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During 1907 the Street Railway Journal printed and circulated 427,250 copies, an average of 8216 copies per week. Of this issue 8000 copies are printed.

The Big Stick in Street Railway Accounts

The tentative classification of the Interstate Commerce Commission has now been published and will be read with interest and surprise by all railway managements. A request is appended for criticisms and suggestions, but the letter of transmissal leaves the inference that certain features of the classification are considered already settled. One of these is that the form of accounts for electric railway

companies must conform as closely as possible to that prescribed for the steam carriers, express companies, pipe lines and other transportation companies under the jurisdiction of the commission. Another is that compensation or rentals for joint facilities must be accounted for in detail. A third is that depreciation accounts for equipment have been decided upon, although the necessity for depreciation accounts for maintenance of way and structures has not yet been settled. The importance of the commission's suggestions is indicated by their statement that at present there are thirty States whose laws give to the State railway commissions or other legally constituted bodies jurisdiction over electric railway companies and that the circular has been issued after correspondence with, and with the approval of, the representatives of these State governments.

We notice that replies are requested by March 28 and that the circular is dated Jan. 10, although it was not sent out generally until Feb. 27. The reason for the gap in dates between Jan. 10 and Feb. 27 is not apparent, but the practical result is that it leaves the companies only four weeks to digest the classification, a period entirely too short for so important a matter as a standard classification of accounts. We regret also that the commission in its letter of transmission and series of explanations did not give some of its reasons for the proposed revolution in the method of keeping street railway accounts. The entire scheme of the classification is so different from that to which the electric railway companies are accustomed and which they have built up as a result of many years of painstaking work that they should be told of some advantages which will accrue either to them or to the public as the result of the proposed radical change. Investors, students of financial values and the general public, in fact all who have occasion to consult the reports of street railway companies, have also something at stake in the matter, and some excuse should be given them for a step which will destroy at one blow a large part of the national, State and corporation data on the financial operation of electric railways.

A casual examination of the classification, hurried because of the late issue of the circular, shows that it follows very closely the draft entitled "Exhibit B," originally proposed by the Interstate Commerce Commission and printed in this paper for Dec. 21, 1907. The fact that this is the case shows that the arguments of the committee of the American Street and Interurban Railway Association, protesting strongly against the impracticability of this classification, were given no weight by the commission, although the suggestions and protests were made in a sincere manner and by men who have had an experience of many years in the business. This action by the commission does not encourage any great hope that modifications of its present schedule may be expected. Nevertheless, we trust that this will not prevent any electric railway company from

acting upon the circular promptly and replying in full to the request of the commission for criticisms and suggestions. We suggested editorially, in our issue of Dec. 28, that this could best be done if each company will frankly and honestly apply the classification to its own business and endeavor to determine how the classification can be used in the practical operation of its own road. This should be done conscientiously and promptly and the conclusions reached should be forwarded to the office of the commission in Washington, and a duplicate should be sent to the head office of the American Street and Interurban Railway Association, which is representing the street railway interests in the matter.

We have already touched briefly upon the objections of the proposed classification, but they appear more pronounced as the full text is published. Summarizing them, they are: (1) The complicated and cumbersome character of the classification, (2) the cost of the clerical hire for keeping it up, (3) its non-adaptability to urban electric railway conditions and (4) the fact that so many charges would have to be estimated, especially on a small road, that the resulting statistics would be practically valueless.

The burden of maintaining such a classification, of course, becomes proportionately more onerous and the statistics less valuable the smaller the road; and when 116 accounts are applied to a road having a gross annual revenue of \$50,000, as proposed by the commission, the results are almost farcical. We do not intend in this issue of the STREET RAILWAY JOURNAL to criticize or analyze the proposed classification in detail. This may be taken up in a later issue of this paper. But we cannot help wondering how the accountant of a road with an income of \$50,000 is going to apportion monthly the proper charges for maintenance of buildings and structures among seven accounts, as required by the classification. According to the last census report on electric railways, the entire expenses under this division amount on the average to only 0.7 per cent of the total. With \$50,000 annual income, or, say \$40,000 expenses, the annual amount to be pro-rated monthly among these seven primary accounts is only \$280. Yet under the law the accounting force is obliged to charge to each of these seven accounts, viz.: Power generating plant buildings; power substation buildings; general offices; car houses and shops; stations, waiting rooms and other buildings; docks and wharfs; and miscellaneous buildings and structures expenses; the cost to each of all materials and labor, less salvage recovered. To the sub-general expense account of "Maintenance of Buildings and Structures" (total \$280 a year) must also be charged monthly the pay of the vice-president, chief engineer, engineer of maintenance of buildings, master carpenter, supervisor, etc., while directly in charge of the work, as well as rent of offices, light, heat, ice water, furniture and supplies for offices of officers whose pay is charged to this account; nor must the cost of running special trains of the officials mentioned be forgotten.

The work of the accountant of the \$50,000 road does not end here. Besides being the general office manager he is usually also the treasurer, cashier, bookkeeper, ticket counter and paymaster of the road, but he must not omit to prorate monthly among his way department, his over-

head line department, his buildings and structures department, his shop department and his transportation department all cost of superintendence, insurance and injuries and damages, chargeable against each. Stationery and printing has to be charged, according to use, to seven departments. Of course there will be but one lot of office furniture and stationery on the entire road, but the following are mentioned in the classification as some of the "more important articles" under this heading whose cost must be so separated between the seven departments according to their use in each: Adding machines, calendars, caligraphs, crayons, cyclo-styles, electric pens, glass pens, hektographs, mucilage, mucilage brushes, neo-styles, paper weights, pins, postage, rubber bands, sealing wax, sponges and water colors. Finally, lest the treasurer-accountant-bookkeeper-paymaster should find time hanging heavily on his hands, and lest he should not know where to get the money to pay for another car when one of his six wears out, he must not forget to charge into the proper depreciation expense account monthly the correct quota of the cost of each part of the equipment or to debit this account correctly in case new apparatus is purchased.

The situation described on the \$50,000 road applies almost as well to the \$200,000 road, but as the classification is still "tentative," we shall not now attempt to depict further the possible fields of activity of the future street railway accountant. When the replies brought out by the present circular are received, the national and State commissions will have a review of the situation and we hope will conclude that the practical needs of the case do not require the street railway companies to maintain accounts involving such minutiae of detail.

The Loop Problem in Chicago

Closely following the Arnold report on increasing the capacity of the New York Subway comes the report of the engineers employed by the Northwestern Elevated of Chicago dealing with the traffic congestion on the Union Loop, which subject Mr. Arnold also investigated for the city some years ago. This report on the Chicago situation will be found in another column in this issue. It was submitted last week and promptly sent to the Local Transportation Committee of the City Council as an outline of the changes which the Northwestern, individually, is prepared to carry out immediately. The other three roads using the Loop, the Metropolitan, Chicago & Oak Park and the South Side Elevated, have not yet signified their willingness to cooperate in such a rearrangement of operating methods on the Loop as is proposed, but it is significant and encouraging that the Northwestern, which owns the Union Loop outright and controls the Chicago & Oak Park, should be the first to make a definite proposition to the city in the shape of a comprehensive plan of relief.

The report proposes several radical changes in present methods of operation which, it is estimated, will nearly double the maximum capacity during rush hours. Chief among these are through routing for Northwestern and South Side trains, lengthening of station platforms and operation of six-car trains and further development of auxiliary stub terminals. All of these points, and some others, were touched upon in the second report of Mr. Arnold made some three years ago, but Mr. Arnold quali-

fied his suggestions on the subject of through routing by the words "if practicable." Therein lies the main difference between the two reports, the one under consideration beginning with this statement: "Based on a detailed examination of the present operating conditions on the Loop, * * * we believe that a plan of through routing can be adopted, even under diversified ownership." The Northwestern now stands committed to such a plan.

The through routeing proposed by Ford, Bacon & Davis differs in some essential features from that formerly suggested by Mr. Arnold. Through north and south trains would be run alternately in both directions on the two sides of the Loop, whereas Mr. Arnold's scheme provided for north bound trains only on the east side of the Loop and south bound trains only on the west side. The Chicago & Oak Park and Metropolitan trains would make the complete circuit of the Loop as at present and a system of universal transfers put into use at all Loop stations. Lengthening station platforms, running six-car trains and building auxiliary stub terminals outside of the loop district are made secondary to through routeing. Heretofore through routeing has not been thought possible with diversified ownership. The Northwestern by its action has driven the entering wedge into the defenses of the exponents of this theory. The tables are apparently turned, and if diversified ownership interferes with through routeing the remedy is consolidation. With all of the elevated roads under one management, with equipment standardized and schedules harmonized, the few remaining objections to through routeing would be more than balanced by the increased capacity to handle the ever growing traffic and the resulting increase in earnings.

High-Temperature and High-Pressure Steam

The subject of high-pressure steam highly superheated has been recently discussed by Mr. Langen in the *Zeitschrift ges. Turbinenwesen*. He starts out from the basis of the economy theoretically possible with the larger temperature ranges. This is quite fully granted by all steam engineers, but is not yet regarded as coming into the sphere of the practical in the way it appears so to present itself to Mr. Langen, who, however, does admit that a temperature of 400 deg. C. or 752 deg. F. is the maximum allowable for piston engines. Above this temperature there would be a bad effect upon the lubricant. It need not be inferred from this admission that the author claims that the lubricant can be heated to 752 deg. F. It may well be conceded that he realizes that no such temperature does reach the lubricant, for the steam first admitted is at once reduced in temperature, probably it is even condensed, and the piston is always sliding upon surfaces that have just been in contact with steam at exhaust temperature, and on the steam face the cooling following on expansion very speedily protects the oil left behind by the piston.

The ideal superheat is that which leaves a little superheat in the exhaust, for such a degree of superheat does entirely prevent cylinder condensation. It is stated that with an admission pressure of six atmospheres and the above temperature of 752 deg. F. and an exhaust at 0.10 atmospheres there will remain about 5 deg. to 7 deg. F. of superheat in the exhaust on a basis of 75 per cent thermodynamic efficiency, while if exhausting to atmosphere an

admission of 20 atmospheres pressure will give a superheated exhaust. With admission of over six atmospheres and working on the condenser it becomes requisite to add superheat to the exhaust of the high-pressure cylinder and this, it is suggested, may be done by the furnace gases, or by live steam, which might be superheated suitably to 932 deg. F. and would then enter the cylinder at 752 deg. F., losing 180 deg. F. to the high-pressure exhaust and adding nearly that amount to the temperature of the steam entering the low-pressure cylinder. By this system the efficiency will not be more than 2 per cent below that secured with an initial cylinder temperature (if such were possible) of 932 deg. F.

The author proceeds to argue on certain assumptions concerning the turbine. With 200 atmospheres' pressure and a temperature of 932 deg. F., a boiler efficiency of 80 per cent and exhausting down to 0.4 atmospheres, the thermodynamic efficiency being 75 per cent, an overall practical efficiency of 27 per cent may be reached and this is better than the overall efficiency of a gas power plant with a producer efficiency of 85 per cent and an engine efficiency of 31 per cent with 70 to 80 atmospheres. This represents about 0.77 lb. of coal per hp-hour.

This article shows to what length continental engineers are disposed to go both in the matter of pressures and of superheat. It may be that in the turbine such a pressure as 200 atmospheres could be secured, but the fact that it gives so little better efficiency over the already high pressure of 70 or 80 atmospheres is not at present very convincing of its commercial superiority. Practically all makers of steam engines on the continent of Europe employ some form of drop valve and many of them claim that they can utilize steam at 750 deg. F., which, as is pointed out above, does not mean any such temperature as regards the sliding surfaces of piston or piston rod when entering upon fresh cylinder surface or into glands, for the piston rod also is coming out of the gland into the hot steam and only enters the gland from colder steam. Only the valve is heated up to or nearly up to the full steam temperature and the valve may easily be of special nickel alloy and moreover has no rubbing surfaces.

In this connection another recent writer advocates nickel alloy for stop valves, nickel steel for spindles and a limit of 500 deg. F. for Corliss valves. Any higher temperatures should be dealt with by other types of valves.

In practice superheated steam does no work as superheated steam, for the work done during admission to the cylinder is done in the boiler, and the steam between the boiler and the piston is merely a push rod or strut piece. When the cut-off valve closes, the steam in the cylinder does begin to do work by expansion, but it is there reduced practically to the state of saturation. The gain is in the fact that there is less or no water now present, so the heat exchanges are minimized. Certain French boiler insurance companies have published tests which show an average saving from superheat of 10 per cent in steam and 11 per cent in coal with simple engines, and of 23 per cent in steam and 21 per cent in coal with compound engines, figures which seem to point to a saving of about 10 per cent for each cylinder in a series, though it seems doubtful if a third cylinder would keep up the same rate of increased economy.

RICHMOND & CHESAPEAKE BAY SINGLE-PHASE RAILWAY

BY JOHN R. HEWETT.

From many points of view the Richmond & Chesapeake Bay Railway is one of more than ordinary interest. It traverses a section of the State of Virginia that is rich in historical associations; and it has numerous features, in both its mechanical construction and in its electrical equipment, that are novel. Over and above this, the civil en-

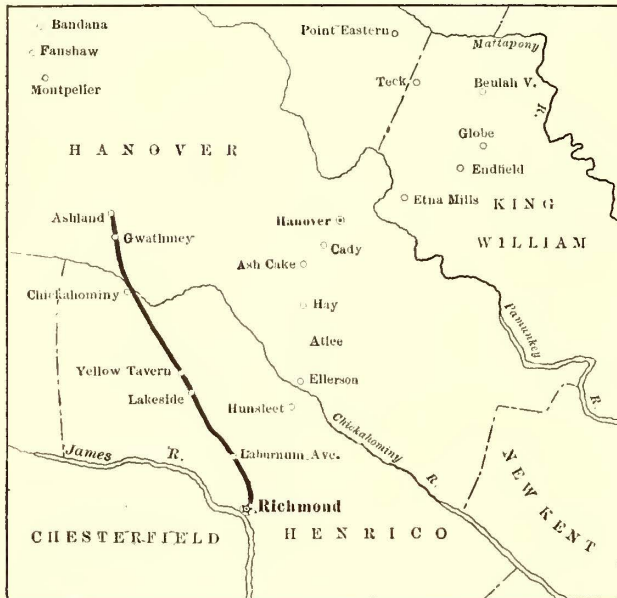


FIG. 1.—MAP OF THE RICHMOND & CHESAPEAKE BAY RAILWAY

gineering features surpass in interest any other single-phase trolley road yet put into operation.

The road at present extends only from Richmond, Va., to Ashland, in the same State, a distance of 14.8 miles (see map, Fig. 1). For the first half mile, starting from the Richmond terminal depot, the road passes northward through the suburbs of Richmond, which in this direction consists largely of negro tenements. This portion of the track is laid upon a reinforced concrete viaduct, which is a remarkably fine piece of construction work. The viaduct is 2800 ft. in length and in certain places reaches a height of 70 ft. from the ground level. The principal features of this viaduct were published in the STREET RAILWAY JOURNAL for March 30, 1907.

The terminal facilities in both Richmond and Ashland are such that they are more comparable with those of a steam road than those ordinarily found in connection with trolley roads. Apropos of this it may be mentioned that those interested financially in the Richmond & Chesapeake Bay Railroad have always been closely associated with steam railroads, and in more than one instance a reflection of steam railroad practice can be distinguished. Both the Richmond and Ashland terminal depots will receive special attention in the latter part of this article.

As regards the electrical features of the road, special interest will be centered in the motors, as these are of the General Electric Company's latest pattern for single-phase working, and the fact that the trolley voltage is exactly double that used in connection with earlier single-phase railways will show to what a marked degree the use of higher trolley potentials is being pushed. The use of the pantograph trolley with a steel pan is also worthy of special note.

The future extension of the Richmond & Chesapeake

Bay Railway must at present be largely a matter of conjecture. At the same time it is highly probable that the first extension built will be a connecting line between Ashland and Tappahannock. Tappahannock is on the Rappahannock, and a road connecting this city with Richmond would traverse a country rich in agricultural products and as yet unserved by any system of transportation. Tappahannock is further the seat of a large fishing industry, the marketable products of which must be taken by boat to Norfolk or Baltimore, this part of the journey consuming a whole day by boat. The construction of the road through this territory would open up a large and profitable freight business between these as yet unserved districts, and such important cities as Richmond, Washington, Baltimore, etc.

GENERAL SCHEME OF ELECTRIFICATION

The general scheme of electrification on the Richmond & Chesapeake Bay Railway is as follows: Current is generated in the Twelfth Street power house of the Virginia Passenger & Power Company and transmitted in underground cables to the trolley at the Richmond terminal depot. The pressure on both the transmission system and the trolley is 6600 volts, there being no transformation. There are no sub-stations for operating the railway, but a lighting sub-station is situated at the Ashland terminus.

ROLLING STOCK

At present the rolling stock of the Richmond & Chesapeake Bay Railway consists of four motor cars.

The electrical equipment of each car consists of a full complement of multiple unit, type "M," Sprague General Electric control apparatus and four GEA-603-A railway motors designed for single-phase working.

CONTROL

The control is of very special interest, mainly on account of the features that make it a "duplicate control." The apparatus is arranged and installed in such a manner that each pair of motors and the compensator, together with their respective contactors, etc., form an equipment which is practically independent of the other two motors and their compensator, etc. This ar-

range has the great advantage that, should a motor or pair of motors, or a compensator, or in fact any piece of apparatus constituting part of the equipment, become damaged or defective by an accident or from any other cause, the car can be operated as a two-motor equipment by simply throwing one blade of the double knife disconnecting switch. A diagram giving the wiring connections for this is published in Fig. 2. A dotted line has been drawn through this diagram to show that as far as the motor control is concerned there is a complete and independent two-

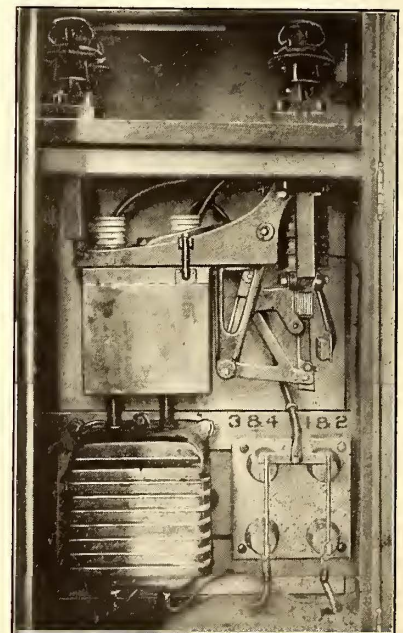


FIG. 3.—INTERIOR VIEW OF HIGH-TENSION CABINET IN CAR

motor equipment on either side of this central line; the above remarks do not apply to the auxiliaries, such as heating and lighting, etc. Double throw switches are provided

The tanks are built of fluted steel and the cables are introduced into the interior through stuffing boxes.

So far as the actual apparatus used in the control system

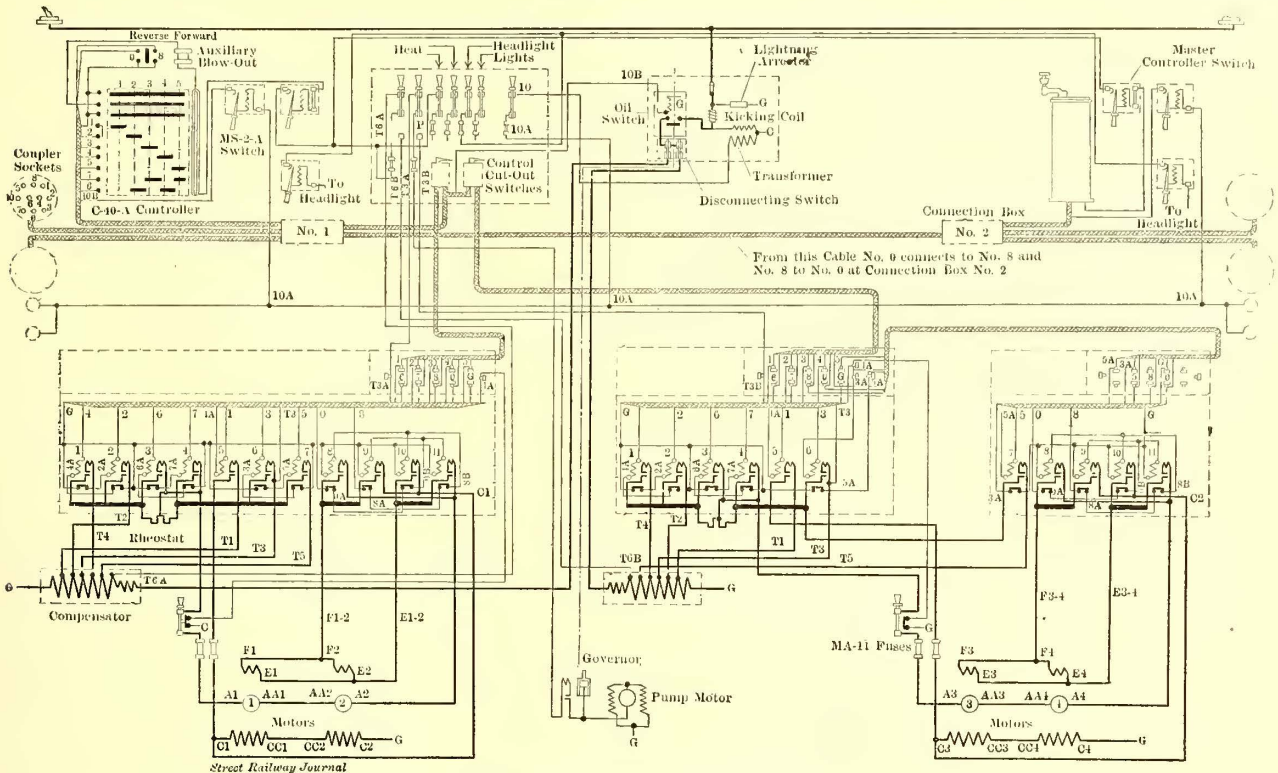


FIG. 2.—WIRING DIAGRAM OF CAR

for transferring the auxiliary circuits from one compensator to the other.

These are the first General Electric equipments put into operation with two compensators, the nomenclature of

is concerned it is practically standard throughout. The master controller is a type C-40-A, and the contactors have been described in previous articles when dealing with other a. c. roads.

All the high tension apparatus in the car is installed in an asbestos lined high tension cabinet. Fig. 3 is an illustration of the interior of this, but unfortunately does not show the expulsion fuse which is at the top of the cabinet. The apparatus installed in this cabinet is as follows:

- One main fuse of the expulsion type.
- One set lightning arresters.
- One oil switch.
- One small transformer for operating oil switch.
- One pair disconnecting switches.

MOTORS

The motors, as has been previously stated, are of special interest, as they are of the series repulsion type. Each has a rated capacity of 125 hp and there are four motors on each car. Some notes on this motor have been published in this paper in connection with the description of the Washington, Baltimore & Annapolis Railway in the issue of Feb. 15, and in Mr. Alexanderson's paper before the A. I. E. E. In practice on the Richmond & Chesapeake it has been found that by the incorporation of the repulsion motor feature at starting and by the fractional pitch winding of the armatures excellent commutation has been secured. The distribution of losses in the motor, that is, the relation between the core and the I²R loss, is approximately the same as those of the d. c. railway motor, so that it is capable of sustaining high overloads without damage. This overload capacity is due to the fact that the whole space in the slots is available for copper and that there is no excessive heating as would be the case if high resistance leads were used.

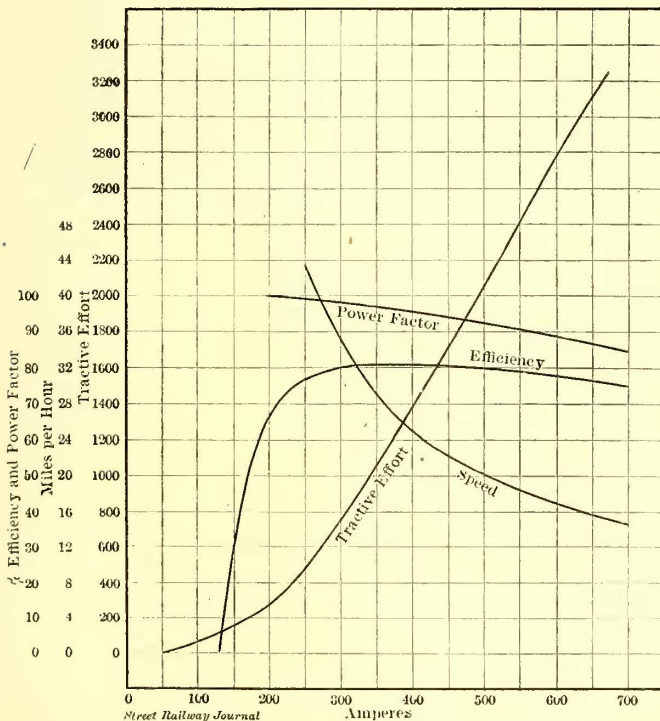


FIG. 4.—CHARACTERISTIC CURVES OF MOTOR

which is RK-508, Form B, oil-cooled railway compensators. They are designed for 6600 volts at 25 cycles, and are provided with taps to give 600, 450, 400, 340, 280 and 113 volts. The 600-volt taps are used on the auxiliary circuits only.

Under actual running conditions after the commutators have been in use for some months it is found that they are polished to a chocolate color, and show no signs of pitting

locomotive to a train of five Norfolk & Western standard railway passenger coaches, carrying 300 passengers, and the four motors hauled this load with perfect ease. To test their capacity still further, two motors were cut out and the remaining two motors started this same train on a 1 per cent grade. This performance speaks more than could a column of figures for the capability of this new type of motor.

The characteristic curves given in Fig. 4 will show the efficiency, speed, power factor and traffic effort of the motor and Fig. 5 an external view.

TROLLEYS

Each car is furnished with two pantograph trolleys, the general shape of which will be seen in Fig. 6. These trolleys are constructed with steel pans, which material has been found to give much greater satisfaction than either copper or aluminum. The pans are grooved for the reception of a lubricant. The life of these pans will be a matter of considerable interest, but actual figures cannot be obtained until the road has been in operation longer.

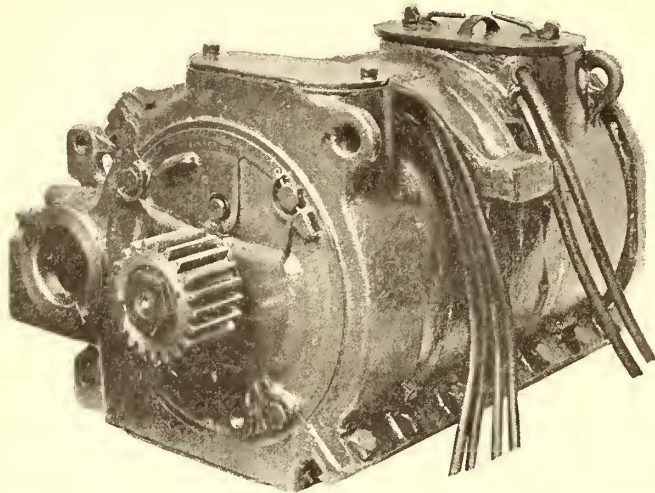


FIG. 5.—EXTERIOR VIEW OF MOTOR

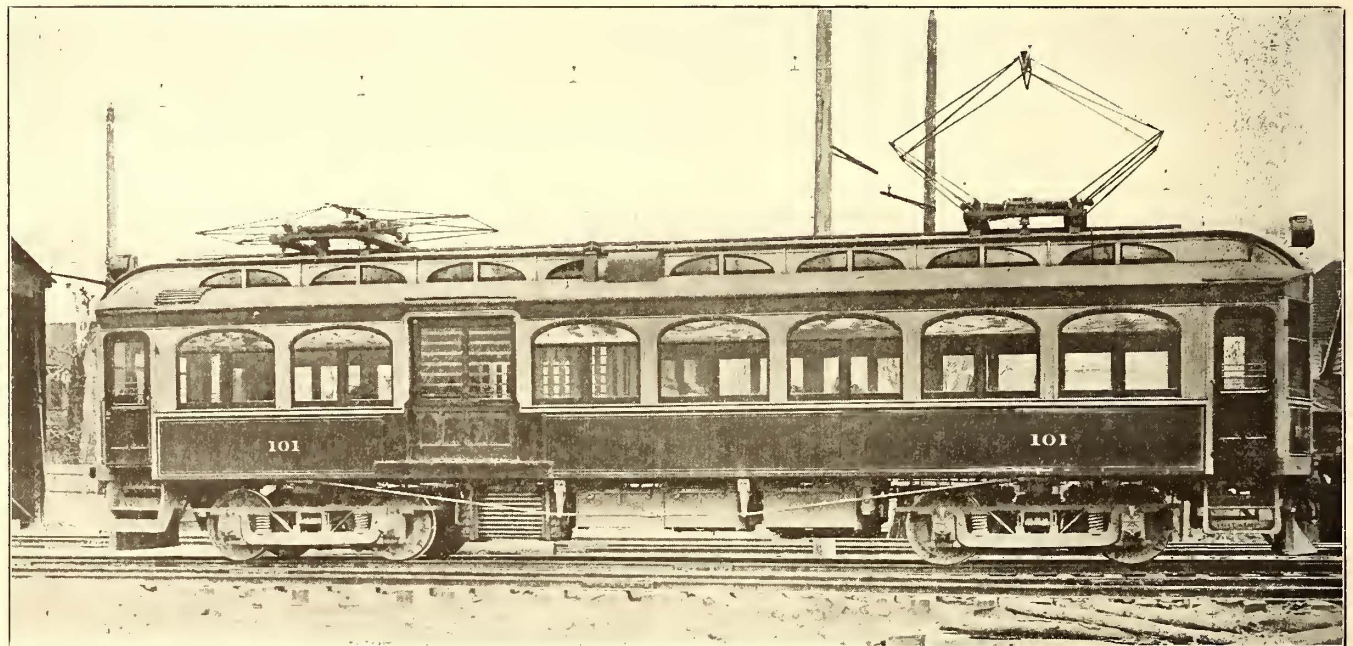


FIG. 6.—VIEW OF CAR, SHOWING PANTOGRAPH RAISED AND LOWERED

from sparking, and service operation indicates a brush life of from 15,000 to 20,000 miles.

The capacity of these motors is well illustrated by a run

CAR BODY

The car bodies were built by the St. Louis Car Company and differ in some essential details from those ordi-

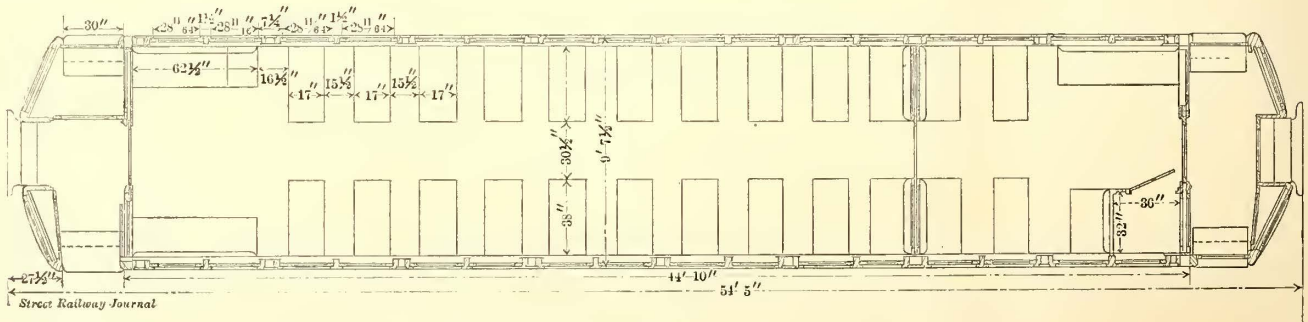


FIG. 7.—PLAN OF CAR, RICHMOND & CHESAPEAKE BAY RAILROAD

that was made for the purpose of taking a large party of people from Richmond to Lake Side. On this occasion there were not sufficient electric cars available, so one car equipped with four of these motors was coupled up as a

ordinarily used on trolley roads. They very closely resemble the standard Pullman car as used in steam road service. The present equipment consists of four cars, two ordinary passenger cars and two combination passenger and bag-

gage cars. Each car has separate accommodation for white and colored people. The principal dimensions are as follows:

Length over all, 54 ft. 5 in.

Height over all, 13 ft. 5 in.

Width over all, 9 ft. 7½ in.

Seating capacity, 64 (combination passenger and smoking car).

Seating capacity, 48 (combination passenger and baggage car).

Weight of car body, 46,000 lb.

Distance between truck centers, 30 ft. 3 in.

