach; Bear Creek—J. J. Achenbach, C. C. Curtin, A. M. Hewitt, E. E. Dodson; King—George Deal, Peter Cashin, John Bradford, A. M. Allen; Taylorville—A. T. Kinney, H. Jayne, Fred Elliott. The work of securing the right-of-way will be commenced at once, as it must be completed within the next ten days. A representative of the road must be in New York by Feb. 10, to meet the capitalists who propose to finance the project. They have positive assurance that the money for the construction of the road will be forthcoming as soon as three-fourths of the right-of-way shall have been obtained.

oCOLUMBUS, IND.—Interest is being revived by the Columbus, Greensburg & Richmond Traction Company, which was organized two years ago to build an electric railway to connect the three cities named. Amos K. Hollowell, president of the company, announces that the enterprise has been financed by a London syndicate and that the road will be built.

†ELWOOD, IND.—The Indiana Union Traction Company has purchased a site in Elwood for the construction and equipment of a modern traction station. Work will begin early in the spring. The structure will be a fac-simile of the company's station at Tipton.

oEVANSVILLE, IND.—C. M. Shanks, of Indianapolis, attorney for the Grand Central Traction Company, which proposes to build an electric railway from Indianapolis to Evansville, has applied to the Board of Public Works for a franchise. He says work on the proposed road will commence not later than March 31.

*FRANKFORT, IND.—A meeting of men interested in the building of a new electric railway to run from Kokomo through Frankfort to Terre Haute was held in Frankfort on Feb. 3, and an organization perfected. At the meeting representatives were in attendance from Kokomo, Russiaville, Forest, Frankfort and Terre Haute. It is said that the plan is to begin active work early next summer. The following officers were chosen at the meeting: President, Dr. Oliver Gard, of Frankfort; first vice-president, J. C. DeWeese, Kokomo; second vice-president, D. W. Bolen, Indianapolis; secretary, E. B. Swift, Kokomo; treasurer, M. W. Eikenberry, Kokomo, and general counsel, Judge J. V. Kent, of Frankfort. Besides these W. H. Eikenberry, Russiaville; Albert E. Betts, Frankfort, and Adam Ridenhour, Forest, are interested. The company will be capitalized at $3,000,000.

*INDIANAPOLIS, IND.—The Indianapolis & South Bend Traction Company has filed articles of incorporation. The initial capital stock is $10,000. The company proposes to construct and operate street and interurban railways for passengers and freight service, the main line, with its several branches, to connect Indianapolis, Westfield, Sheridan, Kerlin, Michigantown, Burlington, Logansport, Rochester, Plymouth, South Bend, Lafayette, Clarks Hill, Linden, Veedersburg, Delphi, Flora, Kokomo, Frankfort, Tipton, Lebanon and Noblesville. It is understood that London capitalists have agreed to finance the enterprise. Robert H. Keller, John Keller and Edward M. Bowman are the directors.

*OWENSVILLE, IND.—At a mass meeting held in Owensville on Feb. 5, a movement was put on foot to construct an electric railway from Evansville to Mt. Carmel, Ill., by way of Darmstadt, Cynthiana and Owensville. J. D. Q. Lockyear, of Evansville, and J. D. Bixler, of Cynthiana, are promoting the enterprise.

1†COUNCIL BLUFFS, IOWA.—The officials of the Omaha & Council Bluffs Street Railway Company announced this week that the extension from the city of Council Bluffs to the State School for the Deaf would