The plan Fig. 7 will show the general arrangement, and it will be noticed that the cars are exceptionally broad. The external appearance of the combination passenger and baggage cars is shown in Fig. 6, while Fig. 8 is a view of the end of the car. From this illustration it will be seen that the vestibules are similar to those of the standard

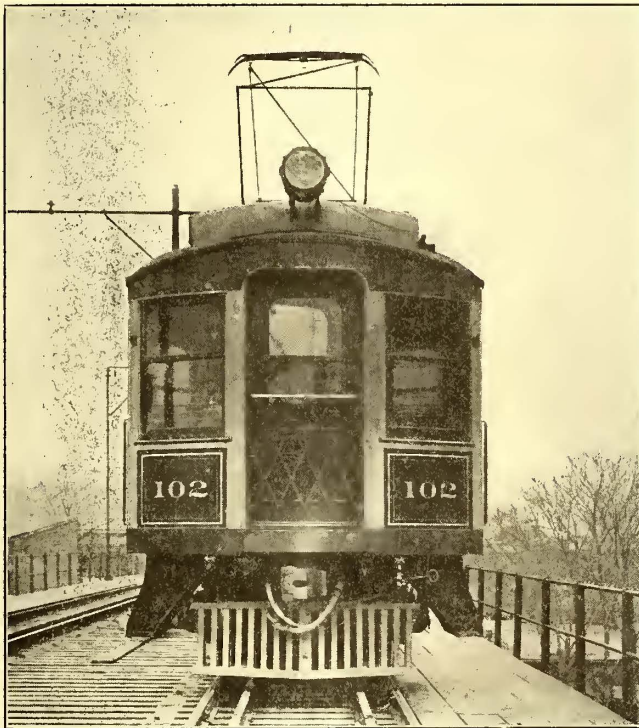


FIG. 8.—END VIEW OF CAR

Pullman coach, providing a continuous central aisle through a train of cars. The MCB type of coupler is used, and a pilot of the standard locomotive pattern is provided at each end. Fig. 9 shows the interior of the car.

The bottom framing of the car is a combination of steel and wood. The side sills are 5 in. x 8 in., and these are reinforced with 6-in. channels. The channels are bent around the under sills, and are bolted to the intermediate I-beams which form the center sills. The body framing is of ash and has double side posts, while the outside is sheathed with narrow poplar boards.

TRUCKS

The trucks are of the inside suspension type and were manufactured by the Baldwin Locomotive Company. Their principal dimensions are given below:

Wheel base, 7 ft. 6 in.

Wheels, 38 in. diameter.

Axle, 6½ in. at center, 7¾ in. at gear seats.

Journals, 5 in. x 9 in.

Weight of each truck, 15,470 lb.

The wheels have the MCB section and the tires are 2½ in. in thickness. A view of one of these trucks before the motors were mounted is shown in Fig. 10.

AIR BRAKES

The cars are equipped with Westinghouse A. M. M. air brakes which can be operated as an automatic system



FIG. 9.—INTERIOR OF CAR

similar to that in use on steam roads, and also have the feature of graduated release which is found in the straight air brake system. These brakes incorporate all the automatic features used on steam roads, and can be coupled up directly with standard equipments.

POWER

The Richmond & Chesapeake Bay Railway has purchased its own generating apparatus, but up to the present date has built no power station. Instead it has entered into an agreement whereby its apparatus is installed in the Twelfth Street power house of the Virginia Passenger & Power Company. This power plant must therefore be looked upon as representing that of the road under consideration, and will be described in so far as it affects the Richmond & Chesapeake Bay Railway.

Fig. 11 shows a transverse section through the Twelfth Street power house and will make it apparent that the general arrangement of the generating apparatus is a departure

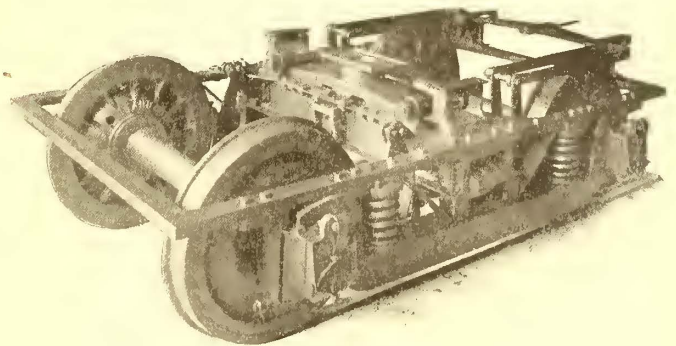


FIG. 10.—VIEW OF TRUCK

from usual practice. Each generator is coupled direct to a hydraulic turbine at one end of its shaft and to a reciprocating steam engine at the other. The method by which the generator is driven is determined by the water supply available. To disconnect the generator from the hydraulic turbine the bolts are removed from the flange coupling.

The Twelfth Street power house is built on the banks of the James River just below the cataracts at Richmond, a dam having been built a little higher up the river to provide the water storage. The capacity of the James River is a very variable quantity, and it was this factor that

engines each of 1000-hp capacity. Each engine has cylinders 20 in. and 40 in. x 42 in. stroke, and is direct coupled to a General Electric MP-750-kw d. c. generator. In addition to these there are four other generating sets. It will be noticed in Fig. 11 that economy in space is effected by

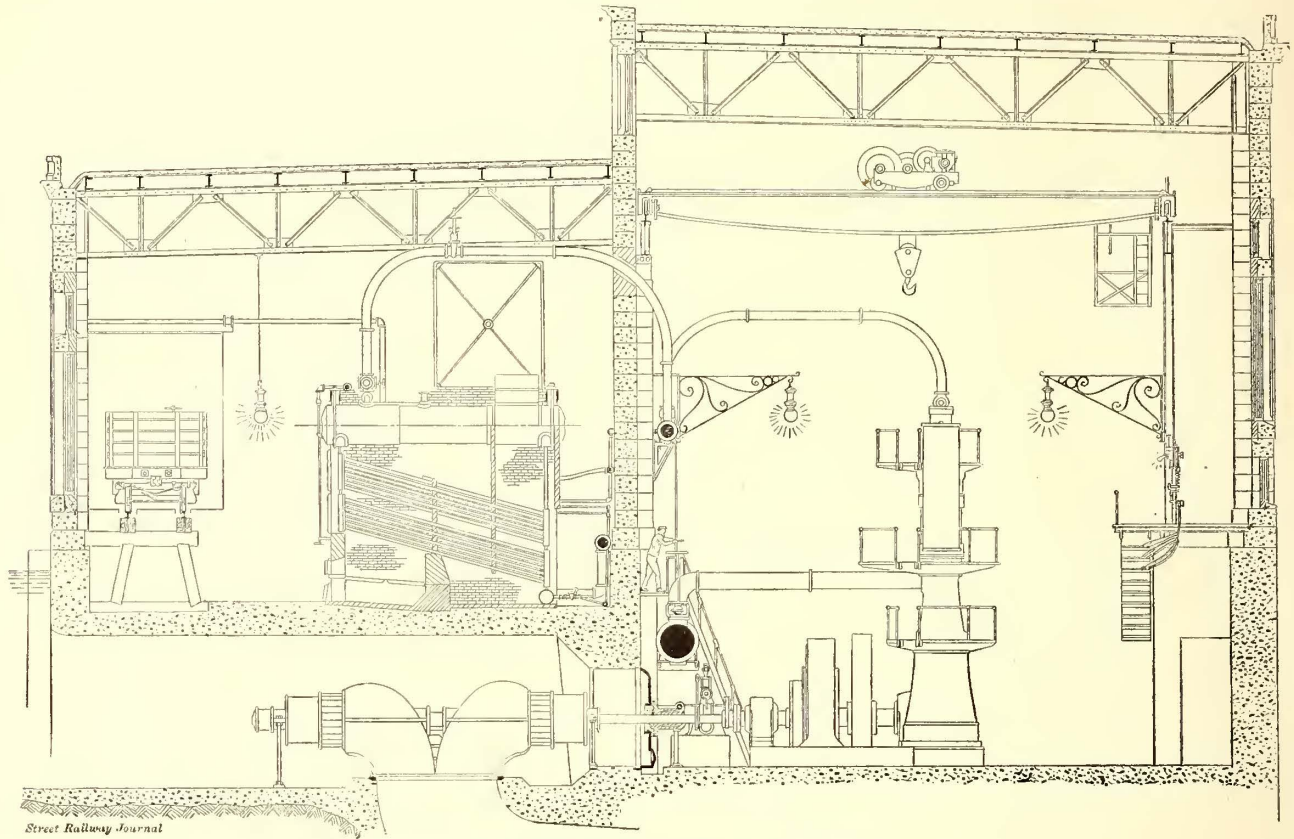


FIG. 11.—TRANSVERSE SECTION OF POWER HOUSE

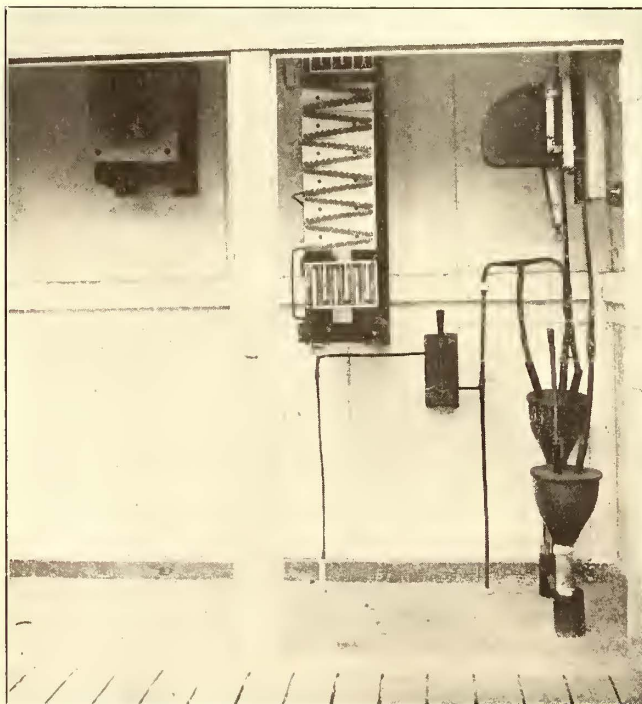


FIG. 12.—INTERIOR VIEW OF HIGH-TENSION CABINET IN RICHMOND TERMINAL DEPOT

necessitated the installation of steam engines in addition to the hydraulic turbines.

The most important items of machinery in the power house are five Edward P. Allis vertical compound tandem

installing the turbines under the boiler room. The boilers installed consist of six Babcock & Wilcox water tube units, each of 500 hp, and these supply steam at 145 lb. pressure. All the switchboard and switching apparatus for controlling the electrical energy generated by the above machinery was manufactured by the General Electric Company.

The machinery owned by the Richmond & Chesapeake Bay Railway and installed in this power house is of special interest owing to the manner in which it is driven, and the provision made for securing operation under varying conditions at the power house. The railway company has two 750-kw, 25-cycle, three-phase generators running at 128.5 r.p.m. and designed to give 6600 and 13,200 volts. One of these generators is direct connected to a 1450-hp hydraulic turbine at one end of the shaft, and to a 750-kw, 60-cycle, 2300-volt, three-phase generator at the other end,

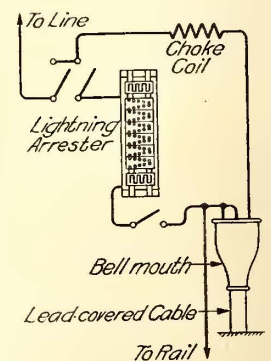


FIG. 13.—WIRING DIAGRAM OF HIGH-TENSION CABINET IN RICHMOND TERMINAL DEPOT.

both of the electric units being mounted on a common base and direct connected, forming a motor generator set. In this case, should there be insufficient water to operate the water turbine, the three-phase, 60-cycle generator is used as a motor. The other 25-cycle generator is coupled to a water turbine in a similar manner, but is mounted on a common base and direct connected to a 750-kw direct-cur-

rent generator, the latter machine being used as a motor in the event of its being necessary to operate this 25-cycle generator electrically.

By the above it will be seen that when the railway company's generators are operating by water power the alternating current and direct current generators can be used for city lighting. To sum up, the railway company's generators can be driven by water power, by 60-cycle alternating current or by direct current. Under the present operating conditions only one phase of the 25-cycle, three-phase generators is used to supply single-phase current at 6600 volts.

The switchboard panels owned by the railway company and installed in the Twelfth Street power house for controlling the output for the two 750-kw, 25-cycle generators are as follows:

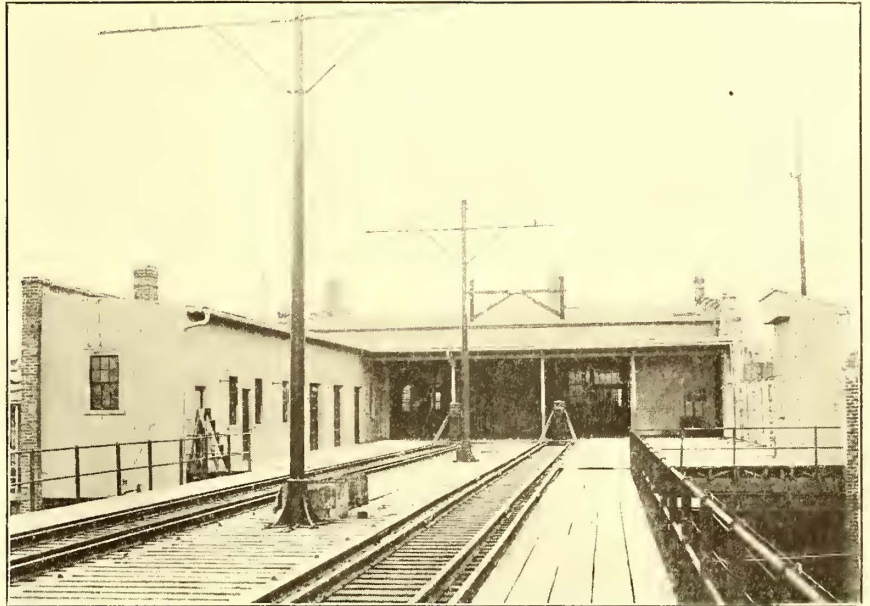


FIG. 14.—OVERHEAD CONSTRUCTION, RICHMOND TERMINAL DEPOT

Two 500-kw, 6600-volt, single-phase generator panels.
 One 1000-kw, 6600-volt, two-circuit (500 kw each) single-phase feeder panel.

The panels are of blue Vermont marble and are provided with the requisite indicating and measuring instruments, all of which are of the General Electric Company's manufacture.

TRANSMISSION

Under the present conditions of operation there is no high tension transmission system on the Richmond & Chesapeake Bay Railway in the generally accepted meaning of that term. The current is transmitted from the power house to the Richmond terminal depot at 6600 volts, which is the same pressure as is used on the trolley. The transmission cable is laid under ground in a vitrified earthenware conduit. The distance from the power house to the terminal depot is approximately 1.6 miles. The cable is a lead covered insulated cable with three cores, each core

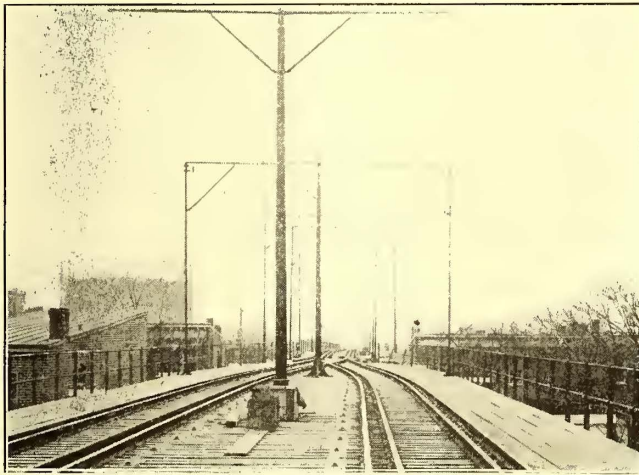


FIG. 15.—OVERHEAD CONSTRUCTION ON TERMINAL APPROACH

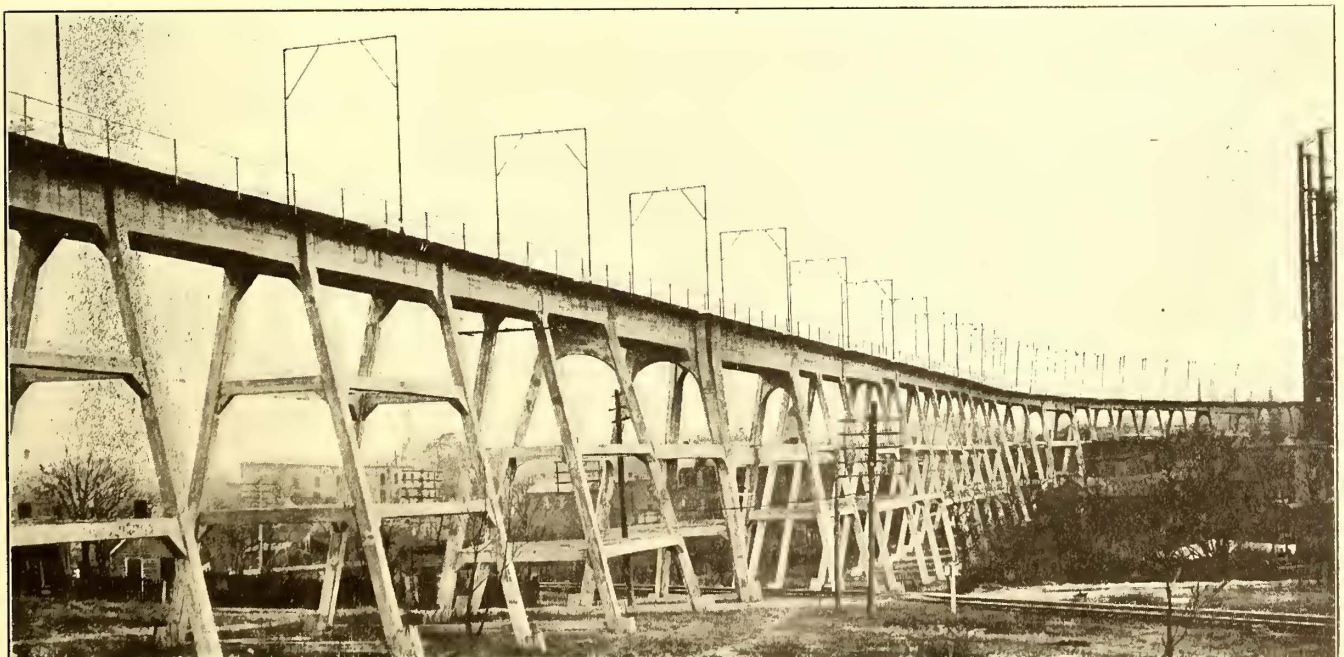


FIG. 16.—OVERHEAD CONSTRUCTION OF CONCRETE VIADUCT

having a capacity of No. 0, B&S; one core is used for feeding the current from the power house to the terminal depot and the others are tied together to serve as a return and are connected to the running rails.

OVERHEAD CONSTRUCTION

The trolley, as has now become the standard practice for high tension working, is of the catenary suspended type. The trolley itself is a No. 0000 groove copper wire, while the messenger cable is of steel; it has seven strands. The over-all diameter of the messenger is $\frac{3}{8}$ in. and it has a tensile strength of 11,000 lbs. A point of interest is to be found in the fact that the working potential of the trolley is 6600 volts. The periodicity is 25 cycles per second.

On the first section of the road, between the Richmond depot and the car barns, the track is laid on the reinforced concrete viaduct; the trolley on this section is supported by a system of steel spans, while for the remainder of the distance bracket supports have been adopted.

Fig. 14 will give a good conception of the trolley construction at the terminal depot; it shows the anchorage of the double brackets used at this point, and in addition shows the feeder coming from the high tension cabinet. (The inside of this high tension cabinet has previously been illustrated in Fig. 12.) It may be mentioned here that the iron hand rails seen in Fig. 14 are all thoroughly grounded.

Fig. 15 shows the special work at the end of the depot, where the double platform tracks converge into a single track, while Fig. 16 is a general view of the construction adhered to for the remaining length of the viaduct.

The line diagram, Fig. 18, shows the details of this span construction. It will be seen that the vertical columns are 3-in. steel pipes, while the horizontal bar is of the same material, but one inch smaller in diameter; the connection between these bars is made by malleable iron elbows. The

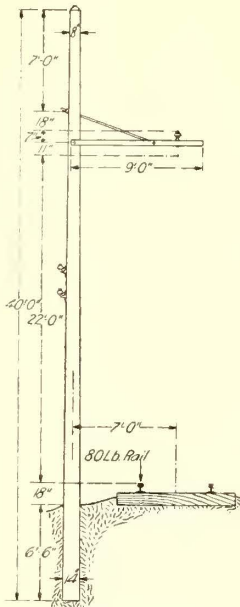


FIG. 17.—BRACKET CONSTRUCTION

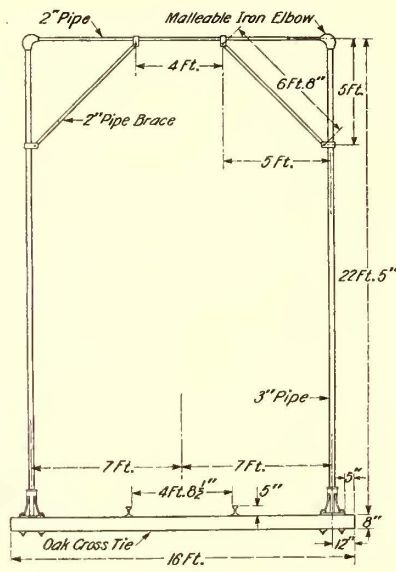


FIG. 18.—SPAN CONSTRUCTION, RICHMOND TERMINAL



FIG. 19.—CATENARY CONSTRUCTION, SHOWING STEADY BRACES

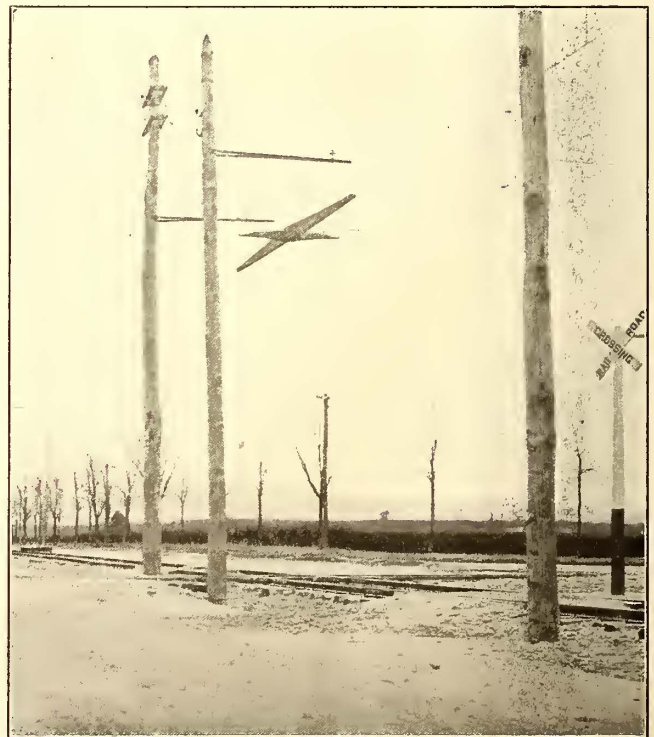


FIG. 21.—VIEW OF INSULATED CROSS-OVER

At the Richmond terminal depot the cable enters a high tension cabinet where the feeder core passes through a choke coil before passing out to the trolley. This high tension cabinet also contains the lightning arresters and switches. Fig. 12 is from a photograph taken of the interior of this high tension cabinet, while Fig. 13 shows the electrical connections diagrammatically.

manner of bracing will be seen in the same illustration. The ties for carrying this construction are of extra length, being made of oak 16 ft. in length, with a cross section of 8 in. x 14 in. The sockets for holding the verticals rigidly in position are of cast iron. They are 14 in. in width and have a bearing surface on the ties of approximately 196 in. The distance from center to center of

bolts is 11 in. The bore of these sockets is $\frac{1}{2}$ in. greater than the external diameter of the verticals; the remaining space between the verticals and the castings when the poles are in position being filled with lead and cement. The height of the span from center of cross pipe to the top of ties is 22 ft. 5 in., while the breadth from center to center of the verticals measures 14 ft. The method of suspending the catenary trolley from this structure is clearly seen by referring back to Fig. 15. The spans are spaced 60 ft. apart on tangents and 30 ft. apart on curves.

The overhead construction from the end of the viaduct to the terminus at Ashland is of the bracket type and the most essential features are given in the line drawing pub-

of staggering the trolley where this is desirable. The method of fixing to the poles will be seen by the illustration.

Brackets built up in this manner from lengths of angle iron have great horizontal stiffness which materially as-

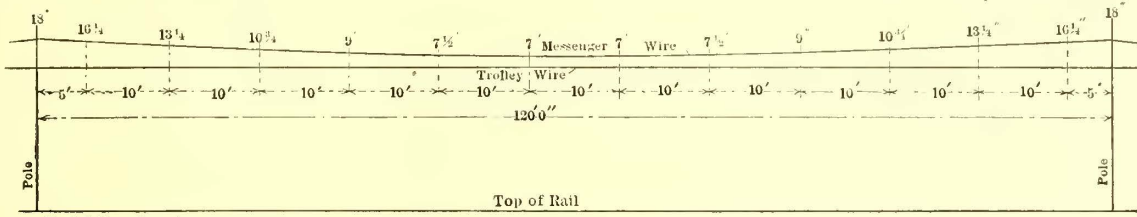
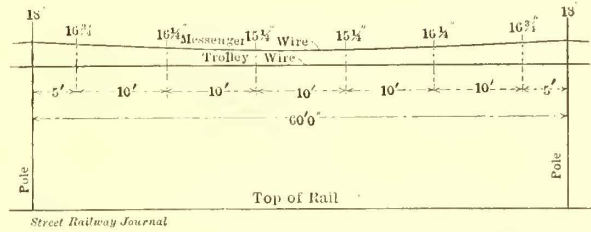


FIG. 20.—DIAGRAMS SHOWING LENGTH OF CATENARY HANGERS WITH DIFFERENT LENGTHS OF SPAN

lished as Fig. 17. It will be noticed that the poles are 40 ft. in height and that the trolley is supported 22 ft. from the rail level. The center line of the bracket is 22 ft. 11 in. from the rail level. These brackets are of standard General Electric make, and are built up of two angle irons each of the following dimensions: 2 in. x $1\frac{1}{2}$ in. x $\frac{1}{4}$ in. The two lengths of angle iron are joined at the extreme

sists in the initial installation of the messenger and permits an even sag being easily obtained. This stiffness is also of great moment in the event of a breakage in the line, as the trolley and messenger remain undisturbed beyond two or three spans from the break.

Fig. 19 is a good illustration of the steady braces in service. These are also standard General Electric line material. They are built up of a porcelain insulator and a length of well seasoned hickory wood. They are furnished at one end with a malleable iron hinged joint and at the other end with a malleable iron goose neck provided with an ear for gripping the grooved trolley wire. The method

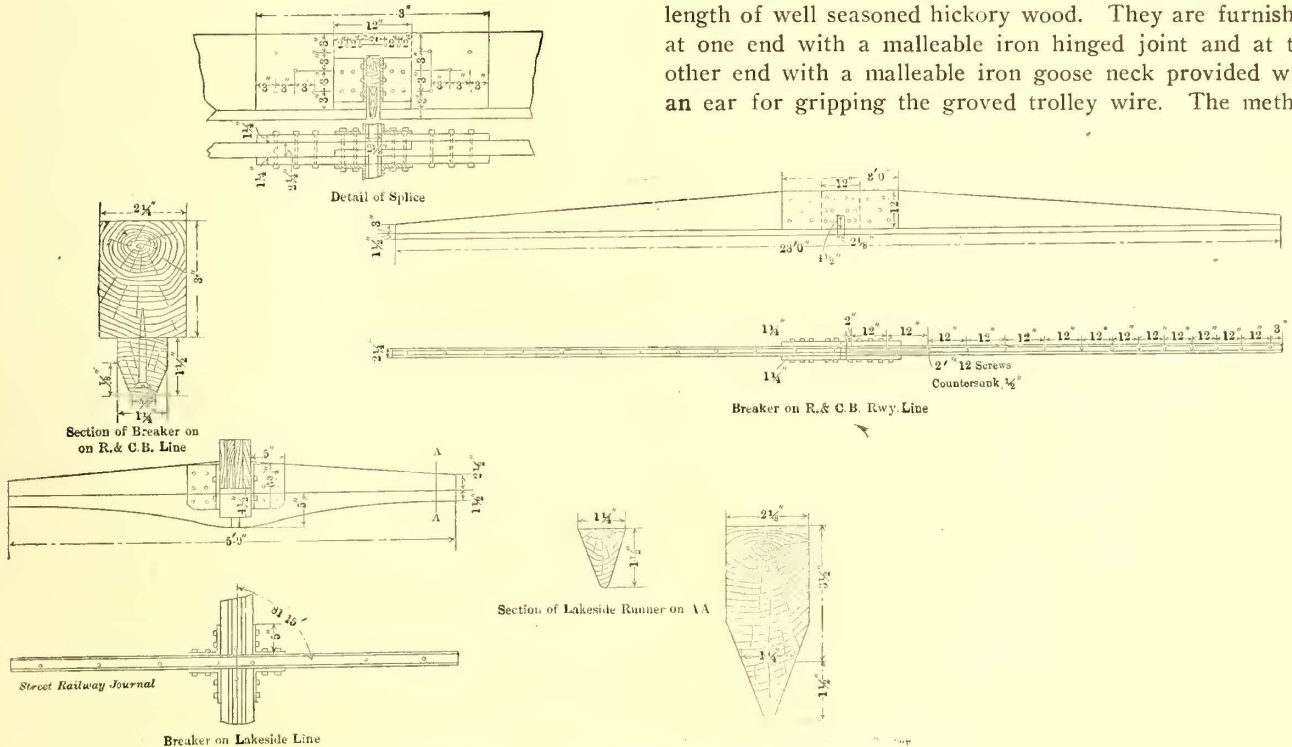


FIG. 22.—DRAWING SHOWING DETAILS OF INSULATED CROSS-OVER

end remote from the pole by means of a space block and rivet, and also by a second space block situated at approximately 2 ft. from the riveted end. This second space block serves to hold one end of the guy rod used to support the bracket from the pole. The slot, formed by the two angle irons between these blocks, serves as a means of adjusting the insulator pins to bring the messenger and trolley in alignment with the track; it also provides a means

of attaching these to the bracket will be seen in the illustration last referred to.

The insulators were supplied partly by the General Electric Company and partly by Locke. They are $4\frac{1}{2}$ in. in height and $6\frac{3}{8}$ in. in diameter and were tested up to a pressure of 50,000 volts.

The messenger clips and hangers are built up of a galvanized iron bar $\frac{5}{8}$ in. in diameter, threaded at both ends.

A standard ear is screwed to one end and a sister hook to the other. These were supplied by the Ohio Brass Company. A diagram, giving the length of hangers used on 120-ft. spans and on 60-ft. spans is shown in Fig. 20. It will be seen that in all cases the spacing of the hangers is 10 ft. The figures given on this diagram refer to the

low tension trolley pole ever coming in contact with the 6600 volts.

In this insulated cross-over the insulated section of the 6600-volt trolley is made 23 ft. in length, which affords ample protection should a trolley pole leave the wire and swing round at right angles. The length of the shorter or d. c. insulated section is 5 ft. 9 in. The roads do not cross at exactly 90 deg. but at 81 deg. 51 min. The material used in the construction of this insulated cross-over is well seasoned white hickory wood. The d. c. or shorter section is continuous to permit the trolley wheels having a free passage, while a small gap is made in the larger section which is easily bridged by the pan of the high tension a. c. pantograph trolley. The details of design, together with the dimensions, will be seen by reference to Fig. 22.

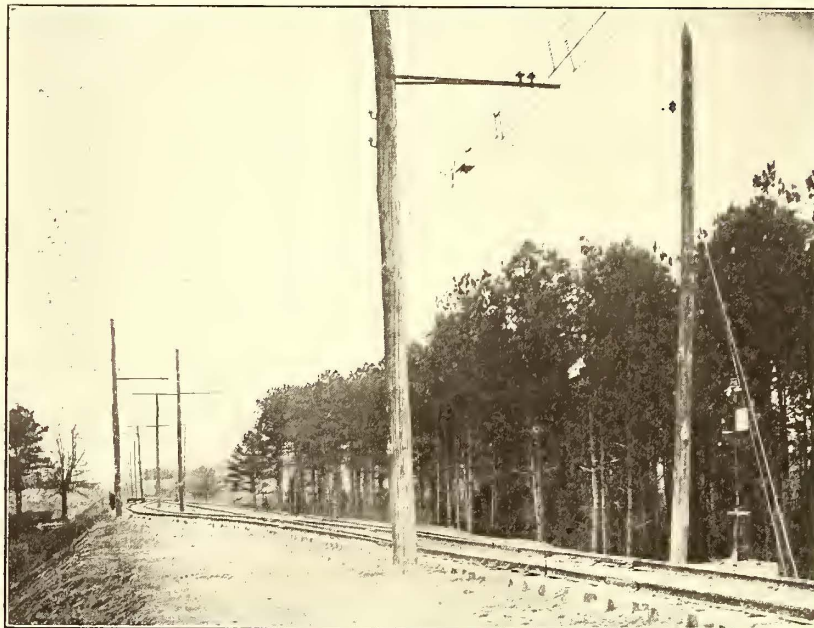


FIG. 23.—VIEW OF CATENARY CONSTRUCTION OF TURNOUT

length between centers of the messenger cable and trolley wire. The poles are spaced 120 ft. apart on level tangent track and 60-ft. spacing is adopted at curves and highway crossings.

An important piece of special overhead construction work is shown in Fig. 21. This view was taken at the

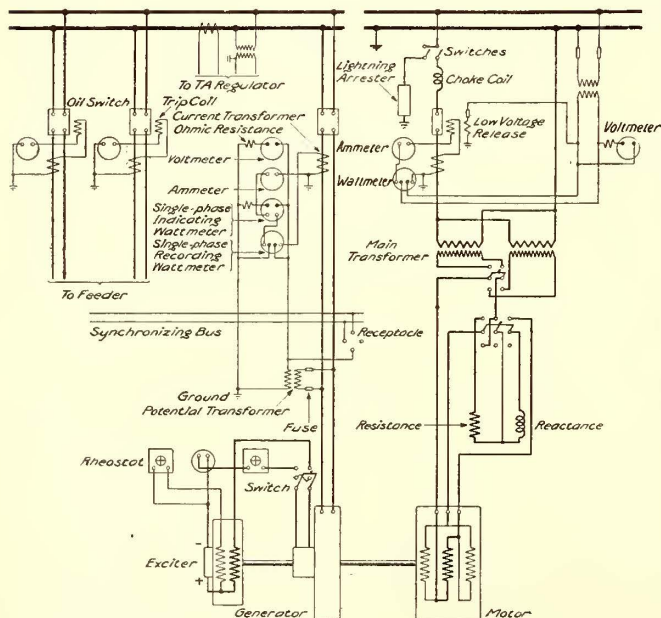


FIG. 24.—WIRING DIAGRAM OF ASHLAND SUB-STATION

junction of Laburnum Avenue and Brook Road, where the Richmond & Chesapeake Bay Railway crosses the lines of the Virginia Passenger & Power Company. The trolley of the one road operates at 6600 volts and that of the other at only 600 volts, and therefore it is necessary to take special precautions to eliminate any possibility of the

Fig. 23 is a view taken of the Lake Side turnout and gives a good impression of the overhead construction adopted at sidings and turnouts throughout the road. The switch pan, to aid the pantograph in passing from one trolley to the other, will be noticed. This pan is made of steel. It is possible that this type of construction may be superseded by deflectors built up of lengths of copper wire.

ASHLAND SUB-STATION

The Ashland sub-station is unique inasmuch as its function is to provide for the lighting of the town of Ashland from the high tension single-phase trolley of the Richmond & Chesapeake Bay Railway. A study of the wiring diagram given in Fig. 24 will best serve to explain how this is accomplished. It will be seen that the 6600-volt trolley



FIG. 26.—LONGEST SPAN OF REINFORCED CONCRETE VIADUCT

is tapped to feed the high tension busses from which leads are taken to the high tension side of the transformers. These transformers reduce the potential from 6600 to 440 volts; leads are taken from the low tension transformer terminals and pass through a phase splitting device, which consists of a reactance and resistance, before being connected to a single phase a. c. induction motor. This induction motor forms one unit of a motor generator set, the other machine mounted on the same base being a single

phase generator. The single phase generator supplies current to a 2300-volt bus from which the feeders to the lighting system are tapped.

A brief specification of the electrical apparatus installed in the substation is as follows:

(1) The transformers, two in number, are type "H," 25-cycle, 150-kw, single-phase units, wound to transform current at 6600 volts to 440 volts. They are oil cooled.

(2) The reactance, or as it may more properly be called the split phase starting device, consists of a certain amount of ordinary grid resistance and reactance (the method of connections will be seen by reference to the wiring diagram).

(3) The motor generator set consists of a 150-hp, 25-cycle, 440-volt, single-phase induction motor, coupled direct to and mounted on the same base with a 100-kw, 2300-volt, 60-cycle, single-phase generator. The

The switchboard consists of the following:

One 150-hp, 6600/440-volt, single-phase induction motor generator panel.

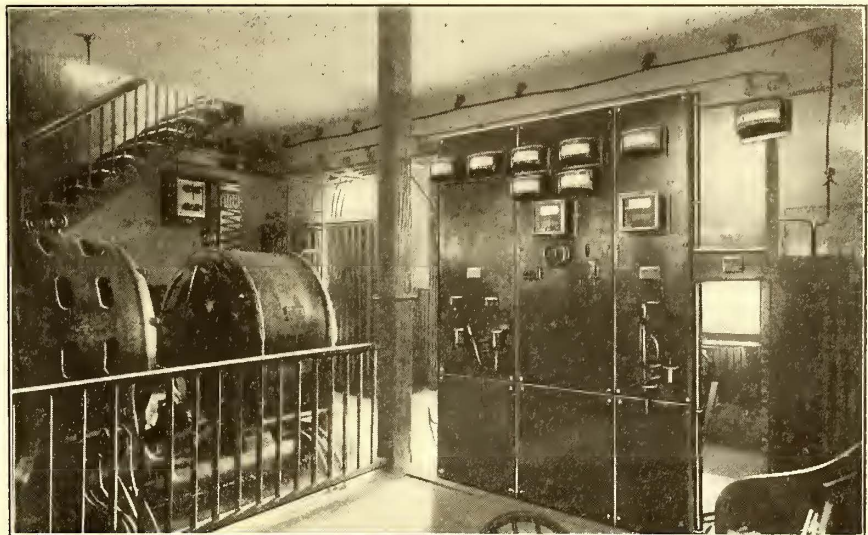


FIG. 25.—INTERIOR OF ASHLAND SUBSTATION

One 100-kw, 2300-volt, single-phase generator panel.
 One 2300-volt, two-circuit, single-phase feeder panel.
 One 150-hp, single-phase induction motor starting panel.
 One 175-volt voltmeter on swinging bracket.
 One type p. a. voltage regulator on bracket.
 One 12,500-volt single-phase multiplex lightning arrester with disconnecting switch, choke coil and switch hook.

The oil switches are of the type "K2" s. p. t. for 6600 volts and are enclosed in cells constructed of brick with fiber doors. All the machinery, switchboards and indicating and measuring instruments are of General Electric manufacture.

The illustration in Fig. 25 will show, as well as is possible in a photograph, the interior of the substation and the respective location of the apparatus. A description of the building itself will be given later when dealing with the terminal facilities as the substation is embodied in the Ashland terminal depot.

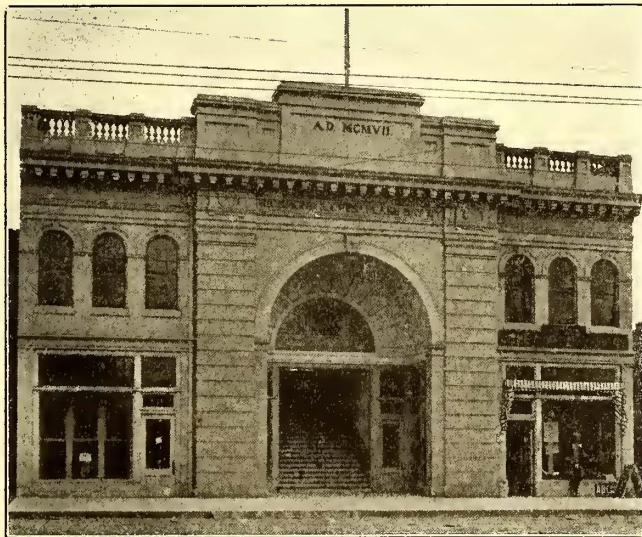


FIG. 27.—EXTERIOR VIEW OF RICHMOND TERMINAL DEPOT

running speed of the set is 720 r.p.m. A 4-kw, 125-volt exciter is mounted on the common shaft at the generator end.

From the foregoing it will be seen that the current enters the substation at a potential of 6600 volts and 25 cycles, that it is transformed to 440 volts and fed to the single-phase motor generator set, which delivers 60-cycle current at a pressure of 2300 volts, at which pressure and frequency the leads leave the substation for lighting purposes.

The important feature of this substation is the voltage regulation. This is accomplished by the use of a Tirrill regulator in the Twelfth Street power house and another at the Ashland substation. The results have been satisfactory and this speaks well for the capabilities of the Tirrill regulator. In all probability it is the first time that an attempt has been made to feed a lighting system from a high tension single-phase trolley subjected to severe fluctuations of load.

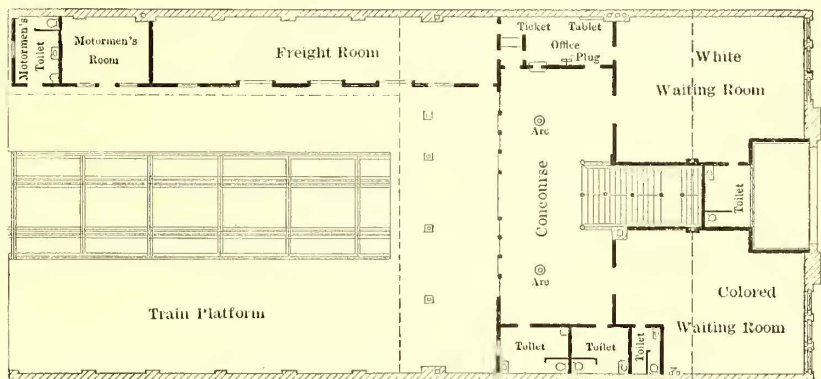


FIG. 28.—GROUND PLAN OF RICHMOND TERMINAL DEPOT

TRACKS

The Richmond & Chesapeake Bay Railway is a single track road with turnouts to provide for cars traveling in opposite directions. It is 14.8 miles in length and is laid for the whole distance with A. S. C. E. standard 80-lb.

rails. The ties are of white oak and measure 7 in. x 8 in., with a length of 8½ ft. The rails are spiked to the ties in the customary manner, and on curves of 7 deg. and over are braced at every tie. The gage is standard.

The rail bonds are 4.8 in. between centers of terminals

phones that are most frequently used are in booths and these are provided with insulated stools.

REINFORCED CONCRETE VIADUCT

Although the reinforced concrete viaduct which has been constructed to carry the track at a high level through the suburbs of Richmond to the terminal depot has been previously described, it will not be out of place here to give some of the most essential details.

This structure shows the most drastic departure from customary railway practice in the construction of trestle bridges, and it is of special interest to learn that the reinforced concrete construction was only adopted after the relative merits of a steel viaduct and of a wooden trestle, with steel girders spanning the longer gaps, had been carefully considered. The steel construction was rejected on the score of high first cost and maintenance.

The wooden structure was actually designed and the timber ordered, part of which had even been delivered, when the probability of such a viaduct being destroyed by fire led the railway company to call for competitive designs for a reinforced concrete structure.



FIG. 29.—EXTERIOR VIEW OF ASHLAND TERMINAL DEPOT

and have a capacity equal to a No. 0000 trolley. The terminals are 7/8 in. in diameter. The cross bonds have a length of 66 in. and have the same type of terminals and are of the same capacity as the rail bonds.

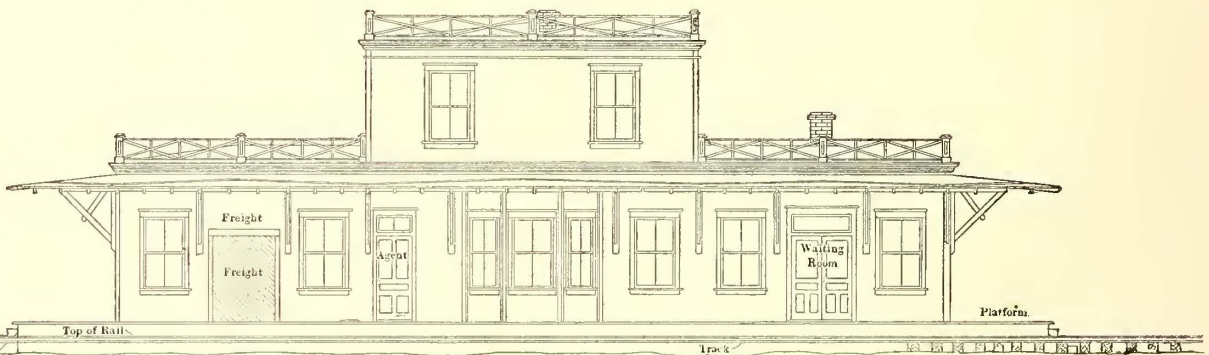


FIG. 30.—FRONT ELEVATION OF ASHLAND TERMINAL DEPOT

The maximum curve on the road is 7 deg. 10 min. and has a length of 412 ft., while the maximum grade is 1 per cent.

TELEPHONE SERVICE

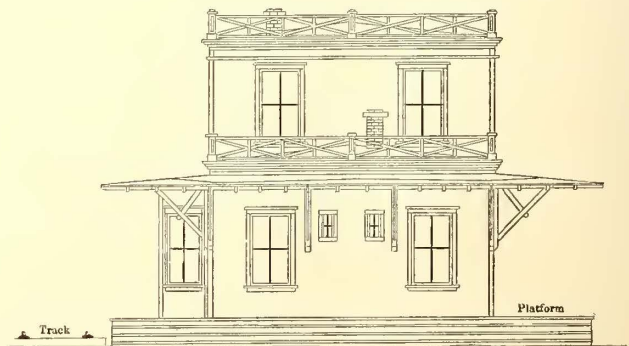
A telephone service is provided which gives communication between the terminal stations and to any car when at a turnout.

The telephone lines are carried on the same poles as the trolley wire. Their location is shown in Fig. 9. The insulators are placed somewhat higher than indicated in this illustration at crossings and on the viaduct.

A No. 8 iron wire is used. No difficulty has been experienced in carrying on conversation over the telephones.

As a protection against static charges or from trolley current should the lines become crossed, protective transformers have been installed. These transformers are manufactured by the General Electric Company and are insulated for more than the full line voltage, and it is claimed that with these devices on the line there is no interference and that no injury will result to a person using the telephone even though the line is crossed with the trolley wire. The telephones are further protected by lightning arresters and high potential fuses. The tele-

Fig. 16 shows the general nature of this structure, while Fig. 26 illustrates one of the longest spans. As previously stated, this viaduct is 2800 ft. in length.



Street Railway Journal

FIG. 31.—NORTH END ELEVATION OF ASHLAND DEPOT

The height from street level varies from 18 to 70 ft. and it crosses a street at approximately every 300 ft. The spans vary from 23 ft. 6 in. to 65 ft. 5 in. The variation in temperature is provided for by expansion joints placed

at intervals of about 200 ft. The Kahn trussed bars are used for reinforcement.

TERMINAL FACILITIES, RICHMOND TERMINAL DEPOT

It has already been stated that the terminal facilities surpass those usually found in connection with trolley roads. The exterior of the Richmond terminal depot is shown in Fig. 27, in which it will be seen that the building is of a pleasing design. The ground floor, as shown, is rented in part as stores. The station itself is on the ground floor.

Fig. 28 shows the general arrangement of the station proper. As it will be noticed, there are two large waiting

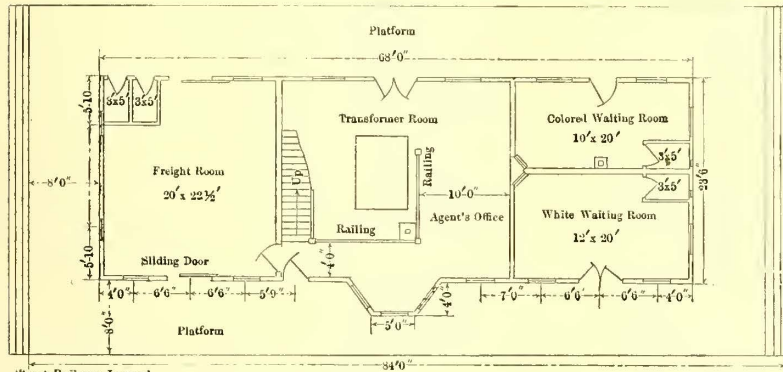


FIG. 32.—GROUND PLAN OF ASHLAND TERMINAL DEPOT

rooms, one for white and the other for colored people, five toilets, a ticket office, freight room and a motorman's room. The necessity of providing separate accommodations for white and colored people has rendered it necessary to duplicate all the conveniences, such as waiting rooms and toilets. The small circles with crosses indicate the location of the lamps. The station is beautifully illuminated with arc lamps and General Electric tungsten lamps.

The freight will be raised to the station floor level by means of an electrically operated hoist.

The building is of brick.

ASHLAND TERMINAL DEPOT

The Ashland terminal depot is a wooden structure and contains the lighting sub-station which has already been described in the present article. Its general exterior appearance will be seen in the photograph published as Fig. 29, while Figs. 30 and 31 show respectively a front elevation and an elevation from the northern end. It will be noticed in these photographs that, while the station building has no expensive adornments, it has been given an artistic appearance. Fig. 32 shows the plan of the ground floor which, being fully dimensioned, will show the space occupied by the substation. The area enclosed by this substation has foundations of solid concrete. The size and location of the waiting rooms and freight room are also given. The platforms are 8 ft. in breadth and run entirely around the building. An umbrella shelter extends to a distance of 9 ft. from the building and runs entirely around the building. On the second floor are the offices, station agent's living room and locker rooms. These illustrations are of such a nature as to render a long written description unnecessary.

The Chambersburg, Greencastle & Waynesboro Electric Railway Company, of Waynesboro, Pa., has arranged a joint schedule with the Western Maryland Railroad Company which facilitates travel between Waynesboro and Hagerstown and points west.

EXTENSIONS IN THE OHIO VALLEY

The Steubenville & East Liverpool Railway & Light Company and The Ohio River Passenger Railway Company, which really constitute extensions of The East Liverpool Traction & Light Company to Steubenville on the south and Beaver and Rochester, Pa., on the east, are putting into operation now from time to time parts of the new lines which are now nearing final completion. Recently the opening of that part of the line between East Liverpool, Toronto and Steubenville was made the occasion of a celebration, in which the mayors and officials of all of the cities through which the lines pass, and many prominent people, took part.

This property, in which Hon. W. Caryl Ely, of Buffalo, is largely interested, was described in the STREET RAILWAY JOURNAL for Sept. 1, 1906. Since that time the company has completed the line mentioned above and is constructing a second track paralleling the present existing track between the cities of Steubenville and Toronto.

The power station at Steubenville has also been entirely rebuilt and has been enlarged by the installation of two 500-kw turbo-generators, new electric lighting machinery, cooling tower, etc. The old power house of the Toronto Electric Light & Power Company at Toronto has

been remodeled into a substation which receives its current from the power house in Steubenville, and from which substation current is furnished Toronto for incandescent and street arc lighting and for the operation of the railway.

The entire railway has been constructed of 85-lb. A. S. C. E. T. rails in 60-ft. lengths, laid upon standard first grade white oak ties, upon a first-class roadbed, ballasted with gravel and crushed stone. The greater part of the road is upon private right of way.

High-powered cars have also been purchased for the through interurban service.

The Steubenville & East Liverpool Railway & Light Company traverses a distance of 20 miles north and south along the westerly bank of the Ohio River, and forms an important link in the chain of electric railways between Wheeling and Pittsburg.

At Steubenville a track connection is made with the track of the Wheeling Electric Railway system which reaches Wheeling, a distance of 21 miles to the south. On the east, the company has contracts for running rights over the tracks of the Beaver Valley Traction Company's lines, now owned by the Pittsburg Railways Company, by which it has perfected a connection between Beaver and Pittsburg, a distance of 25 miles, except for a short distance through the borough of Sewickley. On the north, connections will be made at East Liverpool with the Youngstown & Ohio River Traction Company's lines which extend from Youngstown to East Liverpool, thus giving communication with the electric railway chain in the northern part of Ohio.

The officers of the company are Van Horn Ely, president; Edward McDonnell, secretary and treasurer; J. C. Rothery, general manager; Miller & Miller, attorneys, and Reed, Smith, Shaw & Beal, Pittsburg, Pa., general counsel. Westinghouse-Church-Kerr & Co., of New York City, have been the engineers and constructors of the railway. The investment is about \$3,000,000. The Ohio Valley Finance Company, of Buffalo, N. Y., of which Hon. W. Caryl Ely is president, has financed the construction of this railway.

THE KENWOOD AND STOCK YARDS EXTENSION OF THE CHICAGO SOUTH SIDE ELEVATED RAILROAD

In 1904 the city of Chicago passed an ordinance requiring the Chicago Junction Railroad to elevate its tracks on Fortieth Street from Lake Michigan west to Halsted Street. Under the terms of this ordinance the railroad company

The Kenwood branch connects with the main line just east of the station at Indiana Avenue by an incline which brings the trains down to the lower level of the branch line. The two tracks for elevated trains are on the south side of a solid earth fill between concrete retaining walls. The third track on the north is used by the Chicago Junction for switching cars to and from the Illinois Central, which

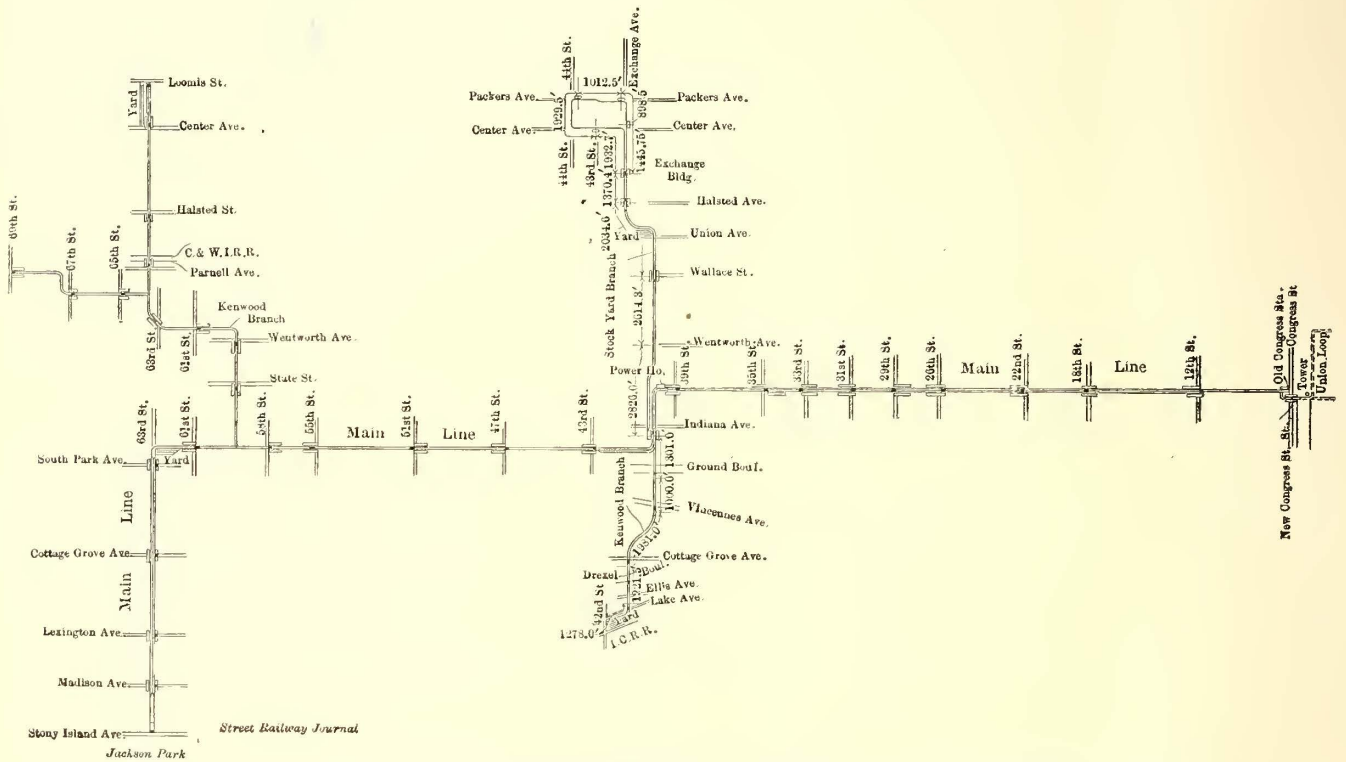
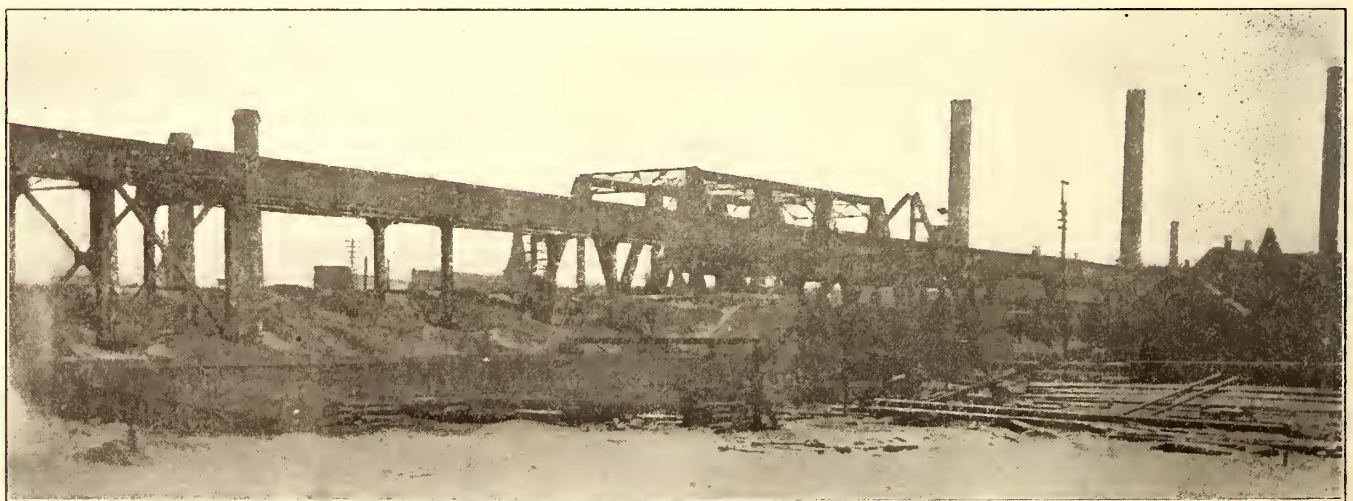


DIAGRAM OF MAIN LINE, BRANCHES AND CONNECTIONS OF THE SOUTH SIDE ELEVATED RAILROAD

was authorized to build for and lease to the South Side Elevated Railroad two tracks in addition to the tracks required for its own use. Elevated trains were to be run over these tracks in connection with the main line which

runs along the lake shore. The tracks are elevated sufficiently to give from 12 to 13 ft. clearance under the street bridges which are through plate girders with solid trough floors. Just east of Lake Avenue the elevated tracks turn



CROSSING OF CHICAGO, ROCK ISLAND & PACIFIC TRACKS

they join at Indiana Avenue and Fortieth Street. The section east of Indiana Avenue, which has been in operation since Sept. 20, 1907, is known as the Kenwood branch, and the section west, ending in a single-track loop around the packing-house district of the Stock Yards, which will be put in operation about May 1, is known as the Stock Yards branch.

south on a steel structure connecting with a large elevated storage yard having eight stub tracks with a capacity of fifty cars. This yard and connecting structure was built and is owned by the South Side Elevated. It has a trainmen's house and interlocking tower and provides facilities for inspection and running repairs for the trains running in over this branch.

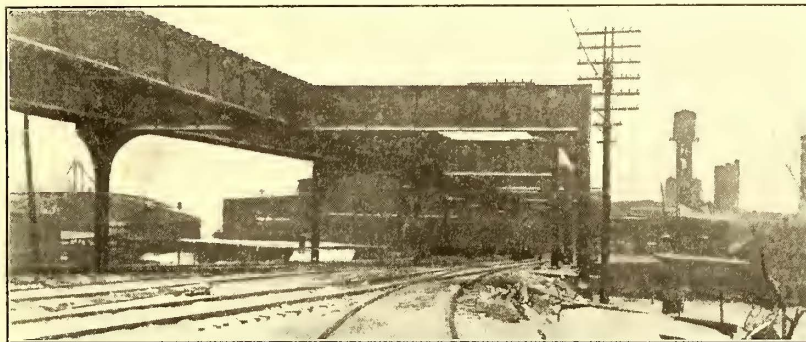
The stations on this branch are built in the earth fill back of the street bridge abutments and the entrances and exits open on the sidewalks under the bridges. Two of the stations, at Grand Boulevard and Vincennes Avenue, have single entrances from these streets only. Two others, between Cottage Grove Avenue and Drexel Boulevard and between Lake and Ellis Avenues, have entrances from each end to the platforms above. A fifth station is under the terminal yard on Forty-second Street east of Lake Avenue. The stations built in the earth fill are constructed of reinforced concrete, transite board and metal lath plastering and are as nearly fireproof as they can be made. The interior trim is light oak and the walls are painted white to make them as light as possible. They are heated by hot water and lighted with incandescent lamps. A wide concrete stairway leads from the waiting room to the platform above and serves as an entrance and exit. The platforms are about 240 ft. long and 12 ft. wide and raised to the height of the car floors. They are protected by a canopy roof supported by a single row of columns down the center, but aside from this there are no shelter houses or wind shields.

The track is practically the same as the South Side Elevated standard for steel structures except that no tie-plates are used and the rails are fastened with ordinary cut spikes. The rails are 80-lb. A. S. C. E. section laid on 6-in. x 8-in. x 8-ft. sawed ties bedded in stone ballast. The ties are spaced 18 in. center to center and every fourth tie is 9 ft. long to support the third-rail insulators. The total length of the Kenwood branch is 6782 ft.

Work on the track elevation was begun in April, 1905, starting from Lake Avenue and working west. Train service was begun on Sept. 20, 1907. A five-minute service

shuttle trains running into the Indiana Avenue station are switched on the express track, which is not used except in the rush hours, and are then switched over on the east-bound track without interfering with the operation of the main line trains either north or south bound. At the present time between 9000 and 10,000 passengers per day are being handled at the five stations. A maximum daily traffic of 12,000 passengers is ultimately expected.

The Stock Yards branch, which is nearing completion, is built entirely on a steel structure. It is double track from the junction at Indiana Avenue west to Center Avenue in the Stock Yards, 10,245 ft., where it divides into a single-

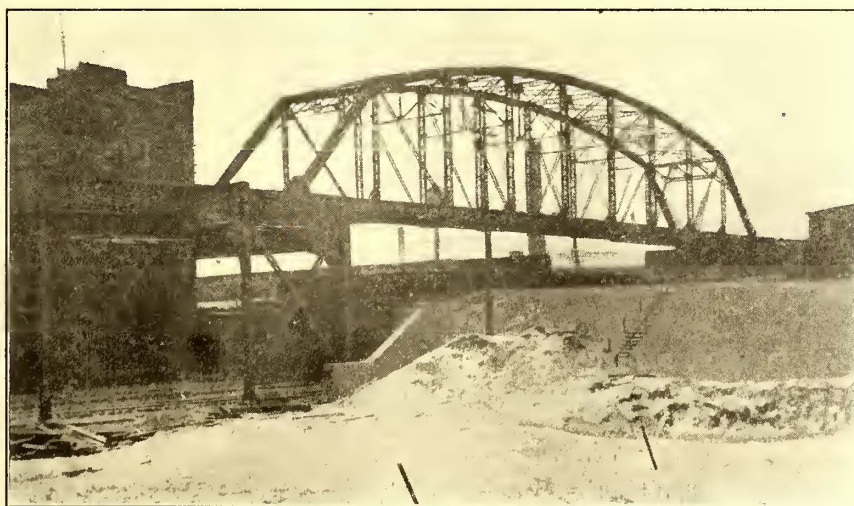


ELEVATED TRACKS SWINGING OVER CHICAGO JUNCTION TRACKS WEST OF WENTWORTH AVENUE

track loop having a length of 4319 ft., making a total length of 24,809 ft. of single track. The original plans called for a junction with the main line at Fortieth Street just east of State Street by a 90-deg. curve, but this was changed in the revised plans and the new line carried on a separate structure south of and parallel to the main line on Fortieth Street, east of Indiana Avenue, where the junction is made by crossovers under the control of the operator in the interlocking tower already installed there for the Kenwood branch junction. This will prevent the operation of through trains from the Stock Yards uptown to the Union Loop unless they are run into and out of the Indiana Avenue station as in a stub terminal by changing ends. The probable method of operation will be to run trains out of the Kenwood branch terminal to and around the Stock Yards loop and back to the terminal, using the station at Indiana Avenue as a transfer point to and from north and south trains on the main line.

Beginning at Indiana Avenue, the new line runs west on private right of way about 150 ft. south of the right of way of the Chicago Junction until it crosses Armour Avenue. Here it swings north with a reverse curve and continues west on the south side of the Chicago Junction right of way, the column foundations being imbedded in

the earth fill. The center line of the elevated structure is only about 16½ ft. south of the center line of the south track of the steam road. Just west of Armour Avenue is the four-track line of the Chicago, Rock Island & Pacific, which is crossed with a 112-ft. through plate girder bridge supported on the same abutments as the through truss which carries the two tracks of the Chicago Junction. For about 400 ft. west of this crossing the elevated column foundations



BRIDGE OVER CHICAGO & WESTERN INDIANA TRACKS. THERE ARE THREE TRACK LEVELS AT THIS POINT

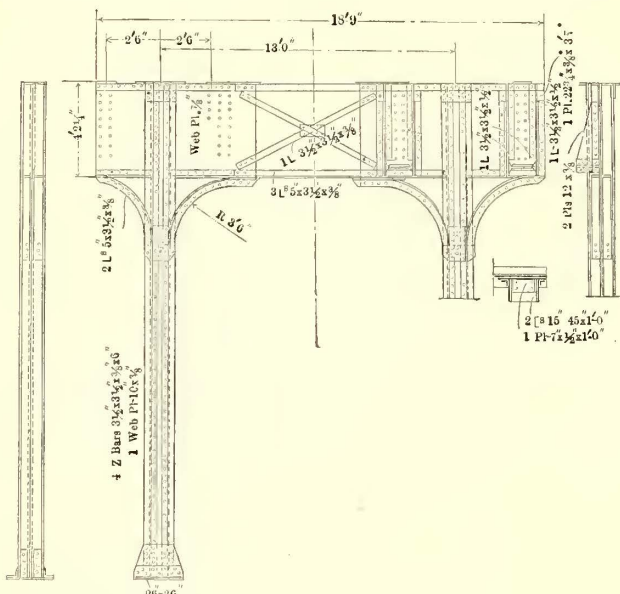
from the Lake Avenue terminal to the junction with the main line at Indiana Avenue is maintained during the middle of the day by alternating two-car shuttle trains and two-car through local trains which run uptown and around the Union Loop. In the morning and evening rush hours through express trains are put on which use the middle express track on the main line between Fortieth and Twelfth Streets, but make all stops on the Kenwood branch. The

are entirely within the earth fill, which is confined on both sides by concrete retaining walls. After crossing Wentworth Avenue the Chicago Junction widens for a short distance into three tracks and it was necessary to carry the elevated structure over the two southerly tracks. As it was not possible to put in supporting columns between tracks, the columns were erected on special foundations built in the retaining walls on each side and the cross girders at

clearance is barely sufficient as it is, and the permanent abutments prevented widening the subgrade and carrying the elevated tracks under. They are, therefore, carried over the Chicago & Western Indiana, making three levels of tracks. A 230-ft. through truss supported by braced towers at each end was put in here, the elevated tracks being about 43 ft. above the Chicago Junction tracks.

At Butler Street, a 130-ft. through truss carries the elevated tracks over a Y connection from the Chicago Junction to the Chicago & Western Indiana. Just west of this bridge the line swings south again on the same right of way, but outside of the steam tracks, and continues on a long tangent to Union Avenue, where it leaves the steam road right of way and turns south two blocks to Forty-second Street. It again turns west, crosses Halsted Street, the Stock Yards belt line and begins to cross the stock pens just north of Exchange Avenue. At Center Avenue, the eastern limit of the packing-house district, the double-track structure joins the single-track loop, which encircles the plants of Swift & Company and Armour & Company, running west on Exchange Avenue, south on Packers Avenue, east on Forty-fourth Street and north on Center Avenue to the loop junction.

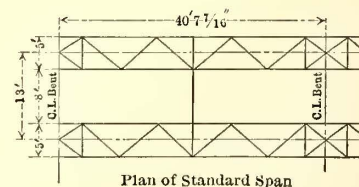
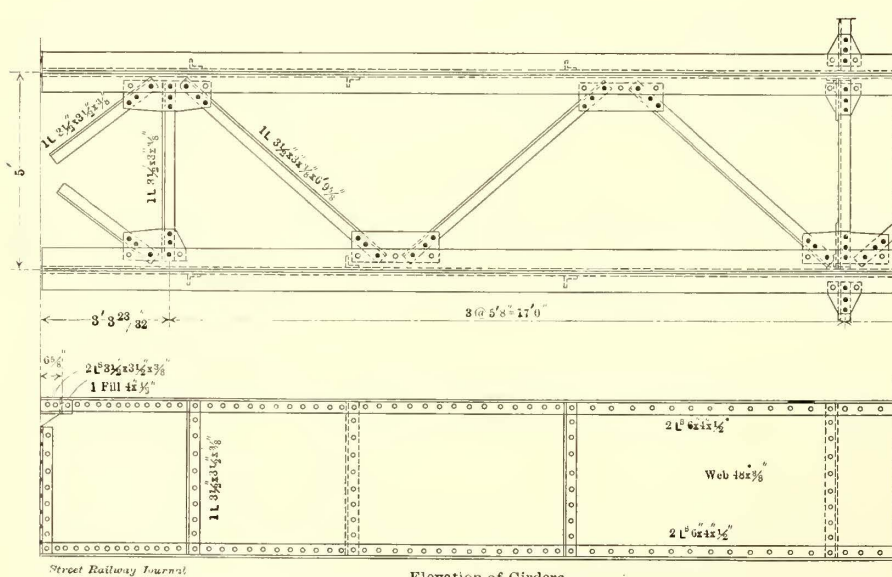
Because of the difficult location of the new line and the many physical obstacles which had to be avoided there are wide variations in the details of the structure and hardly any two spans are alike. As nearly as possible, however, a standard form of deck plate girder construction was followed. The standard span on tangents is 40 ft. with double column bents and short spans of 20 ft. over braced towers put in between every fourth span of greater dimensions. Each track is carried independently by two longitudinal girders stiffened with diagonal cross bracing, top and bottom, and cross frames in the center of each span. The longitudinal girders are riveted to short cross girders built on top of each column and these cross girders are connected together with angle ties and braces. The drawings show



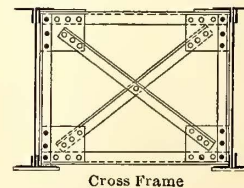
Street Railway Journal
STANDARD BENT, SHOWING EXPANSION JOINT ON RIGHT

each bent span all three tracks below. The normal length of these girders in this section is 43 ft. At the point where the elevated structure is swung to the north over the steam tracks below, the longest cross girder put in was 61 ft. In this section there are several 90-ft. plate girder spans.

The crossing of the Chicago & Western Indiana tracks



Plan of Standard Span



Cross Frame

SPAN AND FRAMING DETAILS OF STOCK YARDS EXTENSION

just east of Butler Street presented a complex problem. These tracks had been elevated before the Chicago Junction improvements were begun, and they crossed the Chicago Junction with a through plate girder bridge. The old grade of the Chicago Junction was maintained under this bridge when the track elevation on that line was carried out and there is a perceptible sag at this point. The under

details of a typical bent and longitudinal girder. A unique feature of the construction is the method of assembling the longitudinal girders so that they form a continuous bearing for the ties over the cross girders of the bents. The longitudinal girders are notched out from 6 in. to 7 in. at each end just under the top flange angles and are stiffened here by short pieces of angle iron riveted under the

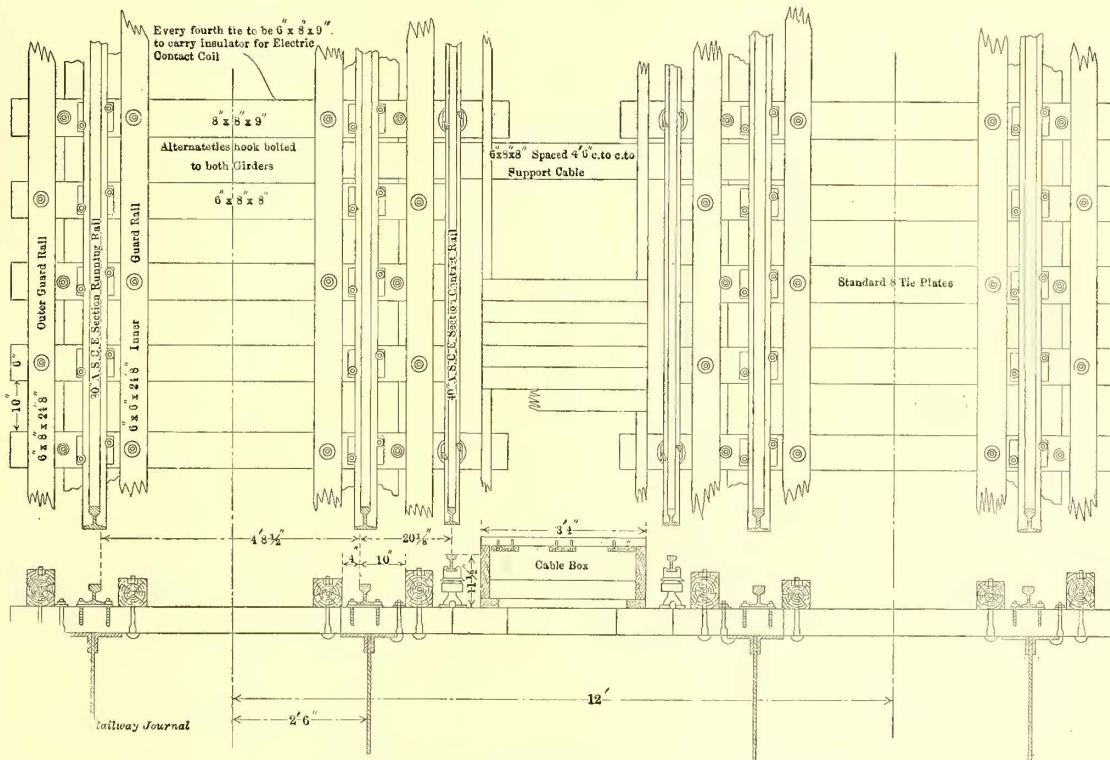
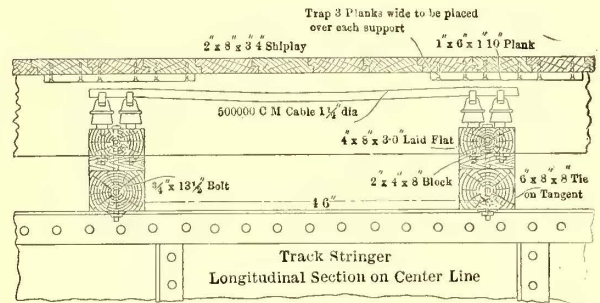
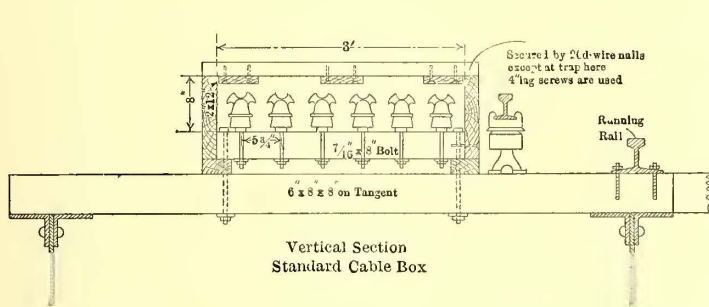
flange angles. The top flange of the cross girders fits in this notch and carries most of the load, a double row of rivets being provided as usual to secure the end stiffening angles of the longitudinals to the cross girders.

Expansion joints are provided approximately every 200 ft. The details are shown on the accompanying drawings. The longitudinal girders rest on brackets attached to the cross girders and are confined laterally, but are free to move longitudinally. These brackets are made up of two pieces of 15-in., 45-lb. channel, 1 ft. long, placed back to back and riveted to 3/8-in. bracket plates extending up to the top of the cross girders. A 7-in. x 12-in. x 1/2-in. bear-

riveted to the web of the column. The bolt washers rest on the top edge of these plates.

The foundations for the structure varied according to their location, but in general they were built with five steps or courses, the top course being 36 in. x 36 in. They contain about 14 cu. yd. of concrete each. In the stock yards and around the loop the foundations were frequently changed or entirely relocated when the excavation revealed unknown sewers, pipes and old cisterns. This accounts in part for the small variations in alignment on this section and in the details of the structure.

The steel work was designed to support on each track



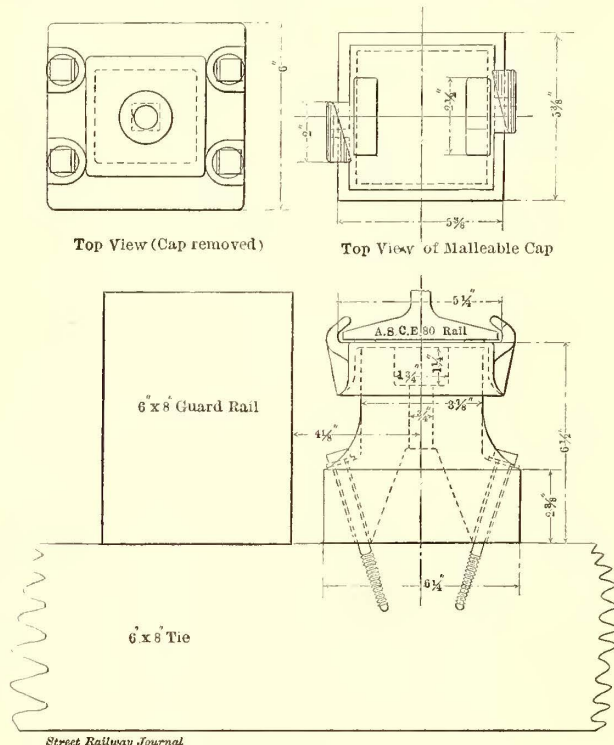
ing plate is provided in the trough of the channel to allow for any wear.

The columns of the structure are made up of four Z bars, 3 1/2 in. x 3 1/2 in. x 3/8 in. x 6 in, and one 3/8-in. x 10-in. web plate. The Z bars are continuous from the base plate up to the top flange of the cross girder, but the narrow web plate is carried up only to the springing line of the bracket angles, where it is butt jointed to the web plate forming the cross girders. The foundation base consists of a bed plate, 26 in. x 26 in. x 7/8 in., two side plates, 18 in. x 26 in. x 3/8 in., and corner angles, 6 in. x 6 in. x 3/4 in. The two foundation bolts are carried up through the bed plate and are enclosed by crimped plates, 1/2 in. x 15 in. high,

trains of cars weighing 80,000 lb. each, 46 ft. 4 in. long over all, 32 ft. 10 in. between truck centers and with a truck wheel base of 6 ft. 1 in. This corresponds to the heaviest elevated equipment now in use. Allowances for impact were made according to Cooper's formula.

The superstructure throughout has been built in accordance with the approved standards of the South Side Elevated. The ties are 6 in. x 8 in. x 8 ft., of sawed yellow pine, laid on the top flanges of the longitudinal girders, which are 12 1/2 in. wide. They are spaced 18 in. apart center to center and every fourth tie is cut to 9-ft. length to provide support for the third-rail insulators. The long ties and alternate intermediate short ties are secured to

the girder flanges by $\frac{3}{4}$ -in. x $7\frac{3}{4}$ -in. hook bolts having flat washers and projecting nuts. The outer guard rail is a 6-in. x 8-in. timber cut in lengths of 24 ft. 8 in. and laid on edge 10 in. out from the gage line of the rail. It is secured by $\frac{3}{4}$ -in. bolts to the alternate ties, which are not hook bolted to the structure. The washers are cupped and counter-sunk. The inner guard rail is a 6-in. x 6-in. timber cut in the same lengths and placed 4 in. inside of the gage line



THIRD-RAIL INSULATION DETAILS

of the rail. It is bolted to the alternate ties, which are hook bolted to the structure.

The running rails are 80-lb. A. S. C. E. section laid to standard 4-ft. $8\frac{1}{2}$ -in. gage on 8-in. tie-plates throughout. They are fastened to the ties with two standard 5-in. screw spikes and are connected with Continuous rail joints. The third-rail on the double-track section, where feeders are run in the cable box, is 40-lb. A. S. C. E. section, supported on insulators mounted on every fourth tie or at 6-ft. intervals. On the single-track loop in the Stock Yards no provision has been made for feeders and an 80-lb. section third-rail was put in. A new form of square vitrified clay insulator base has been used on this work instead of an iron base. These are secured to the long ties by four lag screws or wood screws. The third-rail is located with its center line $20\frac{1}{8}$ in. out from the gage line of the adjacent running rail and with its top $11\frac{1}{2}$ in. above the top of the tie. On double track they are placed inside next to the cable box.

The cable box, which is covered throughout, forms a convenient and safe runway along the structure between the tracks. It is supported on 6-in. x 8-in. x 8-ft. ties laid across the inside girders between track ties every 4 ft. 6 in. The sides are 2-in. x 12-in. planks and the top is made of 2-in. x 8-in. x 3-ft. 4-in. ship lap planks; the under side is

open. On each cross tie support are 2-in. x 4-in. x 8-in. blocks, which raise the cable insulator beams up from the cross ties. These beams are 4 in. x 8 in. and carry eleven insulators in two rows staggered at intervals of $5\frac{3}{4}$ in. The insulators are designed to carry each a 500,000-circ. mil cable, $1\frac{1}{4}$ in. in diameter. Over each cable support is a trap door in the top planking consisting of three planks secured with 1-in. x 6-in. battens, which is fastened down with lag screws. This can be quickly removed for inspection, repairs or when new cable is to be strung.

On curves the superstructure, as described above, varies somewhat. The outer running rail is elevated by beveled shims cut in four sizes according to the radius of the curve where used. For curves over 700 ft. radius, the elevation is $\frac{7}{8}$ in.; between 500 ft. and 700 ft., $1\frac{1}{8}$ in.; between 300 ft. and 500 ft., 3 in., and less than 300 ft., $4\frac{1}{2}$ in. Extra steel guard rails are used on the inside of all curves. All special work is of the heaviest pattern and switch points are protected by a safety guard rail as in special work for street railway tracks. Rail braces are used on the sharpest curves. The sharpest curve on the double-track section is 150-ft. radius, but on the single-track loop the turns are made with a 109-ft. radius.

There are three stations on the double track section, at Wallace Street, Halsted Street and opposite the Exchange Building in the Stock Yards. On the loop there are four stations. The stations in the double track section all have the ticket offices housed in brick buildings under the structure at the street level with steel stairways for entrance and exit from each platform. The loop stations, having only a single platform, are built with the ticket offices on the structure. One of the illustrations shows the station on the loop at Center Avenue and Forty-third Street opposite the new office building of Armour & Company. It is reached by a stairway on the west side of the tracks below with a covered bridge crossing over them. The bridges in the background are stock runways from the pens to the packing houses, some of which are carried under and some over the elevated structure. The station platforms are 240 ft. long and 12 ft. wide and will accommodate six-car trains.



STATION AT CENTER AVENUE AND FORTY-THIRD STREET, STOCK YARDS LOOP

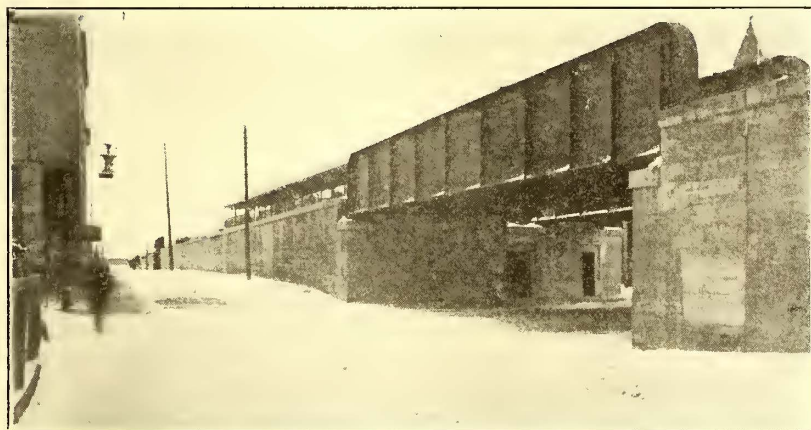
At Union Avenue the South Side Elevated is building on its own account a large elevated storage yard connecting with the structure at the north end. It has six long stub tracks and one shorter one and will have a capacity of 60 cars. An interlocking tower and trainmen's house will be built here and provision made for inspection of equipment by inspection pits hung below the floor of the structure.

The installation of the electrical equipment is being done

by the South Side Elevated. The 80-lb. third-rail which is being laid on the loop is cut to 33-ft. lengths and is spliced with malleable iron fish plates having four bolt holes. Each joint is bonded with two 500,000 circ. mil Crown bonds 15 in. long, which are pin-driven in the webs. The 40-lb. third-rail used on the remainder of the line is cut to 30-ft. lengths and is spliced with rolled fish plates. Two compressed terminal No. 0000 bonds from 2½ in. to 4 in. long are put in the webs at each joint. The track rails are bonded with No. 0000 compressed terminal bonds under the continuous joints.

The power house is at Fortieth and State Streets, and the distribution of current is accomplished with only small transmission loss. One 1,500,000 circ. mil aluminum feeder cable has been laid from the power house to the Stock Yards loop, and in addition one 1,000,000 circ. mil cable has been laid as far as the Union Avenue yard. Third-rail feeders are tapped into these cables about 1800 ft. apart. The elevated structure has been carefully bonded for return current, and each of the track rails is bonded to the structure at intervals of about 400 ft. These bonds to the structure are staggered so that with the four rails there is a bond about every 100 ft. No cross bonding between rails has been put in. All bonds of every kind when applied have been coated with plastic amalgam.

Work was begun on erecting the steel structure in April, 1907, from Butler Street west. Last September the erec-



ELLIS AVENUE STATION ON KENWOOD BRANCH

tion of the west end was practically completed and work was begun on the east end starting again at Butler Street. Only a few bents remain to be erected to complete the connection at Indiana Avenue with the main line. All of the riveting and painting is completed as far east as State Street and the superstructure is being pushed rapidly behind the painters.

The work was carried out by the Chicago Junction Railroad under the supervision and with the approval as to details of Charles V. Weston, chief engineer of the South Side Elevated, now president and general manager of that road. J. B. Cox, chief engineer of the Chicago Junction, had general charge of the work, assisted by O. F. Cole in charge of field work. J. N. Darling, principal assistant constructing engineer of the South Side Elevated, cooperated with them in supervising the construction. The steel work was designed by W. M. Hughes, consulting engineer, and was fabricated by the American Bridge Company, which sublet the erection contract to the Pittsburg Construction Company. Garrett T. Seeley, engineer maintenance of way of the South Side Elevated, is in direct charge of the electrical installation.

NEW TICKET SYSTEM OF THE INDIANAPOLIS & CINCINNATI TRACTION COMPANY

Prior to July 1, 1907, the Indianapolis & Cincinnati Traction Company used the usual form of local trip tickets good only from the station at which sold to destination printed on the ticket and to be used within thirty days from

date of sale. Round-trip tickets of the same kind, and also strip tickets consisting of eleven coupons, each good for 5 cents in fare on any car between any points outside of Indianapolis, and good for city fares in Indianapolis in connection with an interurban ride were sold, the round-trip tickets being sold at the usual reduction of 10 per cent figured on the nearest 5-cent, making an average of about 12 per cent, and the strip tickets sold for 50 cents, or at a discount of 9.1 per cent. In addition to these tickets, the company honored for passage on its trains the interchangeable coupon books of

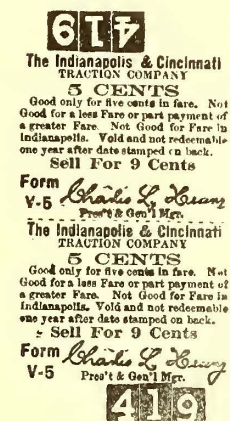


FIG. 1.—DOUBLE FIVE-CENT TICKET

the Central Electric Railway Association which contain \$12 in coupons, and are sold for \$10. When the Interstate Commerce Commission ordered that all roads honoring these or similar interchangeable coupon books, whether themselves engaged in interstate commerce or not, were subject to the regulations of the Commission, the Indianapolis & Cincinnati, which operates as yet wholly in Indiana, gave the required 60-days notice of withdrawal from the interchange agreement because it did not want to be brought under the jurisdiction of the Commission for this reason alone. At the same time, it made arrangements to put into use on July 1 an entirely new system of tickets which are simply card tickets representing cash and are good in payment for transportation on any part of its lines at their face value. They are printed in all denominations of even multiples of 5 cents, from 5 cents to \$1.05, which is the maximum cash fare for a continuous trip on either division.

The idea was taken from the eleven-ride strip tickets, and substantially the same discount of between 9 to 10 per cent was used in figuring the selling price of the single tickets. With the exception of the double 5-cent ticket, shown in Fig. 1, all of the tickets are similar to the \$1.05 ticket, shown in Fig. 2. They are printed on stiff card and measure 1 3/16 in. x 2 1/4 in. The cash value of the ticket is printed in large letters, and below it in small type is printed the selling price. Each ticket has a serial number, and when sold is stamped on the back with the name of the office from which sold and the date. The tickets are good for use any time within one year from the date stamped on the back, but after one year they are not good for

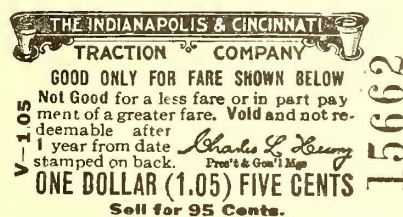


FIG. 2.—REGULAR TICKET, SHOWING FARE VALUE AND SELLING PRICE

shown in Fig. 1, all of the tickets are similar to the \$1.05 ticket, shown in Fig. 2. They are printed on stiff card and measure 1 3/16 in. x 2 1/4 in. The cash value of the ticket is printed in large letters, and below it in small type is printed the selling price. Each ticket has a serial number, and when sold is stamped on the back with the name of the office from which sold and the date. The tickets are good for use any time within one year from the date stamped on the back, but after one year they are not good for

transportation and are not redeemable. The discount, which is figured on a basis of 10 per cent, is calculated to even cents, the company giving itself the benefit of the fractions; thus, the selling price of a 30-cent ticket is 27 cents, and the selling price of a 35-cent ticket is 32 cents. The tickets have printed on their face "Not good for a less fare or in part payment of a greater fare." These restrictions, however, are not enforced. The conductor is authorized to accept a 50-cent ticket for a 40-cent fare, but he does not give change; and, similarly, he will accept a 50-cent ticket and 10 cents in cash for a 60-cent ride.

The double 5-cent ticket, shown in Fig. 1, was designed in order to give passengers paying 5-cent fares the same discount as is given for larger fares. The double ticket having the face value of 10 cents is sold for 9 cents and either half of it is good for 5 cents in fare. A half ticket

With the old system of local tickets, one way and-round trip, from each station on both divisions of the road to every other station, between 900 and 1000 different forms of tickets would be required, and inasmuch as these tickets are bought in 5000 lots, the investment in this item alone amounts to a large sum. With the new system, only 21 kinds of tickets are required—one ticket for each 5-cent denomination between 5 cents and \$1.05. Furthermore, the use of such tickets is a great convenience to passengers, particularly those taking trains at stops between towns. Such passengers can buy a stock of tickets whenever they go to any town where there is a ticket office and can keep them on hand to use going to any station in either direction. It is acknowledged that such a scheme promotes travel because if people have tickets they will use them more frequently than if they paid cash each time they took a ride. The first six months' trial of the system showed that the 10-cent tickets were sold in much larger quantities than any other denomination. Ten cents is about the average fare from country stops to adjacent towns, and the farmers have been quick to take advantage of the economy and convenience of buying tickets in large quantities for the use of themselves and their families. The next largest number of tickets sold were those of 20-cent denomination, and following these came the 15-cent denomination and then the double 5-cent tickets. While it is yet too early definitely to determine the percentage of tickets sold which are never presented for passage or redeemed, it is interesting to know that for the first six months the proportion was quite large. This is, of course, to the advantage of the company.

The principal objection which might be urged against the system of discounts involving amounts of less than 5 cents is the difficulty of making change rapidly during a rush. The system was given a thorough trial shortly after it was put into effect, which demonstrated that this was not an objection. During Home Coming Day at Rushville, Ind., July 8, two ticket sellers sold 3246 tickets at 9 cents each in two hours, and at no time was there any difficulty about making change. It might also be urged as an objection that this form of ticket does not give any information in the auditor's office as to where the tickets were used. It is true that the information cannot be arrived at exactly, but as a rule a majority of the tickets are used to and from the offices at which they are sold, and the ticket agent's reports show the number and denomination of all tickets sold. The use of a fare receipt, such as is shown in Fig. 3, however, gives all of this information and much more.

The system of issuing fare receipts was put into use on the Indianapolis & Cincinnati the latter part of January, 1908, and the recording fare registers formerly used were taken out. This receipt was devised by the traffic department of the road and embodies a number of new features. It is printed and punched in duplicate—one-half of the receipt being retained by the passenger and the other half bearing the same consecutive number is retained by the conductor and forwarded to the auditor's office at the end of each trip. The four vertical columns show cash fares, station from and station to, and ticket fares. Only one fare receipt is issued to each passenger when the fare is taken up. If the passenger pays by ticket, the face value of the ticket is punched in the proper column, together with the stations from and to. If a passenger presents a ticket in part payment of the fare and cash for the remainder the amount of the ticket is punched in the proper column and also the amount of cash collected. The form of transportation is also indicated on the receipt; thus, if

THE INDIANAPOLIS & CINCINNATI TRACTION COMPANY.		PASSENGER'S CHECK.																																																																																																																									
<p>FARE RECEIPT. The Passenger must retain this and produce it whenever called for by Conductor or Inspector. The Conductor will issue One and Only One Receipt to each passenger as the fare is taken. He will punch the stations or groups of stations between which the passenger is to ride, the amount of cash paid and the cash fare value of each ticket (cash to be punched in right and tickets in left column). No cash fare value will be punched for <i>Passes</i> or <i>Press Transportation</i>. If more than one ticket of the same value is used, the conductor will punch as many times as there are tickets of that value, the first punch mark to be in the space where the value is shown and the remaining marks to be opposite, to the left. In every case the cash fare value of each ticket should be indicated by one punch mark. In case of <i>Set</i> coupon tickets or similar tickets, each undetached strip will count as one ticket. If the fare paid is ticket or cash for a child (between 5 and 12), a Student Ticket, a <i>Pass</i>, <i>Press Transportation</i>, or if the amount collected is in payment of transportation of property, when no baggage check is given, the fact will be noted by punching the proper space in addition to punching the receipt as above set out.</p>																																																																																																																											
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FIG. 3.—PASSENGER'S FARE RECEIPT AND AUDITOR'S CHECK, WHICH ARE PUNCHED SIMULTANEOUSLY

is not good in the city of Indianapolis unless used in payment for part of an interurban ride beyond the city limits. The company is still selling the strip tickets which it had on hand when the new system was put into use, but may discontinue selling them later.

The local cash fares on the Indianapolis & Cincinnati are figured to the largest multiples of 5 cents on a basis of 1 2/3 cents per mile. The discount on the tickets reduces their cost to a basis of approximately 1 1/2 cents per mile. Cash fares on the limited trains are based on 1.9 cents per mile, and this is reduced to 1.7 cents by the use of tickets. Where the limited cash fares have been arbitrarily fixed on a basis of less than 1.9 cents per mile, the cost of a ticket for such a ride is correspondingly reduced. The tickets are good on the limited trains as well as on the local trains, being accepted at their face value for full or part payment of the local or limited tariff.

The system has a number of advantages. It increases the revenue from ticket offices and decreases the amount of cash fares collected by conductors on the cars. Prior to the introduction of the system about 35 per cent of the total fares were paid in cash. In December after the system had been in use six months, this percentage was reduced to 26 per cent, although during that time the company sold no commutation or similar books. The work of the conductor is lightened and the chances for knocking down cash fares are lessened.

a pass from Indianapolis to Connersville is presented on a train, the receipt is punched in the space marked "Pass," and in the space marked 5 cents in the cash column, since passes are not good for city fare and require the payment of 5 cents in cash when presented for a through trip. No fare value is, however, punched for the pass itself. If the conductor punches the receipt wrong, or otherwise mutilates it in any manner, he is required to punch the receipt in the space marked "Mutilated" and to turn in to the auditor's office both halves of the receipt undetached. In case the passenger presents three 10-cent tickets in payment for a 30-cent ride, the conductor is required to punch the receipt in the ticket column marked "10" and then make a punch mark opposite and to the left of the first punch for each of the other two tickets collected, thus showing three 10-cent tickets taken up. In case of the eleven-ride strip tickets, when the tickets are presented in one strip undetached, the full amount of the strip is punched in the proper column as one ticket. A suitable space is provided to indicate that the conductor has collected cash in payment for the transportation of property which is not regular baggage.

The conductors receive receipts from certain specified agents, receipting for them by numbers. At the end of each trip the conductor is required to make a neat bundle of the audit checks retained by him, including also the complete receipts which have been mutilated, and turn these into the auditor's office in an envelope together with his train report and all tickets and passes collected. He is required to turn in cash only at the end of the day. The envelope in which the tickets and receipts are forwarded to the auditor's office has printed on the face suitable space for entering the beginning and ending serial numbers of the fare receipts for the trip, the date, train number and the conductor's name, the amount of tickets collected and the amount of cash collected. On the back of the envelope when turned in, the cashier enters in suitable spaces the number of receipts issued for tickets, for cash and for cash and tickets; also the number of mutilated receipts. The total receipts issued must correspond with the difference between the beginning and ending serial numbers. In case any are missing the conductor is charged up with \$1.05, the maximum fare, for each serial number missing. At the end of the day the conductor's cash must correspond with the amount of cash indicated on all of his receipts issued during the day.

It has not been found that issuing these receipts to each passenger delays the collection of fares unduly, and a conductor's work is not greatly increased. The conductors have quickly become efficient in punching the receipts accurately, and few mutilated ones are now being turned in. There is, of course, a chance for dishonesty if the conductor separates the two halves of the receipt before punching and issues a correct receipt to the passenger and retains the audit check punched for a less amount than he collected. To guard against this, the company has four employees authorized as inspectors who are provided with identification cards and who occasionally board the cars and collect from the passengers all checks issued by the conductor. These are then compared with the audit checks and if any discrepancies appear the conductor is dealt with accordingly.

As yet the system has not been in use long enough for the auditor to get every detail running smoothly; but the indication is that there will be little if any more work required in the auditor's office than formerly when fare registers were used. The principal object of the receipts is to prevent failure to collect fares either through carelessness or dishonesty and to prevent substitution of tickets either

for cash or tickets of greater value. In addition to the check upon conductors, the receipts make possible the gathering of an unlimited amount of data whenever desired. At present the company is keeping a daily record of the cash fare value of each train (the difference between the total for the day and the actual earnings for the day giving the total amount of reduction made on the ticket); a record of the number of passengers paying cash, the number riding on tickets alone, the number riding on combinations of ticket and cash, the number riding on free transportation and the number of tickets used. It is the intention to keep from time to time a record for a week or longer, the cash value of each station, the proportion of tickets to all fares from each station, the load on each train at each station, the miles per passenger, etc. Some experimenting has already been done in this way to ascertain the amount of labor required and the results have been highly satisfactory.

The system of tickets and the fare receipts were designed by George S. Henry, traffic manager of the Indianapolis & Cincinnati Traction Company, to whom we are indebted for the information concerning them.

FARE RECEIPTS ON THE CONESTOGA COMPANY'S LINES

The Conestoga Traction Company, of Lancaster, Pa., which has been selling round-trip tickets to important points on suburban lines, started, several weeks ago, a system of

New Holland-Terre Hill
6401

Jan.	1	17	Feb.	2	18	Mar.	3	19	Apr.	4	20	May	5	21	June	6	22	July	7	23	Aug.	8	24	Sept.	9	25	Oct.	10	26	Nov.	11	27	Dec.	12	28	13	29	14	30	15	31	16
Receipt for Fare Paid to Conductor To be given to passenger Conestoga Traction Company Not redeemable Not good for passage <i>C. Edgar Lipton</i> Manager 6401 New Holland 15 10 15 20 25 30 35 Terre Hill																																										

New Holland 15 10 15 20 25 30 35 Terre Hill Conductors Will Return This Coupon With Report Conestoga Traction Company Not redeemable Not good for passage <i>C. Edgar Lipton</i> Manager 6401																																										
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RECEIPT ISSUED TO PASSENGERS AND COUPON RETAINED BY CONDUCTOR

giving cash fare receipts for all one-way fares paid on suburban lines, conductors ringing only once for each fare collected, the cash-fare receipts showing the amount col-

KEEP THIS RECEIPT

It may entitle you to **FIVE DOLLARS** worth of transportation. On the first day of each month this company will give away to holders of **CASH FARE RECEIPTS** five coupon books, each containing 100 five-cent coupons, good for passage on all suburban lines. Watch for the lucky numbers.

ADVICE ON BACK OF PASSENGER'S RECEIPT
 lected. The stubs of the round-trip tickets and the duplicates of the cash-fare receipts show the amount of money the conductor should account for to the company. The cash-fare receipt has been given a value by agreeing to give away a certain amount of transportation on the first day of each month to persons holding numbers selected by some one designated by the company. Thus the passengers all insist upon getting receipts. The company has found the system very satisfactory during the short time it has been in use.

THE VIRGL CABLE RAILWAY IN SOUTHERN TYROL

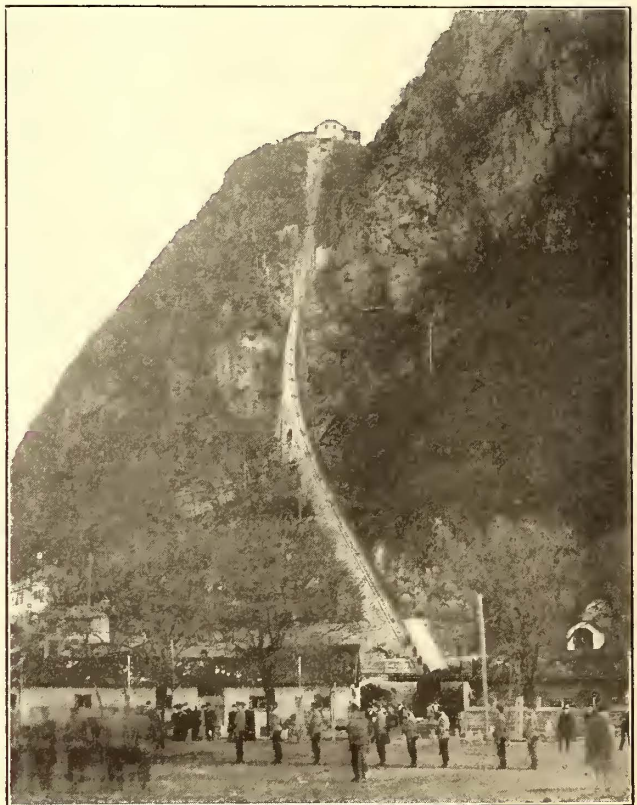
The engineering and financial success of the Mendel Railway* in the famed Etsch Valley of the Southern Tyrol, Austria, has led to the construction of a neighboring mountain cable line known as the Virglbahn, and which offers



CAR STOPPED OVER THE GREAT CONCRETE ARCH



THE PASSING PLACE ON THE VIRGL RAILWAY



THE VIRGL RAILWAY, FROM BASE TO SUMMIT

945 ft.) long horizontally and 195 meters (about 640 ft.) vertically. The road construction, however, is considerably lighter than the Mendel Railway because the cars are smaller and the braking stress on the track less. The experiments in automatic vacuum braking made on the 70 per cent grade showed that loaded cars freed from the cable could be stopped without shock within a length of 1.2 meters (about 4 ft.).

The line begins at the southern limit of the Bozen, connecting at the lower end with a steam railroad. It extends westerly over a curve of 250 meters (820 ft.) radius in its lower half to the Virgl observatory, which contains a large restaurant. The popularity of this place as a tourist resort appears from the fact that even in the dull autumn season 500 to 1000 passengers were carried every Sunday. The line was opened Nov. 20, 1907.

Fully 75 per cent of the railway is cut through the porphyritic rock of which the mountain is composed. The only special work below the siding shown is a concrete viaduct 24 meters (about 78 ft.) long and a de-

the finest views in the vicinity of Bozen, the local tourist center.

Formerly the Mendel Railway and the Mt. Vesuvius cable line held first and second places respectively with maximum grades of 64 per cent and 63 per cent, but the new line has a grade of fully 70 per cent at its upper end and in general averages 66 per cent in a run 288 meters (about

pressed roadway at the lower station. The track is of meter (39.37 in.) gage and weighs 26.8 kg. per meter (about 53.7 lb. per yd.). It is placed on ties laid approximately 3-ft. centers. The tracks at the passing point are 77 meters (about 253 ft.) long and are laid to arcs of 250 meters (about 820 ft.) radius. In addition to the steps cut in the rock alongside the track, others about 20 in. wide have also been provided between the rails.

*See STREET RAILWAY JOURNAL for April 2, 1904.

The cable machinery is located in the upper station and is driven by a 55-hp, 550-volt, three-phase motor operated by current transmitted at 3450 volts from a power plant in the valley. The station machinery is operated at a speed to permit the cars to make the trip in five minutes. Hand and automatic brakes are in the station for the control of this machinery. Automatic braking occurs whenever the speed of the machinery rises 15 to 20 per cent, when a car goes beyond the upper stopping point, when there are interruptions in the power supply and in other contingencies. In every application of this automatic brake the power circuit to the motor is broken.

The cars seat 32 passengers distributed in two closed middle compartments and an open section at each end. The upper section has folding seats which can be lifted when there are standing passengers or when it is desired to convey baggage. The closed compartments have sliding doors on the inner or mountain side. The cars are furnished with both hand and emergency brakes.

This mountain railway is operated by the Südbahn-Gesellschaft (Southern Railway Company). The fare up is 60 heller (\$.15) and the fare down 50 heller (\$.125). The total cost of the line was about 400,000 kroner (\$97,000). Like the Mendelbahn, the new road was financed by the Bozen banker Schwarz, and the engineering carried out by E. Strub, of Zurich, Switzerland. The iron work was furnished by the Beon foundry and the electrical equipment by the Allgemeine Electricitäts Gesellschaft, of Vienna.

EASTON TRANSIT COMPANY'S TRIP SHEET AND TRANSFER ENVELOPE FOR CONDUCTORS

The Easton Transit Company, with headquarters at Easton, Pa., operates about 50 miles of city and interurban track connecting with Phillipsburg, N. J.; Bethlehem, South Bethlehem, Nazareth, Freemansburg and other communi-

EASTON TRANSIT COMPANY

CONDUCTOR'S DAILY REPORT

Form for CONDUCTOR'S DAILY REPORT. Includes sections for BELT LINE RUN NO., DATE, 190, and various tables for recording fares, transfers, and trip details. Includes fields for NAME, Motorman No., and Round Trips.

PART OF SIMPLE DAY SHEET USED BY CONDUCTORS

ties of Eastern Pennsylvania. This diversity of routes and large number of intersections with other lines has led H. R. Fehr, president and general manager of the company, to issue instructions especially applicable for car operation on particular divisions. These instructions are printed on an 8-in. x 12 1/2-in. sheet used for the conductor's daily re-

port, different colors being selected to distinguish the separate divisions readily, although the names of the divisions are printed on these sheets. The front of this report, which is reproduced in part, does not differ materially from the usual form of conductor's trip sheets. The book, however, contains a great deal of important information which car crews are usually supposed to know until some trouble reveals their ignorance. The adoption of these special instructions has resulted in better service from the motor-men and conductors, as they have no excuse for forgetting the regulations applicable to their routes.

A good idea of the extent and character of these instructions may be gained by examining a reproduction of those prepared for the Belt Line division. It can be readily understood that in this case particular stress is laid upon the fare limit regulations, as the routes and lapovers are more complicated than on the regular interurban runs. The heading "General Instructions" covers a wide field, in-

EASTON TRANSIT COMPANY.

INSTRUCTIONS TO MOTORMEN AND CONDUCTORS—BELT LINE.

FARE LIMIT.

- A passenger boarding a car at any point on South Side, West of the junction of Smith and Canal Streets (L. V. R. R. passenger station) is entitled to ride around West Ward Belt via Walnut or Northampton Streets to junction of Walnut and Northampton Streets for 5c.
A passenger boarding a car on Washington Street West of Ninth and Washington Streets is entitled to ride around South Side Belt to junction of Canal and Smith Streets for 5c.
A passenger boarding a West Bound car on Northampton Street West of Fifteenth Street, is entitled to ride around South Side Belt to junction of Canal and Smith Streets for 5c.
A passenger boarding an East Bound car on Northampton Street is entitled to ride around South Side Belt to junction of Canal and Smith Streets for 5c.
A passenger boarding a West Bound car on Northampton Street, between Sixth and Fifteenth Streets, is entitled to ride to junction of Walnut and Northampton Streets only, for 5c.
A passenger boarding a West Bound car on Walnut Street, between Sixth and Ninth Streets, is entitled to ride to junction of Northampton and Walnut Streets only, for 5c.
A passenger boarding an East Bound car on Walnut Street is entitled to ride around South Side Belt to junction of Canal and Smith Streets for 5c.

CHANGE OF REGISTER.

- On West Bound Northampton Street car at Ninth and Northampton Streets from UP to DOWN.
On West Bound Washington Street car at Ninth and Washington Streets from UP to DOWN.
On South Side cars at New and Madison Streets changed from DOWN to UP.

GENERAL INSTRUCTIONS.

- Register each fare upon receipt of same and before giving change.
Do not bunch fares.
Transfers issued only on 5 cent ticket and cash fare upon application at time of paying fare.
No transfers issued upon Free Ticket.
Deposit transfers and tickets in transfer box in car at end of each trip.
Return to General or Dispatcher's office all unused transfers at end of run.
Deposit Cash and Day Sheet in safe at General office at end of run.
Report defects in register immediately.
Lower guard bar on open cars and close vestibule doors on closed cars when operating cars on double track, up Smith Street and along Canal Street.
Examine cars before starting run.
Place car in barn with pole to rear of barn.
Lock register when car is placed in barn.
Allow no passengers on front platform.
TRANSFER POINTS:—L. V. Depot, Centre Square, Fourth and Northampton Streets, Seventeenth and Ferry Streets, Seventeenth and Washington Streets.
Bring car to full stop at Doylestown Junction and L. V. R. R. Depot and announce: "Change cars for Doylestown," and "L. V. R. R. Depot," respectively.
When cars arrive at Third Street and Centre Square conductors shall announce: "Change cars for Phillipsburg."
When cars arrive at Fourth and Northampton Streets the conductors shall announce: "Change cars for College Hill."
When cars arrive at Fourth and Northampton Streets the conductors shall announce: "Change cars for Glendon and West Easton."
When the Park is open the announcement should be: "Change cars for Island Park."

- LOCATION OF JACK BOXES—WEST WARD BELT:—Fourth and Northampton Streets, Sixth and Northampton Streets, Tenth and Northampton Streets, Fifteenth and Northampton Streets, Thirteenth and Washington Streets, Walnut and Washington Streets.
LOCATION OF JACK BOXES—SOUTH SIDE:—St. John and Nesquehoning Streets, Nesquehoning Street east of Davis Street, Coal and Berwick Streets, Berwick Street between McKean Street and Falvey's Crossing, Glendon Avenue and Packer Street, Canal Street Switch, St. John and Canal Streets, first pole west of Beef House on Canal Street.

STOPPING POINTS.

- Via Northampton, Seventeenth, Butler and Walnut Streets.
Centre Square, Bank Street, Fourth Street, Lawall's Crossing, Fifth Street (Sunday Morning only), Sixth Street, Locust Street, City Square, Army, Seventh Street, Eighth Street, Ninth Street.
Via Walnut, Washington, Seventeenth and Northampton Streets.
Raspberry Street, Fifteenth Street, Easton, Palmer Township, Sixteenth Street, Car Barn, Washington and Seventeenth Streets, Lehigh Street, Fairview Street, Twelfth Street, Cherry Street, Thirteenth Street, Seventeenth and Northampton Streets, 1824 Northampton Street.
Via South Third, Smith, St. John, Nesquehoning, Davis, Berwick Streets, Olendon Avenue, Mauch Chunk Street, Valley Avenue and Canal Street.
Madison and St. John Street, North Street, Ferry Street, Young's Coal Office, Lehigh Street, Washington Street, South Side, Maloney's Hotel (Change for Doylestown), L. V. R. R. Depot.
No 4th Berwick Street, Coal Street, Remond Street, Centre Street, Valley Avenue, Zane Alley, Valley Ave. and Canal St., Centre Street, Reynolds Street, Coal Street, Ferry Street, Susquehanna Bridge, Nesquehoning Street, 8. John Street.

CALL STOPPING POINTS.

BACK OF CONDUCTOR'S DAILY REPORT, SHOWING INSTRUCTIONS FOR BELT LINE OPERATION

cluding fare collection, registration, transfer points, location of telephones, speed rules for certain parts of the line and the like. A full list of stopping points is also given.

The sheets for the interurban divisions include rules for handling block target signals. The thoroughness of these instructions will be noted by reading the following state-

ment, abstracted from the form used on the Easton & South Bethlehem division:

BLOCK TARGET SIGNALS.—West-bound cars use white target signal (lights). East-bound cars use green target signal (lights). The boxes which contain the switches controlling the west-bound target signal (lights) are painted red, and those controlling the east-bound target signal (lights) are painted green. The box containing switch for target signal (lights) in next block is marked **THROW ON**, and the one containing the switch which releases the target signal (lights) in block directly in the rear is marked **THROW OFF**. The motorman must pay particular attention to Pilot signal (lights) in his block and should opposing Pilot signal (light) appear against him he must come to a stop and send his conductor ahead to flag approaching car. The car nearest the switch will swing trolley and go back. The motorman must not throw off target signal (light) that is against him under any circumstances. Should you come to a switch and the target signal (light) remains against you three (3) minutes call up dispatcher for orders. The following will be observed in using reverse target signal (lights): When you find your target signal (lights) do not burn, you will throw target signal (lights) of opposite color and proceed to next switch. Upon arriving at switch, be careful to release target signal (lights) before proceeding, always bearing in mind when you use target signal (lights) of opposite color that they are operated directly opposite, that is you use the switch marked **“THROW OFF”** to light the target signals and the switch marked **“THROW ON”** to release them. Upon arriving at passing point and target signal (lights) are not burning, call up dispatcher for orders, always bearing in mind that safety is of greater importance than making time.

The company has also devised a new transfer envelope (2¾ ins. x 5¼ ins.), which is so arranged that the starting

Form 51 1908-2011. U. S. PAT. OFF. 1908.

EASTON TRANSIT CO.

Date _____ 190__

Car No. _____

Total Transfers and Tickets Collected _____

Conductor's Number _____

Route _____

Punch time at start of each trip.

P. M. A. M.	HOURS	1	2	3	4	5	6	7	8	9	10	11	12
	MINUTES	6	10	15	20	25	30	35	40	45	50	55	

TRANSFER ENVELOPE

time of each trip can be punched to the a. m. or p. m. hour and minute, instead of being written in pencil. Thus the transfer envelope itself is an adaptation of the time-limit principle of the transfer slip.

DECISION AGAINST IMMEDIATE MUNICIPAL OWNERSHIP IN COPENHAGEN

The franchise of the Copenhagen Tramways Company was granted about ten years ago, when the company equipped its system electrically. One of the provisions of the franchise is that the city can take over the tramways

Magisterial Council, but this was not obtained. In cases of disagreement of the two councils the law refers the question to the Minister of Internal Affairs, who decided it inadvisable to take over the tramways, certainly at this time. As this decision seemed to indicate a possibility of a postponement of the purchase for three years, and as such a delay was of no particular benefit to the company, the principal stockholder, a German electrical manufacturing company, offered to sell all of the stock to the city. A new committee was then appointed by the city, with the city comptroller as chairman, to consider the offer, but disagreed. In reporting this failure to agree to the Council on Jan. 13 the comptroller, who belongs to the Socialist party, stated he could see no advantage in municipal operation, as under the franchise the city was now participating in the profits of the company without investment or risk. Moreover, the service was as good as all reasonable demands would require. It is the general opinion, therefore, that the tramways will not be municipalized until 1938, when they revert to the municipality without payment under the franchise.

The city now receives a percentage of the gross receipts and has a monopoly of supplying power to the company at the rate of 4 cents per kw-hour. A uniform fare of 3 cents with free transfers is in force.

THE DEVELOPMENT OF STREET RAILWAYS IN JAPAN

A recent government report issued in Japan and published in the *Zeitschrift für Kleinbahnen* contains the interesting statistics given in the accompanying tables on the development of street railways in that country since 1895, when the national industrial exhibition at Kioto signaled the opening of the first electric railway in Japan. By the end of 1905 there were eighteen companies representing a

TABLE II

Year	Income in Yen		Expenses in Yen		Surplus in Yen	Dividends	
	From Operation	Other Sources	For Operation	Miscellaneous		Yen	Per Cent
1896	535,559	15,038	261,711	7,471	281,415	239,410	21.09
1901	1,769,644	102,395	939,846	23,237	908,956	783,922	14.23
1902	1,861,686	139,994	989,701	59,419	952,560	782,592	9.81
1903	1,872,893	127,044	1,116,806	90,517	792,614	713,866	4.36
1904	2,722,241	215,959	1,439,710	215,603	1,332,887	1,071,382	4.98
1905	4,501,302	269,834	2,534,602	316,695	1,919,839	1,629,656	7.22
1906	6,131,214	206,064	3,530,390	257,214	2,549,675	2,170,172	8.52

TABLE I.

Year	Cos.	Authorized Capital Yen	Paid in Capital Yen	Reserve Fund Yen	Length in Km of				Cars	Passengers
					Operating Lines		Lines under construction			
					Distance	Track	Distance	Track		
1896	3	1,385,000	1,135,000	36,198	25.59	34.07	3.72	5.64	177	23,890,489
1901	9	10,350,000	5,506,604	196,549	48.34	65.35	2.64	4.48	428	44,594,783
1902	11	15,125,000	7,974,165	247,968	54.14	72.54	1.39	7.31	465	46,476,601
1903	14	21,109,140	14,551,413	301,823	70.50	98.63	61.03	116.49	525	45,721,810
1904	17	36,284,673	21,486,627	451,288	93.51	140.52	110.24	191.63	862	81,839,864
1905	20	38,264,673	26,583,423	655,305	147.71	230.42	66.56	115.40	1157	127,289,013
1906	19	46,010,673	39,179,618	794,777	173.51	263.62	99.56	142.55	1253	161,161,404

at their then value in August, 1908, or at the end of any three years thereafter, provided the company is given one year's notice. At last summer's election the Liberal and Socialist parties obtained a majority in the Council and voted to exercise this option. A decision of this kind, to be binding on the city, must receive the approval of the

total capital of 37,980,000 yen (yen = \$.50), which operated 130 miles and had 82 miles under construction. Most of these companies have not made much money, but the fact that the Tokio system is earning an annual dividend of 10 per cent indicates Japan to be favorable to street railway enterprises.

THE INTERSTATE CLASSIFICATION OF ACCOUNTS

The Interstate Commerce Commission has just issued from its division of statistics and accounts Circular No. 20. This circular is addressed to the accounting officers of electric lines and announces that the commission expects to prescribe methods of accounting for steam railways, electric railways, express companies, sleeping car companies, carriers by water and pipe lines, and considers it essential that the same fundamental accounting principles should be applied to all of these agencies. It then explains the importance of this circular to roads not directly under the jurisdiction of the commission. There are at present thirty States whose laws give to State railway commissions or other legally constituted bodies jurisdiction over such electric railways. The Interstate Commerce Commission has been in correspondence with these bodies and announces that the circular is issued with the approval of the representatives of the different States. The circular follows:

INTERSTATE COMMERCE COMMISSION.
DIVISION OF STATISTICS AND ACCOUNTS.
WASHINGTON.

JANUARY 10, 1908.

To Accounting Officers of Electric Lines:

Acting under the authority conferred by the twentieth section of the act to regulate commerce, as amended June 29, 1906, the Interstate Commerce Commission has undertaken to prescribe a standard system of accounts for all transportation agencies. This system of accounting, when completed, will include a prescribed method of accounting for steam railways, electric railways, express companies, sleeping-car companies, carriers by water (as described in the act), and pipe lines. In view of the nature of this task, and of the public interest involved, the commission regards it as essential that the same fundamental accounting principles should be applied to all the above agencies of transportation, and that the classifications of revenues and expenses should be the same, so far, at least, as the general accounts are concerned.

This being the first circular addressed to the representatives of the electric railways, a word of explanation may not be out of place. In the first instance it should be distinctly understood that the Interstate Commerce Commission represents the interests of the states, as well as its own interests, in this effort to develop a uniform system of accounts for electric lines. There are at the present time 30 states whose laws give to state railway commissions, or other legally constituted bodies, jurisdiction over electric railways, and this circular is issued after correspondence with, and approval of, the representatives of the state governments. This being recognized, it is evident that this is the only practicable means of attaining the results regarded as essential by both federal and state governments.

This circular, addressed to the accounting officers of electric railways, conforms to the method of procedure followed in the case of all other carriers for which it is proposed to prescribe a standard system of accounts. It is recognized that the co-operation of practical accountants is essential for arriving at the best results, and, as a means of obtaining this co-operation, circulars have been issued asking specific questions, or, as in the case of this circular, tentative classifications have been submitted, accompanied by a request for criticisms and suggestions. In no other way is it possible to bring the knowledge and experience of practical accountants to bear upon the problem in hand.

You are, therefore, requested to consider the tentative classifications herewith submitted, to put this office in possession of any criticisms upon its present form, and to submit any suggestions which in your opinion will bring the classifications into a more satisfactory form.

The tentative classification of operating expenses submitted with this circular is drawn on a plan which indicates four different classes of accounts, viz.:

First. General accounts, indicated by a prefix of Roman numerals.

Second. Subgeneral accounts, indicated by a prefix of capital letters.

Third. Primary accounts, indicated by a prefix of Arabic numerals.

Fourth. Subprimary accounts, which are optional with carriers, and are to be indicated by small letters.

The general accounts are for use in grouping the items into a condensed form of report, it being understood that, in all statements, Group I and Group II under General Account IV "Transportation expenses" shall be shown as separate items.

The subgeneral accounts are provided for the use of small electric lines whose operations are not of such magnitude as to warrant greater detail in accounting; such companies are to be designated as those having a gross annual revenue of less than \$50,000.

The primary accounts are provided for use of the larger lines, including all those having a gross annual revenue of \$50,000 or over.

Provision is made for subprimary accounts in case a further subdivision of the primary accounts is desired by the individual carriers or by the state commissions; but the Interstate Commerce Commission refrains at this time from prescribing any further subdivisions of the accounts than is indicated by the primary accounts.

The following analysis shows the accounts to be kept by the smaller lines. The reports required of them will call for an accurate statement of expenses assignable to the subgeneral accounts as indicated by capital letters:

I. MAINTENANCE OF WAY AND STRUCTURES.

- A. Maintenance of Way.
- B. Maintenance of Electric Line.
- C. Maintenance of Buildings and Structures.
- D. Maintenance of Service Equipment.
- E. Availability Maintenance Expenses.
- F. Adjustment Accounts—Maintenance of Way.

II. MAINTENANCE OF EQUIPMENT.

- G. Maintenance of Revenue Equipment.
- H. Maintenance of Electric Equipment of Revenue Equipment.
- I. Depreciation Estimate—Revenue Equipment.
- J. Maintenance of Power Apparatus.
- K. Miscellaneous Maintenance of Equipment Expenses.
- L. Adjustment Accounts—Maintenance of Equipment.

III. TRAFFIC EXPENSES.

- M. Traffic Expenses.

IV. TRANSPORTATION EXPENSES.

GROUP I.—POWER.

- N. Power Manufactured.
- O. Power Purchased.
- P. Adjustment Accounts—Power.

GROUP II.—OPERATION OF CARS.

- Q. Wages of Car Operators.
- R. Other Car Operating Expenses.
- S. Injuries and Damages.
- T. Adjustment Accounts—Transportation.

V. GENERAL EXPENSES.

- U. General Expenses.
- V. Adjustment Accounts—General Expenses.

The Operating Expense Accounts proposed for the larger lines are stated in the tentative classification found on following pages of this circular, and by comparing the above list of subgeneral accounts with the primary accounts of the classification, the relation of the rules of accounting for the large and the small lines becomes evident. The General Accounts are the same for both, but there are 116 primary accounts provided for large lines as against 22 subgeneral accounts for small lines.

Moreover, the small lines are to follow the text descriptive of the primary accounts provided for the large line, which can easily be done, for the reason that each subgeneral account is, in fact, a grouping of primary accounts. The subgeneral account "A," for example, covers all the primary accounts from 1 to 15 in the Classification of Operating Expenses provided for large lines.

The depreciation accounts provided in this classification have been stated as follows:

First. Depreciation accounts for application to equipment.

Second. Depreciation accounts for application to maintenance of way and structures.

Depreciation accounts for maintenance of way and structures

have not as yet been prescribed for steam carriers, and their appearance in this classification does not mean that it has been finally decided to require them of electric carriers. Provision has been made for them in the tentative classification herewith submitted in order that those carriers that desire to charge depreciation on other property than equipment may exercise that liberty in proper form; also that any state commission desiring to prescribe depreciation charges for all classes of property may do so in proper form and in strict harmony with the general system of accounts prescribed for all agencies of transportation.

JOINT FACILITIES.

Particular attention is called to the Joint Facilities Accounts (see accounts Nos. 45, 46, 66, 67, 104, 105, 115, and 116), which are provided in order:

1. To state the operating expenses of each carrier under its own primary accounts without reference to any service rendered by it to another carrier or to any service rendered by another carrier to it; or, in other words, to permit that the participation of any carrier in the operations of another carrier may, by means of the Joint Facility Accounts, be so shown that a combined statement of the operating expenses of all carriers would represent neither more nor less than their true expenses of operation.

2. To exclude from revenues the amounts paid by one company to another for service furnished which do not properly represent revenue derived from the public.

3. To exclude from operating expenses such amounts paid as represent the use of capital. To illustrate, a pure rent for a track which is maintained and operated at the expense of the lessee represents a payment for the use of the capital invested in the property, and is not affected in any manner by the various acts of operation, and is a proper charge directly against the income account of the lessee company; conversely, it is a direct credit to the income account of the lessor company, as it is not connected with the operations of that company.

A payment for use of tracks and power (including rent, cost of power, and other operating expense), is subject to analysis which should result in determining what portion is assignable to each of the following classes:

1. Use of capital (or rent).
2. Maintenance expenses.
3. Transportation expenses.
4. Administrative expenses (if any).

The determining of these elements will enable both a lessor and a lessee company to handle the subject properly, the lessor company crediting and the lessee company debiting its accounts as follows:

- | | |
|---------------------------------|-----------------------|
| 1. Rent..... | Income account. |
| 2. Maintenance expenses..... | Accounts 45 and 46. |
| 3. Transportation expenses..... | Accounts 104 and 105. |
| 4. Administrative expenses..... | Accounts 115 and 116. |

By excluding from Operating Expenses the cost representing the use of outside capital, the result is that the amount stated as Operating Expenses represents the operating cost incident to the employment of the capital to which it corresponds, and by specifically separating all capital charges from operating expenses the relative and proper correspondence is preserved.

This method of accounting is particularly applicable to the needs of the commissions in determining the results of specific capital employed, and also in assembling statistics into totals which will represent the service to the public and remedy a definite and long-felt deficiency in the subject which these particular accounts meet.

This circular is submitted to the electric carriers for consideration and criticism, and in order that the replies received may be as definite and concise as possible, the following specific information is requested:

1. Name of company?
2. Number of miles of line operated?
3. Number of cars operated under normal conditions?
4. Do you favor dividing electric lines into two classes, as outlined in this circular?
5. What limit, in your opinion, should be used as a line of demarcation indicating the distinction between a *large* and a *small* company?
6. What was the gross revenue of your company as shown in its last annual report?

7. What would be the approximate aggregate charge to operating expenses for the year ending June 30, 1908, resulting from the application of the theory of depreciation to the equipment of your company as outlined in this classification? (In your reply, please explain in detail the method by which you arrive at the amount stated.)

8. What is the present surplus (or deficit) from operation of your company, and in what particular years did it accumulate?

9. Please give a list of joint facilities involved in the operation of your company? (See accounts 45, 46, 66, 67, 104, 105, 115 and 116.)

10. Do you consider the principles involved in the joint facility accounts as applicable to electric railway carriers?

11. General criticisms.

It is not intended that the answers made to this inquiry should be confined to the specific questions enumerated; on the contrary, any criticisms and suggestions pointing to the improvement of the classifications are invited.

Those officers who are not familiar with the "Classification of operating expenses" and of "Expenditures for road and equipment" as prescribed for steam carriers, and who desire a copy will be furnished with the same on application.

Reply to this circular should be made in duplicate, one copy to be forwarded to Mr. Elmer M. White, secretary, American Street and Interurban Railway Accountants' Association, Birmingham, Ala., and the other copy to the undersigned.

It is desired that reply to this circular be made not later than March 28, 1908.

Respectfully,

HENRY C. ADAMS,

In charge of Statistics and Accounts.

Following this circular is a statement on the consideration of depreciation, by Prof. Henry C. Adams, in charge of statistics and accounts. On this point the following statement is made:

CONSIDERATION OF DEPRECIATION.

A number of points have been raised by correspondents relative to depreciation that call for the following general statements, all of which bear upon the manner in which depreciation accounts should be treated:

1. The question of depreciation is fundamentally a question of values, and not a question of maintaining the original capacity, or standard of operating efficiency, or of keeping full the numbers of equipment series.

2. The depreciation rules may be worked either on the basis of the value of individual cars and locomotives or on the basis of the value of series of cars and locomotives. On this point accounting officers are at liberty, until advised to the contrary, to follow whichever method seems to them the more appropriate.

3. The basis of accumulation—that is to say, the amount to which the percentage rate is applied—ought, in strict theory, to be the original cost. For the current year, however, accounting officers are at liberty to accept original cost (estimated, if not known), record value, or purchase price. The term "record value" should not be interpreted to mean the value of the equipment as it stands in the capital account (unless that account represents the original value of the equipment on hand), but the actual cost or value of all equipment, regardless of where charged when purchased; and in case purchase price be accepted as the basis of the percentage charge to depreciation, the percentage rate should be limited to the rate required to replace the price paid. A second-hand car, for example, is not called upon to provide for its replacement, when abandoned, by a new car. As stated above, it is values and not cars with which depreciation charges deal.

4. The application of depreciation charges for the current year and subsequent years must not be influenced by the practice of years past. In case property has been appreciated by excessive charges to operating expenses in years past, the values thus placed in the property must be regarded as a permanent undivided asset to the stockholders. On the other hand, in case property has depreciated on account of insufficient charges to operating expenses in years past, this fact must not be permitted to influence the determination of the depreciation rate for the current year.

5. The monthly charges to operating expenses for "depreciation" on the several classes of equipment will, of necessity, create or require corresponding liability accounts to which such depreciation may be credited. To that end carriers will be re-

quired, beginning ———, to set up an appropriate liability depreciation account for each of the several classes of equipment upon which depreciation is charged. These accounts should be designated as follows:

- (a) Electric Locomotives—Replacement.
- (b) Passenger-Train Cars—Replacement.
- (c) Freight-Train Cars—Replacement.
- (d) Electric Equipment of Cars—Replacement.
- (e) Work Equipment—Replacement.

To these replacement accounts should be credited monthly the amount of accrued depreciation on each class of equipment, respectively. Such credits should invariably equal the gross charges to maintenance for depreciation.

To these several replacement accounts under their appropriate heads should be charged, at cost, all equipment purchased, built, or otherwise acquired for the purpose of maintaining the value of a carrier's equipment.

The monthly charges to operating expenses for "renewals" of the several classes of equipment will be similarly treated.

It is not intended that these accounts should be restricted to individual cars or locomotives, or that carriers are not at liberty to renew or replace equipment upon which depreciation has accrued prior to the retirement of such equipment. On the other hand, the several amounts standing to the credit of those replacement accounts should be available to carriers for the purpose of replacement of equipment to the extent of such credits; however, all replacements in excess of such credits must be considered as Betterments or Additions, and charged either to Income or Capital.

A discussion of the methods of charging per diem and mileage payments between carriers and upon clearing accounts for hire of equipment then follows. Upon these points the circular says:

PER DIEM AND MILEAGE PAYMENTS BETWEEN CARRIERS.

It is understood that "Car mileage—balance" and "Hire of equipment—balance" have been heretofore charged directly to operating expenses under the general account "Conducting Transportation." The propriety of including such items in operating-expense accounts has been questioned by many accountants, it being claimed that the amount paid by one carrier for the use of cars and locomotives of another carrier is in its nature a rent and not an operating expense.

This suggestion that the per diem and mileage for cars, for example, should be treated as a rental proposition, while in the main correct, involves a result which from the statistical point of view cannot be wholly approved, for the reason that, under the regulations for depreciation, operating expenses are charged with the depreciation upon the total equipment of the carrier, while as a matter of fact some or all of that equipment may at some time or other during the year be in operation on the line of another carrier. Such a method of treating per diem and mileage payments would burden the general account "Maintenance of Equipment" of a lessor road with an expense not traceable to the traffic of the lessor road. From the statistical point of view, operating expenses are a measure of the cost of transportation, and no expense should be included in the operating accounts of one carrier that is occasioned by the traffic of another carrier, from which it follows that the Maintenance of Equipment accounts of a lessor road should not be burdened with Repairs, Renewals or Depreciation occasioned by the use of its cars by a lessee road, for not only would this make the account in question too high when assigned to the traffic of an individual carrier, but it would destroy comparison between the Maintenance of Equipment accounts of lessor and of lessee roads.

A complete analysis of the situation discloses the fact that the gross rental charge is in part an operating expense and in part a rent proper, and the Classification herewith outlined provides for the separation of the gross rental charge accordingly.

To that end it is held that while the operating expenses of a carrier should include charges on account of—

- (a) Repairs incident to operation,
- (b) Premature retirement of equipment, and
- (c) A proper depreciation on equipment,

they should also include, under an appropriate account, a proper charge for wear and tear of another company's equipment while in use on the lines of the carrier company. At the same time the carrier's operating expenses should receive credit through an

appropriate account for a proper proportion of wear and tear on its equipment while in service on the lines of other companies, and these debits and credits should be made against the rents paid and received for the use of such equipment.

The chief difficulty in arriving at an accurate measure of wear and tear of equipment under the foregoing conditions arises from the fact that available records do not readily furnish the necessary information for an accurate division. Until a more accurate measure of this class of repairs can be determined from the experience of carriers, it is necessary to lay down an arbitrary rule for that measure, and for the current year, in the case of freight cars interchanged, 12 cents per car per day will be charged and credited to operating expenses under "Maintenance of Equipment," and the remainder of the rental charge will be carried to the income account through an appropriate clearing account as representing approximately the measure of net rental paid or received.

To the end that the payments made and the revenue earned on account of interchanged equipment may be properly taken care of through the income account, and that operating expenses may finally include a proper proportion of the wear and tear on equipment owned by other carriers, companies or individuals, and used upon the line of a particular carrier, from ———, carriers will be required to open a clearing account, to be designated as ———.

CLEARING ACCOUNT—HIRE OF EQUIPMENT.

To this account should be charged monthly:

- (1) The gross accruals for the use of equipment of all classes belonging to another carrier or company on a basis of Per Diem, Mileage, or Rental.

To it should be credited monthly:

- (2) The gross accruals for the use of a carrier's equipment while on the lines of other carriers, companies, or individuals ("car service" excepted), either on a basis of Per Diem, Mileage, or Rental.

To it should also be charged monthly:

- (3a) An amount equal to 12 cents per car per day for the number of car-days a carrier's freight-train cars are on the lines of other carriers or in use by other companies or individuals.
- (3b) An amount equal to the portion of the depreciation and repairs charges accruing against the carrier upon its equipment other than freight-train cars while on the lines of other carriers or in use by other companies or individuals.

NOTE.—These two debits should invariably equal the monthly credit to "Maintenance of Equipment" under the primary account "Equipment Loaned—Cr."

To it should also be credited monthly:

- (4a) An amount equal to 12 cents per car per day for the number of car-days freight-train cars of other carriers, companies, or individuals are on the line of the carrier company.
- (4b) An amount equal to the portion of the depreciation and repairs charges accruing against other carriers, companies, or individuals upon their equipment other than freight-train cars while on the line of the carrier.

NOTE A.—These two credits should invariably equal the monthly debit to "Maintenance of Equipment" under the primary account "Equipment Borrowed—Dr."

NOTE B.—The amounts mentioned in paragraphs (3b) and (4b) should be determined with regard to any particular equipment, by agreement between the owner and the user. In most cases the basis of apportionment will be either equipment-miles or equipment-days, and either may be used according to the best judgment of the carriers concerned. Should, however, the conditions under which equipment is used by two or more carriers make such a basis of apportionment untenable, carriers are at liberty to adopt whatever basis may be deemed proper, but for each case or class of cases carriers will be required to file with the Division of Statistics and Accounts a statement of the conditions under which this class of equipment, other than freight-train cars, is used, and the basis of apportionment agreed upon.

This account should be balanced at the close of each fiscal year, or periodically, at the option of the carrier, and the balance thereof carried as a debit or a credit, as the case may be, to Income Account as "Hire of Equipment."

Attention is called to the fact that by means of the adjustment of per diem and mileage payments between carriers herewith proposed, operating expenses are made to serve the double purpose of disclosing the true measure of the cost of traffic, notwithstanding the fact that one road owns more and another road owns fewer cars than it operates, and, further, of disclosing the full cost of maintaining equipment, whether such equipment is used by its owner or by another carrier.

To the end that uniformity of operating accounts may be maintained from year to year, carriers will be required to submit all questions of doubtful interpretation to this office for consideration and decision.

HENRY C. ADAMS,

In charge of Statistics and Accounts.

The list of general and primary accounts in the tentative classification of operating expenses contained in the circular follows. As will be seen, the schedule corresponds very closely to the original classification proposed by the commission, which was published as Exhibit B, on page 1178 of the STREET RAILWAY JOURNAL for Dec. 21, 1907. The principal changes consist of slight variations in titles of the accounts, such as the addition of the word "lines" after "telegraph and telephone" in account No. 14; the substitution of "underground conductor rails" for "conductor rails" in account No. 23; the substitution of the expression "power generating plant buildings" instead of "power plants" in account No. 26; the addition of the word "buildings" to the title of account No. 27; the addition of the word "sand" to the account "removal of snow and ice," and the addition of the word "repairs" to all of the accounts under "maintenance of revenue equipment" and "maintenance of electric equipment of revenue equipment." Slight changes have also been made in the order of the accounts between Nos. 34 and 46 inclusive, 60 and 69 inclusive, and 79 to 90 inclusive. Numbers have also been omitted from the accounts of depreciation estimates for "roadway," "electric line," "buildings and structures" and "maintenance of shop and power apparatus." The revised tentative classification of operating expenses contained in the circular is then as follows:

TENTATIVE CLASSIFICATION OF OPERATING EXPENSES OF ELECTRIC RAILWAYS.

GENERAL ACCOUNTS.

Account.

- I. MAINTENANCE OF WAY AND STRUCTURES.
- II. MAINTENANCE OF EQUIPMENT.
- III. TRAFFIC EXPENSES.
- IV. TRANSPORTATION EXPENSES.
- V. GENERAL EXPENSES.

PRIMARY ACCOUNTS.

I.—MAINTENANCE OF WAY AND STRUCTURES.

A. Maintenance of Way.

1. Ballast.
2. Ties.
3. Rails.
4. Rail Fastenings.
5. Frogs, Switches, and Special Work.
6. Underground Construction.
7. Paving.
8. Roadway and Track.
9. Tunnels.
10. Bridges, Trestles, and Culverts.
11. Over and Under Grade Crossings.
12. Grade Crossings, Fences, Cattle Guards, and Signs.
13. Signals and Interlocking Plants.
14. Telegraph and Telephone Lines.
15. Other Maintenance of Way Expenses.
Depreciation Estimate "Roadway."

B. Maintenance of Electric Line.

Transmission Lines—

17. High-Tension Transmission Lines.

Distribution System—

18. Overhead Feeders.
19. Underground Feeders.
20. Track Bonding.

Conductors—

21. Overhead Trolley Lines.
22. Third-Rail Conductors.
23. Underground Conductor Rails.
24. Miscellaneous Electric Line Expenses.
Depreciation Estimate "Electric Line."

C. Maintenance of Buildings and Structures.

26. Power Generating Plant Building.
27. Power Substation Buildings.
28. General Offices.
29. Carhouses and Shops.
30. Stations, Waiting Rooms and Other Buildings.
31. Docks and Wharves.
32. Miscellaneous Buildings and Structures Expenses.
Depreciation Estimate "Buildings and Structures."

D. Maintenance of Service Equipment.

34. Snow Equipment.
35. Work Cars.
36. Electric Locomotives (Utility).
37. Miscellaneous Service Equipment.
38. Depreciation Estimate "Service Equipment."

E. Availability Maintenance Expenses.

39. Care of Track.
 40. Removal of Snow, Sand and Ice.
 41. Cleaning, Sprinkling, and Oiling Roadbed.
 42. Injuries to Persons.
 43. Other Miscellaneous Maintenance Expenses.
- ##### F. Adjustment Accounts—Maintenance of Way.
44. Other than Railway Operation—Cr.
 45. Maintaining Joint Tracks, Yards, and Other Facilities—Dr.
 46. Maintaining Joint Tracks, Yards and Other Facilities—Cr.

II.—MAINTENANCE OF EQUIPMENT:

G. Maintenance of Revenue Equipment.

47. Passenger Cars—Repairs.
48. Combination Cars—Repairs.
49. Express Cars—Repairs.
50. Mail Cars—Repairs.
51. Freight Cars—Repairs.
52. Locomotives—Repairs.

H. Maintenance of Electric Equipment of Revenue Equipment.

53. Electric Equipment of Passenger Cars—Repairs.
54. Electric Equipment of Combination Cars—Repairs.
55. Electric Equipment of Express Cars—Repairs.
56. Electric Equipment of Mail Cars—Repairs.
57. Electric Equipment of Freight Cars—Repairs.
58. Electric Equipment of Locomotives—Repairs.

I. Depreciation Estimate—Revenue Equipment.

59. Depreciation Estimate "Revenue Equipment."

J. Maintenance of Power Apparatus.

60. Power Generating Plant Equipment.
61. Power Substation Equipment.
62. Shop Machinery and Tools.
63. Other Equipment Expenditures.
Depreciation Estimate "Maintenance of Shop and Power Apparatus."

L. Adjustment Accounts—Maintenance of Equipment.

65. Other than Railway Operations—Cr.
66. Maintaining Joint Equipment—Dr.
67. Maintaining Joint Equipment—Cr.
68. Equipment Borrowed—Dr.
69. Equipment Loaned—Cr.

III.—TRAFFIC EXPENSES.

M. Traffic Expenses.

70. Soliciting and Administering.
71. Advertising and Attractions.
72. Traffic Supplies and Expenses.

IV.—TRANSPORTATION EXPENSES.

GROUP I.—POWER.

N. Power Manufactured.

73. Wages of Power Generating Plant Employees.
74. Fuel for Power Generating Plants.
75. Water for Power Generating Plants.
76. Lubricants for Power Generating Plants.
77. Other Supplies and Expenses of Power Generating Plants.
78. Operating Substations.

O. Power Purchased.

79. Purchased Power.

P. Adjustment Accounts—Power.

80. Power Transferred—Cr.
81. Other than Railway Operations—Cr.

Q. Wages of Car Operators.

82. Passenger Motormen.

- 83. Passenger Conductors.
 - 84. Passenger Trainmen.
 - 85. Freight, Express, and Other Motormen.
 - 86. Freight, Express, and Other Conductors.
 - 87. Freight, Express, and Other Trainmen.
 - R. *Other Car Operating Expenses.*
 - 88. Superintendence.
 - 89. Interlocking, Block, and Other Signals—Operation.
 - 90. Telegraph and Telephone—Operation.
 - 91. Stationery and Printing.
 - 92. Clearing Wrecks.
 - 93. Station Employees.
 - 94. Station Supplies and Expenses.
 - 95. Car Supplies and Expenses.
 - 96. Carhouse Employees.
 - 97. Carhouse Expenses.
 - 98. Express Service.
 - 99. Other Transportation Expenses.
 - 100. Insurance.
 - S. *Injuries and Damages.*
 - 101. Loss and Damage.
 - 102. Damage to Property.
 - 103. Injuries to Persons.
 - T. *Adjustment Accounts—Transportation.*
 - 104. Operating Joint Tracks, Yards, and Other Facilities—Dr.
 - 105. Operating Joint Tracks, Yards, and Other Facilities—Cr.
- V.—GENERAL EXPENSES.
- U. *General Expenses.*
 - 106. Salaries and Expenses of General Officers.
 - 107. Salaries and Expenses of Clerks and Attendants.
 - 108. General Office Supplies and Expenses.
 - 109. Law Expenses.
 - 110. Insurance.
 - 111. Relief Department Expenses.
 - 112. Pensions.
 - 113. Stationery and Printing.
 - 114. Other Expenses.
 - V. *Adjustment Accounts—General Expenses.*
 - 115. General Administration Joint Tracks, Yards, and Other Facilities—Dr.
 - 116. General Administration Joint Tracks, Yards and Other Facilities—Cr.
- Clearing Accounts.*
- Shop Expenses.
 - Store Expenses.
 - Stable Expenses.
 - Work Equipment—Operation.
 - Insurance.
 - Injuries to Persons.

Following the titles of the primary accounts, as given above, the circular contains 52 pages of definitions of the 116 primary accounts and sub-primary accounts, "the latter being optional with carriers." A discussion follows defining the "Clearing Accounts," of which there are six unnumbered accounts, viz., shop expenses, store expenses, stable expenses, work equipment-operation, insurance, injuries to persons. These clearing accounts, it is explained, are intended to assist the distribution of certain costs which cannot be directly charged to any particular account until they can be distributed among the various accounts affected. Thus, the "Clearing Account—Shop Expense" would include heating and lighting the shops, water, watchmen, pay of employees while attending fires and fire drills, etc. The "Clearing Account—Store Expense" should be charged with the cost of purchasing, handling, storing material in and distributing it from the company's store houses; the "Stable Expense" with the cost of the horses, afterward to be apportioned to the several accounts on the basis of the service rendered by the horses, etc.

Following the classification of operating expenses the circular gives a tentative classification of expenditures for road and equipment, consisting of 62 accounts with definitions.

SUPPLEMENT

A supplementary notice was sent out March 3 by the Interstate Commerce Commission as follows:

This notice is to supply a statement that should have been contained in Accounting Series, Circular No. 20, so far as it refers to the Tentative Classification of Operating Expenses. That classification makes provision, among its primary accounts, for depreciation accounts, but it should be understood that, according to an agreement entered into at a general meeting of the representatives of the electric lines and the Federal and State Railway Commissions, held in Washington, Dec. 18, 1907, the question of depreciation need not be discussed in the replies submitted to Accounting Series, Circular No. 20, for the reason that a special committee of the representatives of the electric lines has been appointed for that purpose.

STATISTICS OF OPERATING IN ST. LOUIS

According to the United Railways of St. Louis, the average fare on all lines in that city last year was 3.38 cents as compared to 3.40 cents for 1906. During the year 313,945,149 passengers were carried, of whom 91,797,561, or 29.24 per cent rode on transfers. The cars traveled 38,447,977 miles, with an average of 8.17 passengers on each run. In 1907 22,422,363 more passengers were transported than in 1906. The revenue from fares was \$10,659,937, an increase of 5.36 per cent. On the Taylor line the average fare was considerably below 3 cents, being 2.3 cents. On the Marcus line the average fare was still lower, being 2.2 cents a ride. On the Hamilton and Vandeventer, the Tiffany, the Grand, the Union and the Sarah, the average fare was about 2.75 cents. The following statistics have been made public of the percentage of transfer passengers carried on each line as an indication of the average fare in all parts of town: Hamilton, 46.29 per cent of transfers to passengers transported; Page, 23.01 per cent; Taylor, 54.11; Vandeventer, 45.38; Chouteau, 27.24; Compton, 29.77; Park, 29.07; Tiffany, 46.19; Clayton, 11.72; Delmar-Clayton, 15.75; Midland, 12.59; Cherokee, 28.35; Tower Grove, 24.95; Grand, 47.05; Cass, 25.32; Easton, 27.50; Lee, 23.12; Marcus, 56.01; Spring, 22.27; Bellefontaine, 25.65; Eighteenth, 40.99; Jefferson, 43.15; Laclede, 31.02; Market, 24.15; Manchester, 23.42; Hodiamont, 18.29; Union, 45.35; Sarah, 45.42, and Suburban county lines, 15.37.

The heaviest traffic was on the Jefferson line. Grand Avenue was second, and Laclede third. The largest number of passengers was carried on the Olive, with the Broadway second, and the Page third. The density of traffic is figured on the mileage basis, and the following is the number carried per mile on each line: Hamilton, 4.66 passengers per mile; Page, 8.02; Taylor, 9.89; Vandeventer, 9.88; Chouteau, 4.42; Compton, 9.32; Park, 10.39; Tiffany, 7.25; Clayton, 1.78; Delmar-Clayton, 4.65; Midland, 4.33; Cherokee, 6.95; Tower Grove, 6.09; Grand, 12.59; Cass, 8.44; Easton, 9.83; Lee, 7.63; Marcus, 5.17; Spring, 5.64; Bellefontaine, 6.82; Eighteenth, 9.84; Jefferson, 14; Laclede, 11.99; Market, 8.14; Olive, 9.58; Broadway, 7.76; Fourth, 9.61; Seventh, 5.26; Manchester, 6.35; Hodiamont, 7.38; Union, 4.63; Sarah, 8.48; and Suburban county lines, 3.19.

NEW YORK STATE CONVENTION.

It has been decided to hold the next convention of the Street Railway Association of the State of New York at Niagara Falls on June 23-24. The headquarters will be at the Clifton Hotel.

REPORT ON THE ELEVATED LOOP PROBLEM IN CHICAGO

The following is the text of a brief report made on Feb. 20 to M. B. Starring, president of the Northwestern Elevated Railroad Company of Chicago, by Ford, Bacon & Davis, of New York, on increasing the capacity of the Union Loop:

DEAR SIR:

We are just completing the investigation commenced last June at your request covering the subject of improvement of your downtown terminal facilities, especially concerning the enlargement of capacity of the Union Loop. We present herewith our recommendations for the principal and immediate means of such improvement.

THROUGH ROUTEING.

Based on a detailed examination of the present operating conditions of Loop tracks, crossings, stations and car equipment, and after a careful study of the destination and number of passengers carried at times of maximum travel, we believe that a plan of through routeing can be adopted even under diversified ownership, which will be more convenient for the traveling public than the present operation around the Loop and will increase largely the number of cars that can be operated through this terminal district during the rush hours. It would, however, probably not be possible to obtain the full benefit to the public under diversified ownership which could be obtained were the roads under one management.

This plan contemplates through routeing only between the Northwestern and South Side companies, inasmuch as we believe it would be impracticable in addition to through route from north and south sides to the west side, and furthermore, from the standpoint of the public, through travel in the latter direction can be accommodated by means of transfers. We would recommend, however, that the operation of the west side lines can be made more satisfactory to the public by the operation of Loop trains of the Humboldt Park and Logan Square branches of the Metropolitan to the Loop over Lake Street by means of a connection between the Metropolitan and Lake Street structures near Paulina and Lake Streets. This would shorten the time of travel between these branches and points on the Loop and would also enable the Metropolitan to operate into the Loop more trains than at present. It is questionable, however, whether it would be possible to accomplish the routing of the Humboldt Park and Logan Square trains to the Loop over the Lake Street tracks without unified ownership of the roads involved.

The plan for through routeing between the north and south sides contemplates the operation of such through routed trains in both directions on both sides of the Loop, supplemented, for the benefit of the west side by an exchange of transfers without the payment of additional fare, between cars coming from the west side and these through routed trains. This alternation of through routed trains on both sides of the Loop would enable passengers to board or leave a train at any station on the Loop and go direct to their destination by traveling on one or two sides of the Loop without traveling around the third and fourth sides as is now necessary either in going or returning.

This plan of routing in conjunction with the lengthening of platforms, rearrangement of station stops, and the operation of six-car trains upon all roads, which we have heretofore recommended to you, will enable the operation at the peak of the rush hour of trains at the rate of 1164 cars per hour, as compared with the recent rush hour operation at the rate of 588 cars per hour upon which our calculations were based, which practically doubles the present operation on the Loop. We see no reason why seven and eight car trains should not be operated ultimately.

The rate of 588 cars per hour is a fair average of present maximum car service on the Loop, although at times we have observed a somewhat higher rate.

AUXILIARY TERMINALS.

In addition to the increase of terminal capacity above outlined, the Northwestern Elevated Railroad Company should build an auxiliary stub terminal as contemplated, at North Water Street, which would provide stub terminal facilities which are now used by the other three elevated companies. This stub terminal will give an immediate relief from the present rush hour congestion and can later, if deemed desirable, be supple-

mented by an additional stub terminal crossing the river at Dearborn Street, which latter would be a reserve against accident to the present Wells Street bridge and provide transportation facilities for passengers when the city shall proceed to remove the center pier of the Wells Street bridge.

The use of these stub terminals will provide sufficient terminal capacity for the passenger traffic of your company until such time as a subway can be constructed from the north to south side in which the city shall provide space for your trains. We believe that by the time such subway is constructed the elevated traffic will have increased sufficiently to warrant the use both of the present loop, the stub terminals and the subway. We have taken into consideration in our recommendations in this particular the history of electric railway transportation systems not only in Chicago, but also in New York and other large cities, where it has been found impossible to construct such terminal facilities fast enough to keep up with the increase in passenger traffic.

We are prepared to present the details from which the above conclusions have been derived to support our opinions as stated above.
(Signed) FORD, BACON & DAVIS.

ADVERTISING ON TRANSFERS IN BALTIMORE

A short account was published in the STREET RAILWAY JOURNAL of Jan. 18, of the notice printed by the United Railways & Electric Company of Baltimore on the back of its transfers, calling attention to methods of preventing tuberculosis. For some time past the company has used the backs of its transfers to call the attention of the public to matters of public concern or to advertise the company in different ways. Outside advertising is not accepted, but other notices which have been used are given below. They are printed in display type which is not reproduced:

Avoid accident. When leaving car grasp front handle with left hand and face forward.

There are 15 electric lines which go through suburbs and country; that means 15 different ways of spending a cool evening. The trolley makes you feel well, eat well and sleep well; try one.

Shop in the morning; salesmen have more time. A timely suggestion, as this is a great month for shopping. Don't put it off until the last minute. Shopping can be made pleasant if done at the proper time. Our cars run everywhere. You avoid the rush. Save time and temper.

Just to remind you how you and your friends can spend a delightful winter's evening on the trolley in a special car provided for your exclusive use. Don't worry about where to go—many suggestions to offer; about what to do—glad to answer questions. See the excursion agent. Tell your troubles to us.

Why not shop early? The business districts are conveniently reached by trolley from all sections of city and suburbs. Try it and be convinced that you will be benefited.

A business proposition. Your business is to get all the enjoyment and pleasure out of life there is in it. My business is to show you how much a trolley trip adds to your pleasure and enjoyment of life. Our business is to get together. See the excursion agent.

The advertisements are prepared by Benjamin B. Long, the excursion agent of the company, who also issues circulars relating to private cars, the parks of the company and conducts the promotion of the company's passenger business.

Regulations have recently been established in Los Angeles for the conduct of all street traffic. The rules are summed up as follows: "Always keep to the right, and, when turning to the left, cross the street first." The strict enforcement of the aforesaid regulations means practically an open street for electric cars, except, of course, at intersections.

FINANCIAL ASPECT OF THE NEW YORK CENTRAL ELECTRIFICATION

The proceedings of the American Society of Civil Engineers for February, page 68, contain the text of a paper by W. J. Wilgus entitled "The Electrification of the Suburban Zone of the New York Central & Hudson River Railroad in the Vicinity of New York City," which is to be presented before the society March 18. It is an elaborate discussion of this important work and includes some figures on costs of steam and electric operation from which the following is taken:

The operation, for a considerable period, of steam and electric equipment side by side has afforded an unexampled opportunity for a true comparison of costs of operation. Until now, data on this subject have been based on theory, ignoring many of the indeterminate features of actual operation that have such a weighty effect on costs. For instance, among the variables entering into an analysis of this character are:

- (a) Cost and quantity of coal and water at the power station, and on the steam locomotive tender.
- (b) Relation of ton-mileage of the motive power to total ton-mileage, including motive power and cars.
- (c) Frequency and volume of traffic.
- (d) Mechanical and electrical design of motive power as affecting repairs, and hours available for active service.
- (e) Fixed charges, depreciation and maintenance on all items of both kinds of service, that have a bearing on comparative results, including land, structures and equipment.

In other words, to obtain a true comparison, observations must be made under like conditions in a known service.

With this object in view, a typical steam switching locomotive, engaged in terminal service, and a steam passenger locomotive, assigned to road service, were each selected for observation in the same class of traffic with electric locomotives. The terminal service embraced switching at the Grand Central yard, and hauling dead cars to and from Mott Haven storage yard, a distance of 6 miles. The road service comprised the hauling of schedule trains by the electric locomotive between the Grand Central Terminal and Wakefield, 12½ miles, and the same trains by steam between Wakefield and North White Plains, 11½ miles.

Observers constantly rode the locomotives for the period of the tests, namely, Sept. 12 to 27, 1907, in terminal service, and Oct. 4 to 18, 1907, in road service. Cyclometers and wattmeters registered actual distances, speeds and current consumption. Record was also kept of the number of cars switched and hauled, and the proportion of time each

day engaged in actual service, awaiting duty, and laid up for inspection and repairs.

The coal used contained 14,000 b.t.u. per lb., and the cost per ton of 2240 lb. was:

Steam locomotives in terminal service (anthracite) \$5.00 per ton
 Steam locomotive in road service (bituminous).... 3.50 " "
 Port Morris power station (bituminous)..... 3.05 " "

Water, per 1000 gal., cost as follows:

Terminal service and at power station..... 13½ cents
 Road service 5 "

The cost of electric current, when the power station designed load is attained, is taken at 2.6 cents per kw-hour, delivered at the contact shoes of the equipment, and includes all operating and maintenance costs, interest on the electrical investment required to produce and deliver the current, depreciation, taxes, insurance and transmission losses. The details of this cost are:

Items.	Operating costs	Fixed charges	Total
Power station.....	\$0.58	\$0.44	\$1.02
Transmission losses.....	0.19	0.15	0.34
Distribution system and substations.....	0.32	0.92	1.24
Totals.....	\$1.09	\$1.51	\$2.60

Locomotive wages are practically identical for each class of service.

Table I shows the details of locomotive repairs, maintenance and fixed charges for each class of service, from which it will be noted that, although the fixed charges and depreciation of the electric locomotive are higher than those of the steam, owing to the greater first cost, the net result is in favor of the electric locomotive, due to lower costs for repairs and maintenance. These results are based on actual observations of the steam locomotive covering a period of several years, and of the electric locomotive for two years on the experimental track near Schenectady and one year in the New York zone. The reasons for the lower cost of repairs on the electric machine are the simplicity of construction and the minimum number of mechanical parts. It is also worthy of comment that the electric locomotive costs very much less per day for repairs and maintenance, due to lower expenses for land and structures, and fewer days out of service. For instance, the fixed charges and cost of maintenance and operation of the extensive steam-engine plant on costly land, are comparable with the simple inspection-shed charges of the electric locomotive.

TABLE I.—COMPARISON OF COSTS PER DAY OF AVAILABLE SERVICE OF STEAM AND ELECTRIC LOCOMOTIVES FOR INTEREST, DEPRECIATION, REPAIRS, INSPECTION, AND HANDLING.

SUBJECT.	STEAM.			ELECTRIC.		
	Description.	Amount per annum.	Per day.	Description.	Amount per annum.	Per day.
Interest.....	4½% on \$15,000.....	\$637.50		4½% on \$30,000.....	\$1,275	
Depreciation.....	5% on \$15,000.....	750.00		5% on \$30,000.....	1,500	
Repairs.....	General at West Albany.....	\$1,170		General at Harmon.....	\$468	
	Running at Mott Haven.....	414		Running at High Bridge and Wakefield.....	166	
	Trips to shops, 300 miles.....	168		Trips to shops, 60 miles.....	34	
	Use of shops.....	90	1,842.00	Use of shops.....	36	704
	Total for 335 days available for service.....	\$3,229.50	\$9.64	Total for 350 days available for service.....	\$3,479	\$9.94
Handling and inspection, including fixed charges and maintenance of land and structures ...	Mott Haven engine-house plant, 365 days.....	1,231.00	3.37	High Bridge and Wakefield inspection sheds, 365 days.....	200	0.55
Total.....		\$4,460.50	\$13.01		\$3,679	\$10.49

The saving in favor of the electric locomotive, therefore, is \$2.52 per day, equal to 19 per cent.

The Schenectady experiments indicated that the cost of repairs of the electric locomotive of this type is about two-fifths of that of the steam locomotive of a corresponding age and capacity.

The results of these observations are summarized in Table II. They show that, under the stated conditions, the electric locomotive has the following advantages over its steam rival:

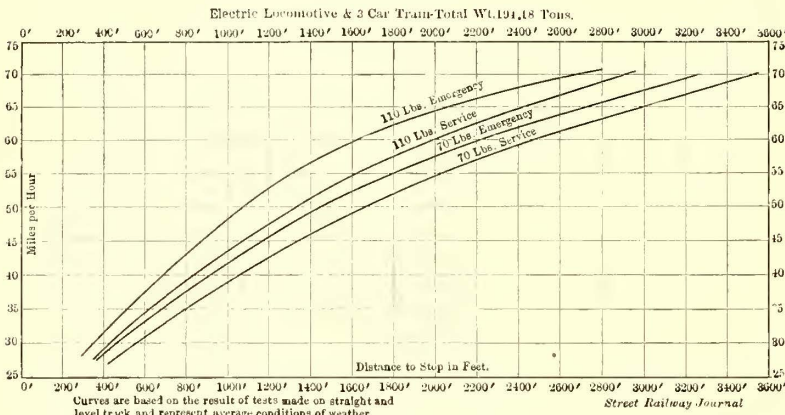
Nineteen per cent saving in locomotive repairs and fixed charges.

Eighteen per cent saving in dead time for repairs and inspection.

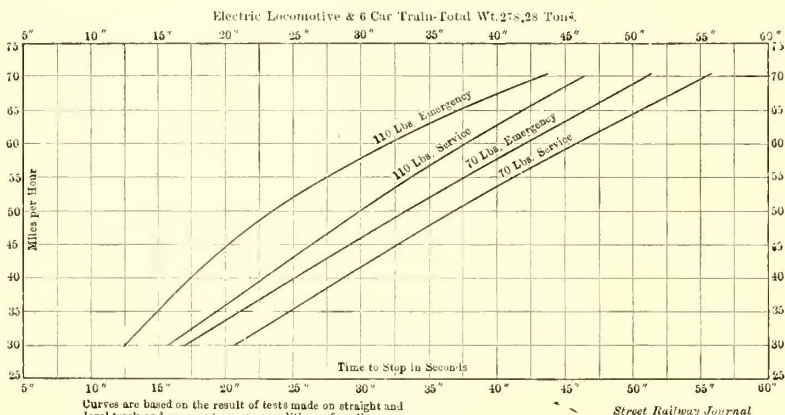
road locomotives at the terminal, the full benefits of change of motive power have not yet been secured. However, on the same wage basis for 1907 as for 1906, the month of August, 1907, showed a decrease in cost of terminal locomotive and yard operation of nearly \$3,000, although the number of cars in and out increased from 64,984 to 68,519. In other words, the cost of operation decreased 9 per cent while the work done increased 5½ per cent, which is equivalent to a net saving of 13½ per cent.

INCREASED REVENUE

As to the fourth expectation—increased revenue from a larger volume of business—no definite conclusions can be reached until the extension of electrical service, and the completion of the various other improvements afford an opportunity for increase in frequency and speed of train service; for the production of revenue from various sources at the terminal; and for the expansion of business that is sure to follow the enlargement of the facilities of the company throughout the suburban zone, not only as regards the local service, but in an even larger degree from long-haul freight and passenger traffic.



TRAIN BRAKING CURVE—DISTANCE



TRAIN BRAKING CURVE—TIME

Twenty-five per cent greater daily ton-mileage.

Six per cent saving in locomotive ton-mileage in hauling service.

Eleven per cent saving in locomotive ton-mileage in switching service.

Sixteen per cent saving in locomotive ton-mileage in road service.

Twelve per cent net saving in cost in hauling service.

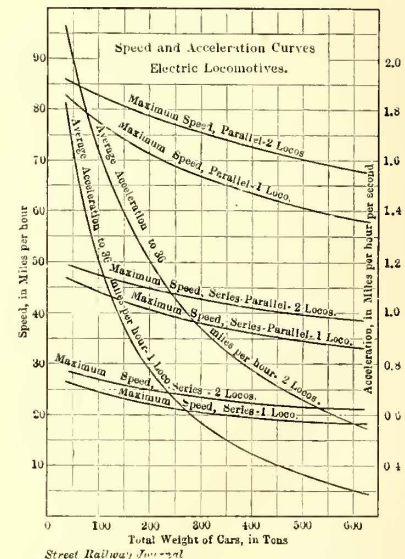
Twenty-one per cent net saving in cost in switching service.

Twenty-seven per cent net saving in cost in road service.

Even better results may be expected during winter months, when steam locomotives are subjected to many conditions that cause additional expenses not incident to the electric locomotive.

REDUCED COST OF GRAND CENTRAL TERMINAL OPERATION

Owing to the partial use of steam switching locomotives, and the presence of the New Haven Company's steam



SPEED AND ACCELERATION CURVES —ELECTRIC LOCOMOTIVES

SUMMARY OF RESULTS

To summarize, the observations thus far made demonstrate that this pioneer electric installation in heavy traction trunk-line work in the United States has fully accomplished the purposes that prompted its adoption, namely:

(1) Abolition of nuisances incident to the steam locomotive; and

(2) Increased capacity of the Grand Central Terminal a full year in advance of the date fixed by law; and in addition:

(3) The promise, with the completion of the changes, of a saving in cost of operation of from 12 to 27 per cent, after providing for increased capital charges for electrification; and

(4) The outlook of a large future growth of remunerative traffic, and other sources of revenue attendant on the use of electricity, much more than sufficient to provide for the increased capital charges for the other improvements.

Several years will be consumed in the gradual rounding out of the work as a whole; but it is gratifying to have this early indication of the success of the undertaking from both the engineering and financial standpoints.

OTHER OPERATING CONCLUSIONS

Apart from these results, it is interesting to note the conclusions, suited to this particular problem, that may be drawn from a study of the various observations.

Equipment designed for the electric system over which it is to operate offers economies so superior as to over-

systematic inquiries of all foremen in charge of electric zone track maintenance, and of the motormen operating electrical equipment, have brought out the practically unanimous opinion that the effect of electric locomotives, apart from slightly greater wear on switches, does not differ from steam motive power, on either line or surface of tracks, but that the former has better riding qualities. The superiority of electric traction is manifest, of course, in the cessation of costly corrosive action of locomotive gas on metallic structures, and the freedom from cinders which,

TABLE II.—SUMMARY OF COMPARATIVE TESTS OF STEAM AND ELECTRIC LOCOMOTIVES.

Kind of locomotive	Miles per day	Cars per day	Busy hours per day	Hours ready for duty daily	Percentage of time dead	Total ton-miles daily	Car ton-miles daily	Percentage of car ton-miles to total	Car ton-miles per busy hour	Coal or current per car ton-mile	Total cost per car, in cents	Speed and stops			Cost per 1,000 car ton-miles				Watt-hours required to do work of 1lb. coal
												Average miles per hour	Maximum miles per hour	Stops	Supplies	Wages	Interest, depreciation, and repairs on locomotives	Total	
SWITCHING SERVICE—GRAND CENTRAL TERMINAL.†																			
Steam.....	10.91	55	†1.83	†6.16	†0.52	2,580	916	0.35	501	3.36lb. coal, 264 watt-hr.	35.2	..	..	..	\$8.06	\$5.34	\$7.61	\$21.01	} 79
Electric.....	11.13	53	†2.01	†6.80	†0.26	1,980	914	0.46	445	.....	28.5	..	..	..	6.88	5.25	4.40	16.53	
Advantages in favor of electric locomotives....	0.22	....	†0.18	†0.64	†0.26	....	....	0.11	....	.....	6.7	..	..	..	1.18	0.09	3.21	4.48	
HAULING TO AND FROM MOIT HAVEN.†																			
Steam.....	40.0	45	†3.36	†5.18	†0.53	16,540	11,720	0.71	3,490	0.46lb. coal, 44.3 watt-hr.	51.6	11.9	48	0.9	1.12	0.35	0.52	1.99	} 96
Electric.....	78.4	95	†6.41	†10.42	†0.30	30,370	23,310	0.77	3,640	.....	43.2	12.3	45	2.0	1.16	0.31	0.28	1.75	
Advantages in favor of electric locomotives....	38.4	50	†3.05	†5.24	†0.23	13,830	11,590	0.06	150	.....	8.4	0.4	3	1.1	....	....	0.24	0.24	
ROAD SERVICE.*																			
Steam.....	74.04	28	3.72	†11.11	†0.54	25,620	12,660	0.49	3,400	1.22lb. coal, 52.3 watt-hr.	126.0	19.9	60	8.6	2.03	0.28	0.46	2.77	} 43
Electric.....	126.22	43	5.34	†13.70	†0.43	33,210	21,510	0.65	4,030	.....	100.0	23.6	55	2.9	1.37	0.31	0.34	2.02	
Advantages in favor of electric locomotives....	52.18	15	1.62	†2.59	†0.09	7,590	8,850	0.16	630	.....	26.0	3.7	5	..	0.66	....	0.12	0.75	

* Portion of time of locomotives engaged in other service not shown in this table. † Switching and hauling done by same locomotives. ‡ Total time of locomotives in all classes of service.

shadow any other advantages that may be claimed for a kind of equipment that can be operated over several systems.

In switching service, the economy of electric traction lies in savings for supplies, and in lower unit fixed charges and repairs due to less lost time for repairs and care.

In slow-speed hauling, the advantage lies in the lower unit fixed charges and repairs of the electric locomotive, due to its ability to do more work while busy, and to less lost time for repairs and care.

High-speed road service shows advantages for electric traction in all three items: supplies, wages and fixed charges and repairs. The small 18 per cent increase in current consumption for the greater speed of road service, as compared with hauling service, is in marked contrast to the 165 per cent increase in coal consumption for steam traction.

Opportunities for large economies lie in the thorough training of motormen in the manipulation of their controllers, a very simple problem as compared with the difficulties of teaching both the enginemen and firemen on steam locomotives to perform their duties so as to result in fuel economy.

MAINTENANCE OF TRACK AND STRUCTURES

It is yet too early to express in dollars the comparative effect of steam and electric traction on the cost of maintaining and renewing tracks and structures. Repeated

with the steam locomotive, cause heavy maintenance costs for cleaning, rock ballast, and pointing brick tunnel arches.

ACCELERATION AND BRAKING

Mr. Wilgus also appends to his paper the accompanying diagrams of acceleration and braking with electrical equipment.

INTERVIEWS WITH GLASGOW TRAMWAY MANAGERS

The *Cleveland Leader* is publishing a series of articles from a staff correspondent on municipal conditions in Europe, in which interviews have been given with some of the tramway managers. The most interesting are those with James Dalrymple and Sir John Primrose, of the Glasgow system. Mr. Dalrymple said: "I believe no small part of the success of the Glasgow system under municipal operation is due to the fact that there is absolutely no politics in it. The slightest outside influence will make the difference between success and failure."

Sir John Primrose referred to one danger in municipal activity which he thought would be even more apparent in America than in Great Britain. This was the building up of an army of municipal employees which might wield a power in the direction of the city government not altogether for the best interests of the municipality. The only remedy was one advocated by himself at a public dinner recently, namely, to withhold the franchise on all municipal matters from city employees.

CORRESPONDENCE

REPLIES TO THE INTERSTATE COMMERCE COMMISSION CIRCULAR

AMERICAN STREET & INTERURBAN RAILWAY ASSOCIATION
NEW YORK, March 2, 1908.

Editors STREET RAILWAY JOURNAL:

Circular No. 20, of the Interstate Commerce Commission, states that replies to the circular should be made in duplicate, one copy to be forwarded to Elmer M. White, secretary, American Street & Interurban Railway Accountants' Association, Birmingham, Ala., and the other copy to Prof. Henry C. Adams, of the Interstate Commerce Commission.

The inclusion of Mr. White's address in the circular was due to a misunderstanding. One copy of the reply should be sent to Prof. Adams, as stated in the circular. The other copy should be sent to the New York office of the American Street & Interurban Railway Association, 29 West Thirty-ninth Street, and not to Mr. White. I shall esteem it a favor if you will notify your readers to this effect.

B. V. SWENSON,
Secretary.

THE CLARK JOINT IN BUFFALO

INTERNATIONAL RAILWAY COMPANY

BUFFALO, Feb 18, 1908.

Editors STREET RAILWAY JOURNAL:

Upon request of a number of engineers and others interested, a description of the "Clark Joint," so called, is given below:

The "Clark Joint" briefly described consists of the common joint plates with drive fit bolts with a shoe of thermit steel on the base of rail at the joint. The method of obtaining the best results so far has been to order the rails and plates drilled with round holes all of the same size and 1/16 in. smaller in diameter than the bolts to be used. The bolts are standard machine bolts with square heads and hexagon nuts. The holes are reamed to fit. On the work in Buffalo, N. Y., for the reaming of these holes we have been using three No. 4 Ludlow double-track drillers with special reamers designed by W. E. Ludlow, of Cleveland, Ohio, who also designed the track drillers.

The cost of a twelve-hole, 1 1/4-in. hole joint for a 140-lb. rail is as follows:

Plates, No. 130	\$2.21
Bolts, twelve 1 1/4-in. No. 3, 9 oz. each.....	1.05
Reaming, labor and depreciation of reamers.....	.16
Bolting up .....	.10
Thermit, includes all charges.....	2.55

\$6.07

If eight-hole plates are used..... 5.08

The figure on reaming is based on our experience that two men at a cost of \$3.75 will ream about twenty-five 12-hole, 1 1/4-in. hole joints per day and about thirty 12-hole, 1-in. joints. We have reamed ten holes in ten minutes. One of the special four-blade adjustable reamers will ream eight to ten joints without sharpening. A great advantage in using the adjustable reamer consists in the ease with which the diameter of the reamer can be slightly varied by introducing strips of paper under the blades. As is well known, a commercial machine bolt will not caliper exactly to size, and the reamer should be adjustable. The plates are first put on as ordinarily a joint plate is placed and two

bolts 1/8-in. less in diameter used. A drift pin each side of the joint keeps the butts of the rails snug up. These pins are not removed till a reamed fit bolt is inserted each side of joint. The drift pins will also keep rails "butt up" when contraction takes place, as over night or in rainy weather.

After the bolts have all been placed and tightened, a shoe of thermit steel is placed around the base of the rail. This thermit welds the base of the rail and makes solid at the joint, thus preventing any working of the joint and loosening of joint plates. The thermit not only makes the joint mechanically perfect, but serves as a bond—a bond which will not oxidize and fail to carry the current. Seven pounds of thermit only are used for each weld. As a matter of interest to track men the Cleveland Electric Railway Company has placed about 5000 Clark joints within the last two years and during the present winter has been testing them electrically, and mechanically also. Out of about 3000 joints none was found leaking or not returning all the current carried by the rail.

Before the joint is called complete the heads of the abutting rails are surfaced with a 14-in. flat bastard file. This will prevent any tendency to pound.

CHAS. H. CLARK,
Engineer of Way.

GAS ENGINE MAINTENANCE

NIAGARA FALLS, SOUTH, Ont., Feb. 15, 1908.

Editors STREET RAILWAY JOURNAL:

I am glad to learn from Mr. Marburg's letter, published in your number for Feb. 1, that there is no cause for alarm as to the maintenance charges of producer gas plants in this country. If this is the case why do not the manufacturers of gas engines give out such figures as they have at hand? Surely there are some small plants which have been operating in this country for a sufficient length of time to give a fair idea of their maintenance charges.

It is, of course, useless to draw comparisons with European conditions, as the cost of labor there is so materially lower than that in this country as to render such a method extremely inaccurate. Let us have some actual figures.

W. N. RYERSON.

TRANSFERS IN HEALTH CAMPAIGN IN NEW YORK

Attention was recently called in these columns to the use in Baltimore of the transfer in a campaign against disease. It seems that New York is also among the cities which has thus recognized the value of the transfer in such relief work, one of the large department stores, which uses the transfer as an advertising medium, making available for the use of the committee on the prevention of tuberculosis of the Charity Organization Society the reverse side of the transfers of the New York City Railway Company on Sundays. The words of warning are as follows:

CONSUMPTION IN EARLY STAGES CAN BE CURED

Take your case in time to a good physician, or to a dispensary and you may be cured—DO NOT WAIT.

Consumption is "caught" mainly through the spit of consumptives.

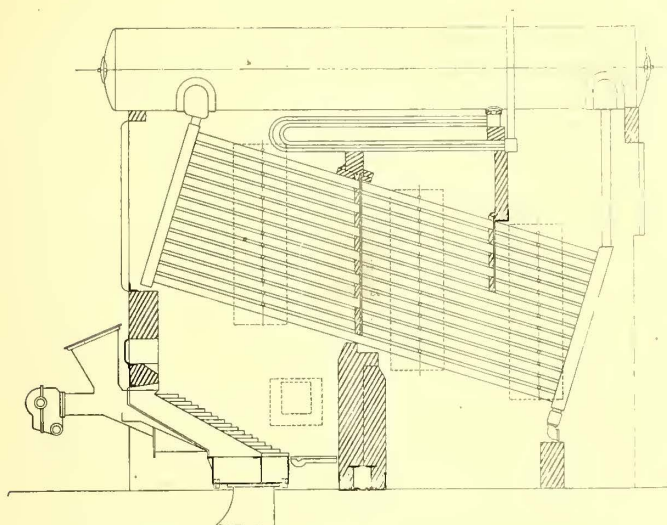
Friends of Consumption—Dampness, Dirt, Darkness, Drink. Enemies of Consumption—Sun, Air, Good Food, Cleanliness.

If you have tuberculosis, do not give it to others by spitting; even if you have not, set a good example by refraining from a habit always dirty and often dangerous.

THE COMMITTEE ON THE PREVENTION OF TUBERCULOSIS OF THE CHARITY ORGANIZATION SOCIETY.

AN IMPROVED UNDER-FEED STOKER

During the past few months the Taylor underfeed stoker has been installed in several of the large steam power plants in New York and vicinity. The results obtained have been so satisfactory that all power users should be interested in an account of this stoker and the efficiency it has shown in several tests made under operating conditions in one of the



CROSS-SECTION, SHOWING STOKER INSTALLED UNDER WATER-TUBE BOILER

large power stations of New York for a period extending over five months.

This underfeed stoker differs materially from earlier designs in combining the underfeed with the inclined gravity feed. This novel construction, in connection with several other features, has produced a stoker which is claimed

air-perforated tuyeres, which are simple cast-iron plates laid one on top of the other. Between the rows of tuyeres are two cylindrical rams, the upper ram receiving coal from a hopper and the lower ram feeding only the coal and partially consumed coke delivered from the upper ram. These two rams move in unison, the upper ram deriving its motion from a crank shaft on the front of the stoker and the lower ram from the connecting rod of the upper. The travel of the upper ram is fixed (about 10 ins.), that of the lower ram being adjustable to suit the conditions imposed by fuels of varying ash contents. In practice with ordinary fuels the lower ram travel is from 2 ins. to 3 ins.

The lower tuyeres rest on a rectangular box which acts as a support and also as an air box connecting all the tuyere rows to a common source of air supply. From this air box is hinged the sectional dump plate operated from the boiler front. This plate is unperforated, as combustion is supposed to be complete by the time sufficient ash has accumulated to require dumping. No arch combustion of any kind is used, but provision is made for introducing secondary air above the grate when needed at the higher rates of combustion.

The operation is as follows: Coal is fed between the several rows of tuyeres passing forward and upward and is met in its passage by streams of highly heated air projected horizontally. The tendency of the whole fuel bed from the combined action of the rams is to move downward toward the dump, the resultant of the ram action and the fuel travel being to break up the fuel bed continuously.

This breaking action renders it unnecessary to slice or level the fuel bed, the coal distribution being even. The only attention necessary is the periodical dumping of the ash. In practice these dumps take place in from three to five hours according to the fuel consumption. The coal feed is regulated by driving the stoker mechanism from

—TABLE No. 1.—

Test No.	Date	ECONOMY, ETC.													
		Duration Hr.				Horse-Power				Total Test					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Wet Coal Fired per Hr.-Lbs.	Actual Water per Hr.-Lbs.	Factor of Evap Corr. for Superheat	Equiv Water Lbs. per Hr.	Maximum Hr	Per Cent Rating	Per Cent Rating Max. Hr.	Actual Water per Lb. Dry Coal	Equiv Water per Lb. Dry Coal	Equiv Water per Lb. Comb Fired	Equiv Water per Lb. Comb Burned	Equiv Water per Sq Ft H.S. per Hr.	Dry Coal Fired per Sq Ft G.S. per Hr.	
1907		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	8	2230	19870	1.141	22690	658	728	101.2	112.0	9.23	10.54	11.38	11.79	3.55	25.39
2	8	2275	21000	1.137	23880	692	740	106.5	113.9	9.62	10.94	11.63	11.83	3.74	25.75
3	8	2300	22780	1.154	26300	762	818	117.3	125.8	10.19	11.76	12.60	12.72	4.12	26.38
4	8	2475	24730	1.149	28420	824	987	126.7	151.9	10.27	11.80	12.94	13.16	4.45	28.39
5	8	2500	25040	1.151	28820	836	1022	128.6	157.2	10.24	11.79	12.75	12.94	4.52	28.85
6	8	2650	25530	1.152	29410	852	1001	131.0	154.0	9.92	11.42	12.28	12.54	4.61	30.38
7	8	2625	25300	1.163	29410	852	917	131.0	141.1	9.93	11.54	12.31	12.38	4.61	30.06
8	8	2600	26100	1.135	29620	859	912	132.1	140.3	10.35	11.75	12.69	13.04	4.65	29.75
9	8	2779	26930	1.144	30800	893	1069	137.4	164.5	10.05	11.49	12.37	12.76	4.82	31.63
10	8	2825	28080	1.135	31870	924	1094	142.2	168.3	10.24	11.63	12.40	12.59	4.99	32.33
11	8	3825	35230	1.140	40180	1164	1279	179.0	196.9	9.59	10.93	11.81	12.28	6.30	43.35
12	3.85	38.43	36.360	1.143	41520	1204	12.46	185.3	191.7	9.77	11.16	11.93	12.21	6.51	43.88

—TABLE No. 2.—

Test No.	CONDITIONS.														
	Ins Water						Ins Water								
	15	16	17	18	19	20	21	22	23	24	25	26			
	Steam Pressure	Steam Temp	Superheat - Deg F	Feed Water Temp	Furnace Draft	Flue Draft	Ash Pit Pressure	Total Draft on Fire	Boiler Room Temp.						
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	189.9	447.1	63.6	165.6	23.34	19.2	1.13	81.9							
2	193.3	450.3	65.4	168.5	22.33	19.2	1.12	101.5							
3	193.4	454.0	69.1	154.0	39.55	19.2	2.29	95.7							
4	194.0	461.5	76.3	164.0	46.70	21.2	2.56	90.6							
5	193.7	461.5	76.4	161.2	38.59	21.2	2.48	97.0							
6	191.7	462.0	77.7	158.5	39.62	21.2	2.49	84.2							
7	195.3	463.3	77.6	150.0	45.69	20.2	2.45	84.2							
8	192.3	451.8	67.3	171.9	31.50	21.2	2.41	103.5							
9	196.0	466.9	80.9	171.0	37.64	22.2	2.57	73.2							
10	194.1	451.8	66.7	172.8	37.54	22.2	2.57	80.0							
11	195.0	466.7	81.1	176.6	23.53	2.9	3.13	103.5							
12	193.2	466.7	81.8	172.0	35.63	2.9	3.25	80.0							

to be free from the objections urged against other horizontal fuel bed stokers, such as caking, clinkering and irregular or smoke-producing combustion caused by the periodical opening of furnace doors whereby too much air is admitted. From a maintenance standpoint the new stoker must appeal to the operating engineer since no ignition, coking or combustion arches are required in it.

The device consists of an inclined grate made up of

the engine or motor which drives the forced blast fan. The relation of the air supply to the coal feed having once been established, all that is necessary is to change the speed of the fan engine in accordance with the demand for steam.

The claims of the manufacturer for this stoker are: Smokeless combustion throughout the entire range of operation, high furnace efficiency, maximum range of capacity, quick response to capacity demand and from a banked con-

dition, no moving parts subjected to the fire, low operating cost, low maintenance cost and applicability to any externally fired boiler.

The accompanying trial data secured under conditions of operation in the New York plant show how this apparatus fills the claims of efficiency and capacity made for it.

were of eight hours duration and all results are averages of the entire period of each test.

The tables Nos. 1 to 5 give data of output and economy, of conditions, analysis of coal, gas and refuse, of temperatures throughout the boiler and of utilization of heat supplied, as shown in the heat balance. From these data

—TABLE No. 3.—

COAL, REFUSE AND GAS.												
Test No.	Coal Analysis.					Refuse		Gas Analysis				
	Moisture	V.M.	FC	Ash	BTU. per Lb. Dry Coal.	Per Cent Combustible in Refuse thro Grates.	Total Refuse. per Cent Wet Coal.	CO ₂	O	CO.		
	24	25	26	27	28	29	30	31	32	33		
1	3.4	200	69.4	7.2	14484	29.5	10.2	10.9	7.9	0		
2	4.0	19.6	70.6	5.8	14537	21.0	7.3	12.1	6.85	0		
3	2.8	19.4	71.4	6.4	14516	12.8	7.3	13.3	5.9	0		
4	2.7	19.9	68.9	8.5	14360	14.7	10.0	12.2	7.5	0		
5	2.2	18.8	71.6	7.4	14291	14.9	8.7	13.0	6.2	0		
6	2.8	18.5	71.9	6.8	14329	21.4	8.6	12.7	6.5	0		
7	2.9	19.1	72.0	6.0	14820	9.8	6.7	13.5	5.8	0		
8	3.0	20.8	69.0	7.2	14480	25.4	9.7	12.9	6.1	0		
9	3.5	19.8	69.8	6.9	14329	27.9	9.6	13.5	4.7	0		
10	3.0	19.9	71.1	6.0	14702	17.7	7.3	16.2	1.4	5		
11	3.9	20.8	68.1	7.2	14360	32.2	10.6	14.1	4.4	0		
12	3.2	19.9	70.7	6.2	14858	26.1	8.4	16.5	1.3	2		

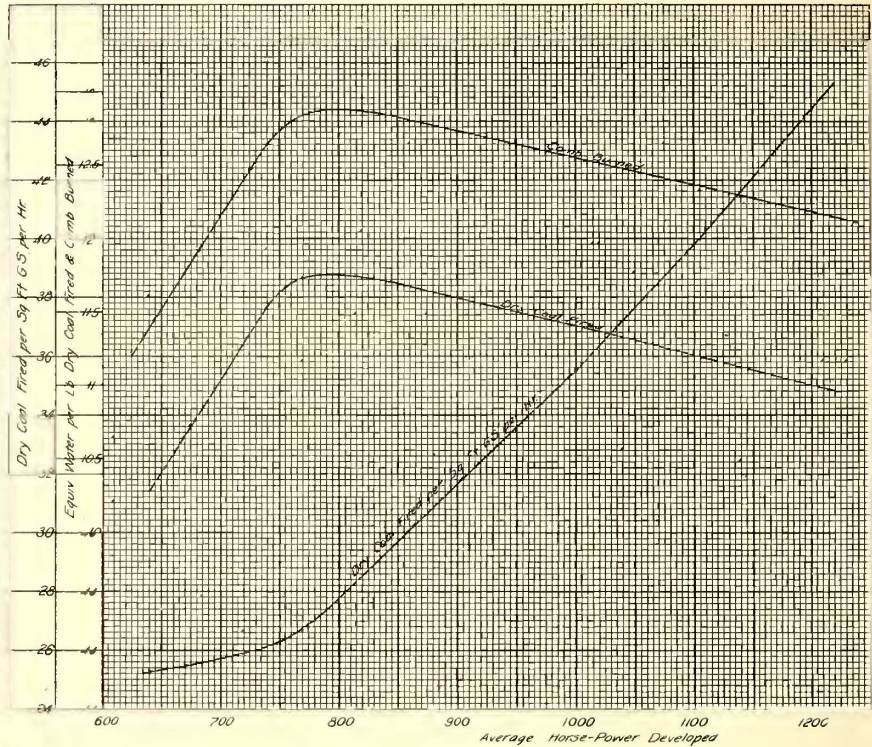


FIG. 1

The steam generator on which these tests were run is a standard water-tube boiler containing 6386 sq. ft. of heating surface and a self-contained superheater of 760 sq. ft. of surface. There is no special furnace construction,

three curve sheets were prepared, two of which are reproduced as Figs. 1 and 2.

Fig. 2 shows very forcibly the necessity for proper relation between grate area, combustion space and heating

—TABLE No. 4.—

HEAT BALANCE.																	
Test No.	BTU per Lb. Combustible Burned.																
	BTU. per Lb. Combustible	Absorbed in Evap. Water in Boiler	Absorbed in Superheating Steam	Total Absorbed in Superheating & Evap	Moisture in Coal	Loss Due to	Temp of Flue Gases	Loss through Grates with Ash	Loss Due to Radiation etc.	Total Delivered to Boiler	Boiler Efficiency (37-42)	Furnace & Grate Eff (42-44)	Combined Eff (43 x 44)				
	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	15620	11026	354	11380	48	1916	544	2276	15572	73.1	96.7	70.6	72.9	31	12.3	35	14.6
2	15470	11063	367	11430	53	1723	270	2264	15417	74.2	98.3	72.9	73.9	34	11.1	17	14.6
3	15540	11864	416	12280	38	1655	161	1567	15502	79.3	99.0	78.5	79.0	24	10.6	10	10.0
4	15740	12228	472	12700	38	1925	213	1077	15702	80.7	98.7	79.6	80.6	24	12.2	14	6.8
5	15460	12015	465	12480	30	1756	224	1194	15430	80.9	98.6	79.8	80.6	19	11.3	14	7.7
6	15410	11643	457	12100	39	1870	322	1401	15371	78.7	98.0	77.1	78.5	25	12.1	22	9.1
7	15800	11503	447	11950	39	1760	114	2051	15761	75.8	99.3	75.3	75.6	25	11.1	7	13.0
8	15640	12162	418	12580	41	1715	439	1304	15599	80.7	97.2	78.4	80.5	26	11.0	28	8.3
9	15440	11822	488	12310	50	1890	464	1190	15390	80.0	97.0	77.6	79.8	32	12.2	30	7.7
10	15670	11732	398	12130	41	1470	225	2029	15629	77.6	98.6	76.5	77.5	26	9.4	14	13.0
11	15520	11378	472	11850	55	1708	621	1907	15465	76.6	96.1	73.6	76.4	35	11.0	40	12.3
12	15860	11308	472	11780	45	1646	392	2399	15815	74.5	97.6	72.7	74.3	28	10.4	25	15.1

—TABLE No. 5.—

Test No.	TEMPERATURE OF GASES. THROUGHOUT THE BOILER—DEG. F.						
	Optical Pyr.	Electrical Pyrometers:					
	Furnace Temp.	Mid 1st Pass	Top 1st Pass	Top 2nd Pass	Mid 2nd Pass	Mid 3rd Pass	Flue
	51	52	53	54	55	56	57
1	—	833	615	519	485	428	418
2	—	852	632	524	490	—	441
3	2336	866	655	619	511	471	455
4	—	893	689	646	526	485	473
5	2420	888	681	633	521	481	468
6	2455	889	682	642	519	479	468
7	2430	913	694	655	512	486	473
8	—	896	679	—	516	—	459
9	—	956	723	660	547	512	492
10	—	939	700	634	523	493	475
11	2640	995	742	—	550	—	488
12	2530	1051	751	700	578	541	519

the gravity underfeed stoker being inserted between the side walls directly under the boiler tubes.

The tests were conducted in accordance with the code of the American Society of Mechanical Engineers and all apparatus and instruments calibrated by comparison with standards. All tests, except one at maximum capacity,

surface; that this proportion was not correct in the apparatus tested is evidenced by the fact that the highest efficiency was shown at a rate of combustion of 27.5 lbs. per sq. ft. of active grate corresponding to a boiler output of 800 hp or 123 per cent of builders' rating. Below this rate it was impossible to keep the grate properly covered,

resulting in excess air admission and consequent loss in efficiency. At the higher rates of combustion the need for more ample combustion space was shown, as the losses charged to radiation and unaccounted for most probably are due largely to incomplete combustion of the volatile constituents of the fuel. It will be noticed that the heat losses due to temperature of waste gases are very con-

laid by the inefficiency of kerosene lanterns and the inability of five lamp series strings from trolley to ground throwing light where it is most needed. At Memphis, Tenn., a wrecking car built by the Memphis Street Railway Company obviates this difficulty by the installation of five incandescents just beneath the sill of the forward and rear ends, the result being a flood of light available at either or both ends simultaneously. One of these lamps in each group is fitted with a red bulb to act as a cautionary tail light. Another desirable feature is the provision of a wrought-iron rope link with rounded prongs and stem to prevent cutting the rope when hauling under the car's own power. It has been found that the elevation of tool and operating cab about 18 in. above the deck of a wrecking car is a great convenience when it is desired to carry rails and long timbers on the car itself. A cast-iron pedestal can easily be designed to bolt through the floor, and unless the cab is bulky no difficulty occurs in carrying it in this way. Another convenience of great value is some arrangement for raising a platform on top of a work car from the inside; by a windlass and cranks this can be done without great difficulty and if some form of pin-locking device is installed to hold the platform in place little is left to be desired. In some cases a small motor-driven hoist can be located within the car as far as the motor control and drum are concerned. At Knoxville an arrangement of this kind has proved suc-

cessful and the space outside the cab is left free for the handling of materials. As an emergency precaution hand brakes should never be omitted from the make-up of a work car moving under its own power, and the provision of side steps and grab irons cannot be too carefully made. By the proper separation of the smaller supplies in the line of bolts, nuts, ropes and minor tools in marked compartments a large amount of apparatus can be carried in a very small cab. Plenty of inside lighting is worth many times its cost in the operation of a work car under trying conditions.

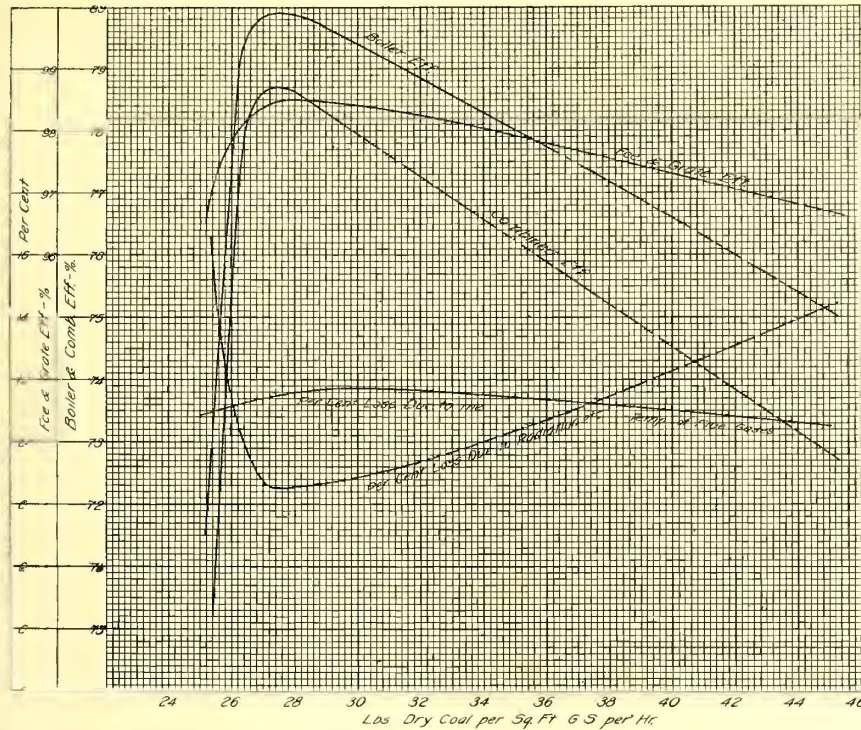


FIG. 2

stant throughout the entire range of capacity. This is accounted for by the decrease of excess air at high rates of combustion more than balancing the increase of flue temperature.

These results would indicate that for this particular installation a somewhat smaller grate area and a higher boiler setting should improve the general performance by allowing more coal to be burned per square foot of grate and providing a larger combustion chamber for the complete combustion of the hydro-carbons.

The economical limit of capacity was not reached in these tests. A rate of combustion of 50 lbs. of coal per sq. ft. of grate surface, an evaporation of 8.1 lbs. of water per sq. ft. of heating surface or an equivalent boiler output of 1500 hp is not at all beyond the range of economical operation.

DESIGNING WORK CARS FOR MAXIMUM CONVENIENCE

Work and construction cars for electric railway service are almost always special in design on account of the differences in local operating conditions found in various localities. The problem of track clearance limits the length closely in some cities, while in others the work car is required to fulfil both emergency and general repair functions. In certain directions, however, the convenience of the work car can be increased, no matter how limited may be the general design.

Inadequate lighting of the track space immediately in front of and behind a work car is a frequent complaint and there is no doubt that work done at night is often de-

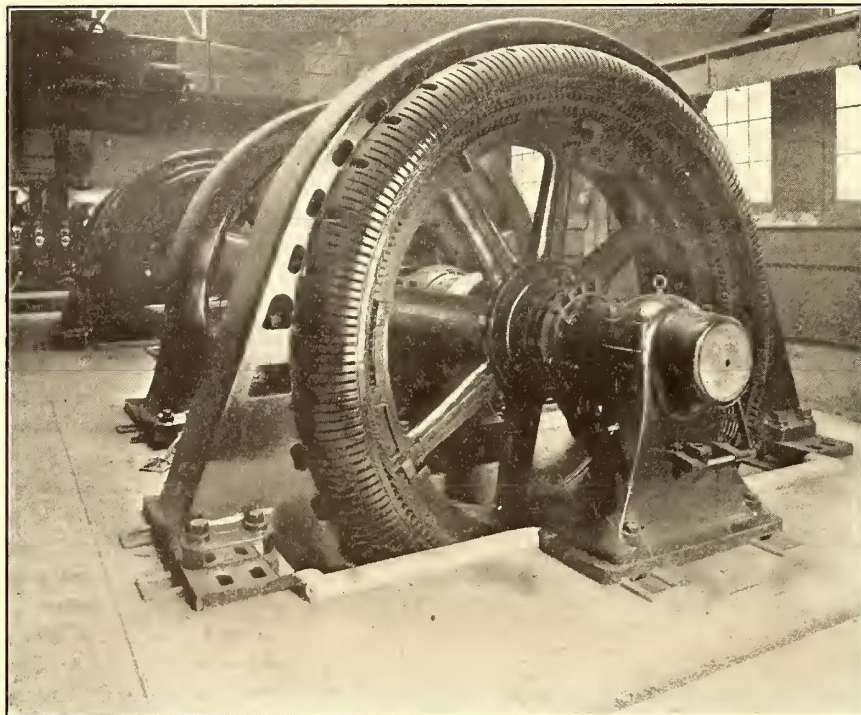
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In speaking of work in contemplation by the Long Island Railroad, P. H. Woodward, secretary to President Peters, of the Long Island Railroad, said that the first work to be undertaken when the money is available is the double tracking of the line from Whitestone Junction to Port Washington. For this the company has already purchased the rails, ties, and all necessary equipment. The cost will be something over \$2,000,000. When this is done and the electrification of the line from Port Washington to Long Island City is complete, passengers from Port Washington and all other points on the line will be able to go through to the Pennsylvania station at Thirty-second Street and Seventh Avenue, Manhattan, without change of cars.

The United Railways Company, of St. Louis, is building nine new mail cars for use in that city. They will be 30 ft. long, 10 ft. longer than those now in use, and will be running within two months.

LARGE MOTOR GENERATORS FOR THE LONDON COUNTY COUNCIL

The accompanying illustration shows two 1500-kw induction motor generators furnished by Dick, Kerr & Co., Ltd., of London and Preston, for the London County Council Tramways' Elephant & Castle substation. These machines are the largest of their type supplied in Great Britain. Each has an outfit of 1500 kw at 500-550 volts d. c., has a speed of 133 to 135 r.p.m. and can carry 25 per cent overload continuously for one hour. The induction motors are of



TWO 1500-KW MOTOR-GENERATOR SETS IN THE ELEPHANT AND CASTLE SUBSTATION.

the wound rotor type, with slip rings for inserting the starting resistance, the stator being wound for the full normal pressure of 6600 volts between the three phases. The frequency is 25 cycles.

The induction motor stator consists of a heavy cast iron ring cast in one piece, separate from the base plate to which it is bolted by turned and fitted bolts. The core plates are thin steel punchings, reannealed after punching, securely clamped between end plates drawn up by heavy bolts. Ventilating spaces are provided along the length of the stator core, corresponding to similar spaces in the rotor core. The stator windings are enclosed in micanite troughs, the external loops being taped and finally finished over with varnished cord. These loops are protected from mechanical injury by ventilated cast iron guards. The rotor is built up on a solid spider of cast steel, keyed to the shaft. The core is

made up of thin steel stampings, ventilated throughout its length and well clamped together by end plates. The motor is started up with full voltage on the stator, resistance being inserted in the rotor circuit by slip rings which are short circuited when the machine has run up to speed.

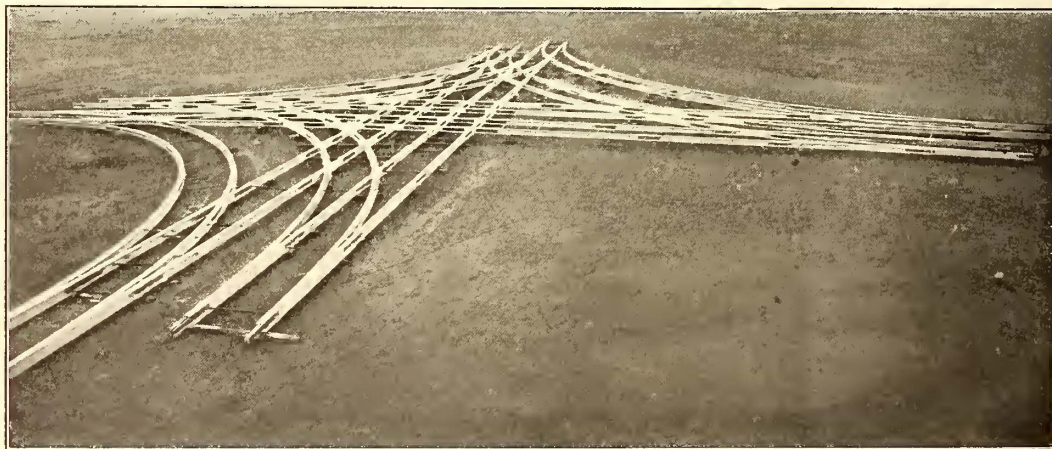
AN IMPORTANT PIECE OF MANGANESE STEEL TRACKWORK FOR NEWCASTLE-ON-TYNE

Edgar Allen & Company, Limited, Imperial Steel Works, of England, who are well known throughout the world for their trackwork, have recently completed a remarkable track crossing for the Newcastle-on-Tyne Tramways, which is made entirely in their "Imperial" manganese steel.

The length of the Newcastle layout is 148 ft. x 143 ft., being nearly a square, actually 91 deg. 7 min. The nearest example for purposes of comparison is afforded by Fitzalan Square layout, Sheffield, which, however, is about 45 ft. less in one direction and about 30 ft. in the other. Whereas that junction has curved tracks on two sides only, the Newcastle layout contains curved tracks on three sides, forming two 3-Y curves, thus increasing the number of compound castings.

There are 136 pieces in the layout, the total weight of castings being 50 tons. The longest switch is 17 ft. and consists of a moveable switch and two crossings combined and weighs 1792 lb., while its mate weighs 1233 lb. and carries one crossing at the toe end. The average length of the switches is 12 ft. with 9-ft. tongues and they weigh 1736 lb. per pair.

There are five large three-day crossings, averaging 1344 lb. each. The center star crossings are of the ordinary type except one, which has legs about 10 ft. long on each side so as to connect up two sides of the junction, and weighs 1008 lb. There are thirty



SPECIAL CROSSING FOR NEWCASTLE-ON-TYNE

crossings varying from 9 ft. to 14 ft. and from 560 lb. to 1680 lb. each.

There are sixty-three rails, all cast manganese steel. Their average length is 15 ft., the lengths being regulated by the necessary joints, but where possible 20-ft. rails are

used, so that Newcastle now holds the record for the longest cast rails. All the rails are cast straight and curved to radius required. A special feature is that all the straight rails are manganese steel. It is believed this is the first time these have been used in a large junction of this class.

The chief aim of the city engineer of Newcastle was to

GERMAN AUTOMATIC AIR BRAKE SYSTEM FOR STREET RAILWAYS

The operation of trail cars on street railways is very common in Germany and consequently a great deal of attention has been given in that country to street-car braking.

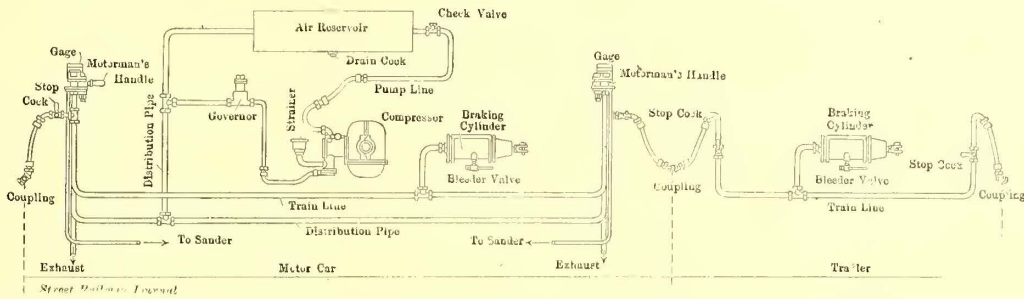
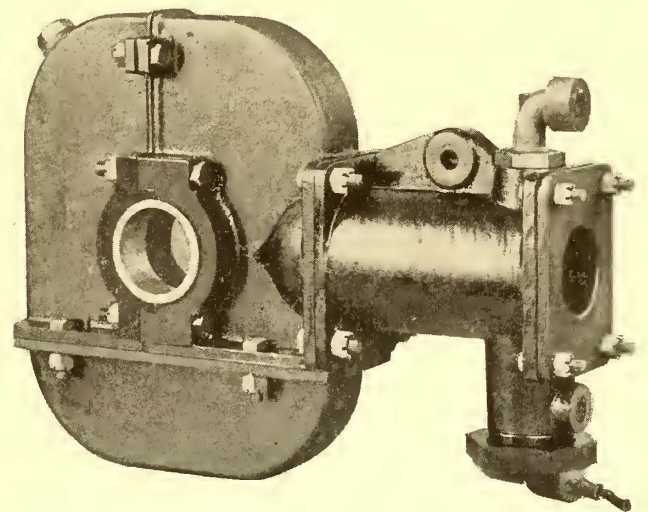


DIAGRAM SHOWING PARTS OF AUTOMATIC AIR-BRAKE SYSTEM ARRANGED FOR ONE MOTOR CAR AND TRAILER

avoid joints, and this has been done to an unusual extent, though Messrs. Allen claim that they are prepared still further to reduce the number of joints on a future occasion. The chief features are therefore: The use of manganese steel throughout; compound work; extra long crossings, designed to couple to each other, which, with one exception, do connect to each other, and to the switch on the inner of the three Y curves; inside curves coupled to each other and also to the center crossings. It is intended to put the job together on spare land and haul it bodily into position;

The latest development along these lines is the automatic air-brake system made by the Siemens-Schuckert Works,



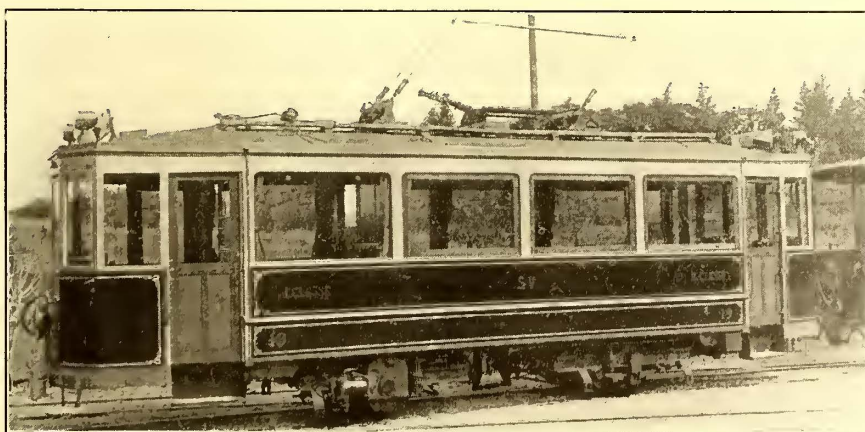
BRAKING CYLINDER AND COMPRESSOR OF AUTOMATIC AIR-BRAKE SYSTEM FOR STREET RAILWAYS

leaving the outer curve rails to be coupled afterward. The entire layout has been constructed to the grades of the street.

of Berlin, Germany. As in other self-acting systems, the application by the motorman brakes every car at once and the automatic application occurs upon the rupture of the train line.

The employees of the United Traction Company, of Reading, Pa., and their wives and children, were given a turkey

The accompanying diagram shows the general arrangement of this system for a motor car and one trailer.



NARROW-GAGE CAR WITH COMPRESSOR MOUNTED AT OUTER AXLE END

The outside air is taken through a strainer and pumped past the check valve into the reservoir, where the governor keeps it at a pressure ranging from two to five atmospheres. The air pump is driven by an encased eccentric, which is mounted on the inside of the car axle on standard-gage lines or outside on narrow-gage roads, as shown in the illustration. The governor is adjacent to the air pump. The air reservoir is of sheet steel tested to five atmospheres above the normal pressure and is furnished with the customary drain cock for entrained water and oil.

dinner on Feb. 16, between 3 and 6 o'clock, at the Tenth Street car barn. Arrangements were made so that all of the crews were given an hour and half off.

The brake handle has the regular five positions of full release, running, lap, service and emergency. In the last position the pneumatic sander goes into action until the

brakes are released. It is also possible to secure an easier start by applying the sander when releasing. This system enables the graduated release to be secured by moving the handle back and forth from release to lap in the same manner as the usual service application is made by moving the handle between the service and lap positions.

The braking cylinder is divided into two chambers, one of which is filled with air at a given pressure and contains the piston. The other is connected to the train line; consequently a reduction in pressure in the latter changes the condition of equilibrium in the braking cylinder and results in movement of the piston.

SIGNALS AND AUTOMATIC TRAIN STOPS IN THE HUDSON TUNNELS

The signal system of the Hudson & Manhattan Railroad under the Hudson River is completely automatic, with train stops, and between Hoboken and Greenwich Avenue—the river section of the tunnels—signals are placed on an average of 367 ft. apart. The minimum distance where speed is low is 115 ft. and the maximum is 1620 ft.

The signals give three indications: Proceed, indicated by a green light; proceed with caution, yellow light; stop, red light. As the consequences of a train passing a signal in the stop position may be disastrous, a device for automatically stopping such train is used at each signal. This consists of two movable short arms or trips placed alongside each rail. When the signal is in the stop position these arms are raised to engage with the trigger of a valve in the air-brake pipe of the train, releasing the air and setting the brakes. Each car is equipped with two of these valves, one on each end and on opposite sides of the car. When the signal moves again to the proceed position the motor moves these train stop arms out of stop position, thus permitting the train to pass without setting the brakes, the arms being returned to stop position by gravity after the train has entered the block. This automatic method of train control is in successful use on the Boston Elevated Railroad and on the New York Subway express tracks. On these lines, however, but one automatic stop is used to protect a train. In the Hudson Tunnels, two stops are used.

The arrangement of the block section is unusual and so designed to provide a maximum of safety, together with the greatest possible train capacity. In most railway signal installations the block sections end at the home signals, no clear space being provided at each signal in case a train should accidentally overrun such home signal. In the New York Subway a space is provided at each signal equal to the distance between signals. This distance is called the overlap—that is, the block sections (a space in which one train is permitted at a time) overlap each other for half their length. This is termed a double or one block section. To provide for maximum safety and maximum train capacity in the tunnels, it was found necessary to use a triple or two block overlap—that is, one block section is the length of three overlaps. Under this arrangement if a train should stop in the tunnel it would be protected by three stop (red) signals, four caution (yellow) signals and two automatic train stops. The overlap lengths are made long enough to permit of stopping a train at maximum speed and include an allowance of 33 1/3 per cent as a safety margin.

The system used is the regular a.c. system at 25 cycles

with induction bonds, so that both rails can be used for the train return.

The switches are all under the control of the interlocking devices, consisting of seven plants, one at the Hoboken Terminal (the largest), two at Caisson No. 1, two at Caisson No. 2, one at Greenwich Street and one at Nineteenth Street. The interlocking is the well-known all-electric system, the switches being operated by electric motors at each switch. The signals are the same type as used in the block system and are all controlled from the machines, the levers of which are so interlocked that it is only possible to make such movements as have been previously arranged for; conflicting movements are in this manner absolutely guarded against.

An interesting and novel feature of this plant is the illuminated track diagram. This is a diagram or chart of each track layout painted on glass and placed in front of each machine for the information of the operator. Each line of track has a row of small electric lamps placed back of the glass; these lamps are controlled from the different track sections; when the tracks are unoccupied the lamps remain lighted, showing a bright green light; as soon as a train enters the limits of the interlocking the lights controlled by the track on which the train is running are extinguished, so that movement of a train along the track can be followed by observing the corresponding movement of the dark space along the track on the diagram. Without this method of indicating train movements it would be difficult for the operator to follow closely the train movements, on account of his limited field of vision, due to the construction of the tunnels. The system is one of the most complete that has ever been installed owing to the exacting requirements of operating frequent train service. The number of signals and switches are as follows: Home signals, 90; dwarf signals, 10; distant signals, 82; total signals, 182; switches, 13; automatic train stops, 85.

The signal system was furnished by the General Railway Signal Company, of Rochester, New York and Chicago. The automatic stopping system was furnished by the Kinsman Block System Company, of New York.

RAIL BONDS DISCUSSED AT CLEVELAND

At the February meeting of the Cleveland branch of the American Institute of Electrical Engineers Mark Stanton, engineer of return circuits of the Cleveland Electric Railway Company, and E. G. Hindert, chief engineer for power of the Cleveland, Southwestern & Columbus Railway Company, presented papers on railroads. Both spoke of the brazed rail bond as being most satisfactory. Mr. Stanton said that some tests made recently upon brazed bonds installed in 1904 showed them to be as good as when put on. Of 1168 joints, bonded with 8-in. No. 0000 bonds two years ago, only eighteen tested over 6 ft. of adjacent rail length. Four of these had broken strands, twelve had one end knocked off by wagons and two had been imperfectly brazed. Out of another lot of 513 joints recently tested 510 tested 4½ ft., while three tested 6 ft. The bonds were 8 in., No. 0000, under Weber joints on 95-lb. girder rails. Mr. Stanton also spoke of the good results given electrically by the Clark joint. Of the 2542 Clark joints tested, all were equivalent to 3½ ft. of adjacent rail, although some had been in two years and the average was one year. The paper of Mr. Hindert was very much along the same lines and he also spoke highly of the brazed bond.

THE "MIXED PRESSURE" TURBINE

A turbine designed to operate under high or low pressure steam supply or both at the same time has recently been brought out by Willians & Robinson, Ltd., of Rugby, England. This company became famous through its well-known type of vertieal engines, but is now becoming equally well known through its manufacture of turbines of the Parsons type. The "mixed pressure" turbine is intended to supply the demand for an exhaust steam turbine under circumstances where there may be at times an inadequate supply of exhaust steam.

The mixed pressure turbine has high and low pressure sections, each supplied by separate admission ports. The low-pressure steam pipe leading to the low-pressure section of the eylinder has a stop valve and a governor valve, and the high-pressure pipe leading to the high-pressure section is similarly fitted with two valves. This permits the use of the turbine under four conditions. If the turbine is to work only with exhaust steam the stop valve in the high-pressure pipe is closed, that in the low-pressure pipe is opened and the turbine is governed from the governor valve in the low-pressure supply. Supposing, however, that the exhaust steam is not sufficient at all times to operate the turbine and more steam is intermittently required, the stop valve in the high-pressure supply would be opened and the high-pressure governor valve so adjusted that when the speed of the turbine falls, sufficient high-pressure steam would be admitted to carry the load. If a limited quantity of high-pressure steam is constantly required, the low-pressure valve is opened wide and the governor operates entirely on the high-pressure supply. Finally, if it is necessary to eut off the exhaust steam supply entirely for a shorter or longer period, the turbine can be operated entirely as a high-pressure turbine.

While the turbine, when running with exhaust steam only, will work somewhat less economically than if it had been designed solely for exhaust serviee, it is elaimed by the manufacturers to be more economical than the ordinary exhaust steam turbine which receives high-pressure steam through a reducing valve.

BOILER INQUIRIES IN GREAT BRITAIN

In Great Britain there has been until recently no law whatever relating to the inspeetion of land boilers. The only eheck upon their unsafe working has been the liability, should any one be killed, that a verdict of manslaughter might be brought in by a eoroner's jury. This was the condition until a few years ago. Then it was ordained that every explosion of a boiler should be investigated by the Board of Trade so as to fix responsibility and part or all the cost of this inquiry might be eharged upon persons responsible. This inquiry still left the existing eoroner's inquest in ease of any fatality. Still more recently boiler owners have been eompelled under an extension of the factory aets to have their boilers periodically inspeeted by a competent person. An owner may select his own inspektor and this law has put much more business into the hands of the boiler insurance companies, for owners would be blamed if they did not ehoose a reasonably good inspektor and, indeed, some that have been ehosen have been strangely unfitted for the work.

An explosion recently oeeurred of a thermal storage vessel, or rather it oeeurred over a year ago, and the inquiry into it has just been made, tests of the plate which

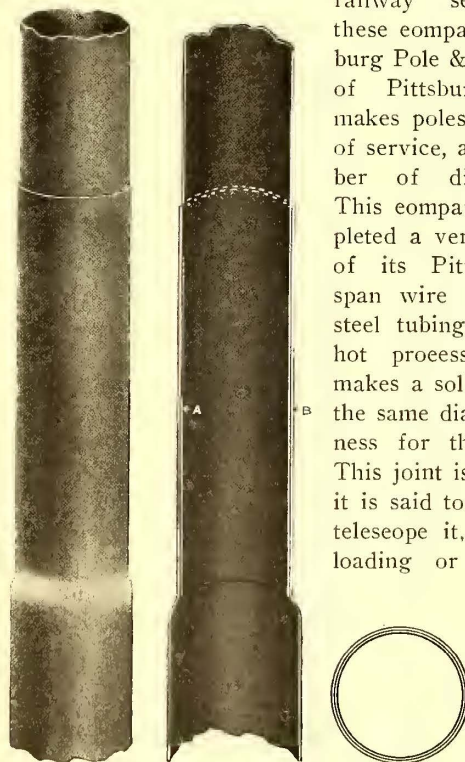
failed having meantime been carried out. The inquiry has been far from edifying. A non-teehnical commissioner sitting like a judge of the high court, eounsel without technical knowledge of boilers or of steel asking questions that no technical witness could possibly answer, general laek of comprehension all round as between the "court" and witnesses and a lamentable omission from the inquiry of details of prime import. The end of it all was a fine of \$2,000 on the boiler makers, \$250 on their manager and of \$250 and \$180 on the chief engineer and his chief assistant for not, in the opinion of the court, knowing they ought to have shut down the vessel when the eraek appeared.

Engineers are complaining that in the course of this inquiry witnesses were made to look foolish who were speaking the truth and that, after the manner of counsel generally, the inquiry so far as they were concerned was carried out less on lines of seeking facts than of damaging witnesses. In this inquiry some most important points were never raised at all.

DURABLE AND ARTISTIC METAL POLES

The growing scarcity of lumber and the requirements of municipal bodies that overhead construction shall be ornamental make the subject of durable and artistic metal poles one of import to all pole users. The first steps forward were made in the electric light field, where, of course, the demand was greatest and where the requirements of service were not unduly severe. While somewhat different conditions prevail in electric railway work, artistic pole designs have been evolved which combine both strength and beauty, a number of manufacturers of both light and electric railway poles taking advantage of the experience gained in the lighting field in designing poles for street

railway serviee. Among these companies is the Pittsburg Pole & Forge Company, of Pittsburg, Pa., which makes poles for both classes of service, and offers a number of different designs. This company has just completed a very successful test of its Pittsburg Standard span wire pole made from steel tubing with its patent hot proecess joint which makes a solid swedged joint, the same diameter and thickness for the entire length. This joint is very strong and it is said to be impossible to telescope it, either by overloading or the drop test, while under hydraulic pressure the pole will bend before the joint will give way. Furthermore the joint is



POLES SHOWING SWEDGE JOINT

proof against corrosion by water. The accompanying illustrations show an exterior, sectional view and cross section of the joint of the poles designed for electric railway and lighting purposes.

LONDON LETTER

(From Our Regular Correspondent.)

The receipts from the London County Council Tramways continue to increase in a very substantial and satisfactory manner, and it would appear that the action of the Progressives in the last Council is being more than justified every day as the financial condition becomes better known. During a week in January the electrified lines carried about 1,500,000 more people than they did for the corresponding week in the previous year, while the lines still operated by horses carried about 750,000 less passengers, so that over the whole system at that time operating there was an increase of more than 750,000. The success of the tramways has had one rather important effect. It has resulted in the County Council deciding to dispose of the steamboats which have been plying on the river for the last two or three years. From a financial point of view, undoubtedly, this service of steamboats has been a dismal failure, representing a loss of about £40,000 per year, though some of the members of the committee claim that the accounts audited a little differently would only show an actual loss of about £7,000 per year. In any case, the committee has decided that it cannot afford a loss of even this sum and it has been decided to dispose of the steamers at the least sacrifice. It seems a pity that these boats should be withdrawn entirely, for though they may not have paid, taken in conjunction with the tramways they certainly have afforded a wonderful attraction to the citizens of London at a comparatively small cost, a cost estimated by McKinnon Wood as equal to the rate of only one-twentieth of a penny in the pound.

The County Council is experimenting with a car which leaves the Tooting Terminus at 7.15 in the morning and on which is labelled the words "Women Only." The experiment was suggested by Whitaker Thompson, chairman of the highways committee, as the scramble for these early morning cars by men and working girls has been little short of a scandal. Only one car has been used for this purpose as yet, but from reports received it would seem to have been a great success and doubtless more cars will be added to this service in the near future. It is worthy of note that London is the first city in the world, so far as the writer knows, to have special cars for women. The electrification of the Council Tramways in the south of London is approaching completion, and work is to be commenced immediately on the reconstruction of the present horse tramways from Brixton Road via Coldharbour Lane to Camberwell Green at an expense of about £35,000. On the northern system work will be commenced almost immediately with the reconstruction of the tramways in Caledonian Road and Seven Sisters Road. The construction of the new lines of tramways from Harrow Road to Putney Bridge has also been commenced and this work is being vigorously pushed on account of the Franco-British Exhibition to be opened in May at Shepherd's Bush. This exhibition promises to be a great success and it is imperative that adequate communication with all parts of London should be made.

It is a pleasure to be able to report that the affairs of the various new tube railways which were inaugurated by the late Mr. Yerkes are beginning to improve distinctly. The report of the Baker Street and Waterloo Tube, which was the first to be put in operation, certainly shows a great improvement over 1906, and it has been found possible to pay a dividend of four per cent on the preference shares and three per cent on the ordinary shares other than those held by the Underground Company or its nominees. The gross receipts have increased during the last year by nearly £25,000, or more than fifty-five per cent over those of the year 1906. The report of the Great Northern, Piccadilly & Brompton Tube is also comparatively good, the receipts during the four weeks of January of this year being more than fifty-five per cent over the corresponding period of 1907. The directors in this case also are enabled to pay a dividend of four per cent per annum on the ordinary shares other than those held by the Underground Company or its nominees. As to the Charing-Cross, Euston & Hampstead Railway, which is the one most lately put into service, the report simply states the amount of receipts for the half year, as this tube has not been in operation long enough to make any return on the capital invested. It would look, however, as if this tube would also pay its way in time.

The report of the directors of the Central London Railway,

which is the old original "Twopenny Tube," is not quite so encouraging, only two per cent being paid this year on the deferred ordinary stock. The traffic on this line has been decreasing for some time owing very largely to increased competition, the total number of passengers having fallen off during the last half year by more than 4,000,000 or nearly twenty per cent compared with the corresponding period of the year before. It is interesting to note, however, from the report, that the line from Shepherd's Bush Station, the western terminus of the railway, to the depot is in course of construction and that it will be completed in time for the opening of the Franco-British Exhibition in May. A new station is being provided immediately opposite the entrance to the Exhibition which will, of course, be on the surface, the railway coming to the surface immediately west of Shepherd's Bush Station. This extension with the present line from Shepherd's Bush Station to the depot yard will form a complete loop and will in every way facilitate the working of the service.

Railway and automobile interests met recently when Mr. Philip Dawson presented a paper on "The Electrification of Railways" before the Royal Automobile Club. The event was noteworthy not only from the fact that the Automobile Club should be taking up subjects of this nature, but on account of the class of men that found it expedient to be present on this particular occasion. Quite a number of chairmen of railways were present and expressed their opinions, and also a number of the general managers of the various railways, large and small, main line and suburban, were interested hearers, and in many instances also expressed their opinions. From a perusal of Mr. Dawson's paper it is easy, of course, to gather that he is an enthusiastic believer in the electrification of railways in certain circumstances clearly outlined in his paper. The new chairman, Lord Bessborough, of the London, Brighton and South Coast Railway, had naturally little to say on the subject, as the whole electrical world is awaiting the result of the experiment now under way. Mr. Forbes, general manager of the railway, likewise had comparatively little to say for the same reason, though both he and the chairman stated that they agreed with Mr. Dawson that they were on the right track and were looking forward hopefully to the result of the experiment. Mr. Ellis, general manager of the Metropolitan Railway, had some interesting remarks to make. It will be remembered that in the arbitration proceedings of about four or five years ago, when this company intended putting in high tension alternating current in opposition to the low tension direct current of the district railway, it lost its case and was therefore compelled to adopt the same direct current system as the District Railway. It has always been extremely difficult to get actual figures from railway men as to the cost of operation, and while Mr. Ellis did not give figures his remarks tended to show that after careful investigation the cost of operating electric railways was after all very slightly higher than the cost of operating by the old steam system. He admitted, however, that the advantages of the electric system were great and perhaps not yet fully appreciated, and considers that many mistakes made are by care and attention rapidly being eliminated and that with a few more changes he considered the system would soon be as perfect as it was possible to make it. Thus, it appears to be the opinion of many railway managers, that taking everything into consideration the long open type of American car is not the best suited for suburban traffic in England, and the Metropolitan Company is now making efforts to use more and more of its old rolling stock modified to suit the present conditions, as it was found that trains could be loaded and discharged on the old compartment system much more quickly than on the long open car system. Some most interesting remarks were also made by the general manager of the Great Northern Railway Company, one of the large main line railways of Great Britain. This gentleman is a sceptic on electrification and commenced his remarks by stating that it was not an engineering problem at all but simply one of finance, and that in considering suburban traffic if they had to lose this by the competition of tramways, motor omnibuses, municipal tramways and other methods of transportation, the electrification of a line would certainly not bring this traffic back. Notwithstanding his pessimistic note, however, one would have gathered from the meeting that on the whole there was a favorable disposition among railway men towards electrification, and frequent comments were made regretting that Mr. Aspinall, of the Lancashire & Yorkshire Railway, had not seen fit to publish any figures giving direct results of the Liverpool

& Southport line. It is to be hoped that Mr. Aspinall will some day arrange to do this, as most assuredly the figures would be of immense value to other railway men, not only in Great Britain but in other parts of the world. The enormous gain made in a terminus by operating electric trains instead of steam trains is bound, with growing suburban traffic, to make itself felt in all large London termini in time. The mere fact that there is no shunting of locomotives to be done and that a train can run up to a platform, discharge its passengers, refill and go out from the same platform in a minimum of time is sure sooner or later to bring about electrification.

Lord Cotteslor, presiding at the meeting of the London, Brighton & South Coast Railway, said that tramway competition in the suburbs of London was increasing rather than diminishing, and added that the linking up of lines, which now ran practically over the whole of South London, with the West-end and the City by the extension over Westminster-bridge, and the projected extension over Blackfriars-bridge, would make the competition even more severe. The difficulty of a railway competing with municipal tramways for distances of five or six miles was almost insuperable, either by way of reducing fares or increasing the services, although it might be hoped that if the experiment of electrifying the South London Railway proved successful some portion of the suburban traffic might be ultimately recovered through the improved and rapid service that would be given under the system. In this connection it is interesting to note that the chairman, directors and general manager of this railway have made an inspection of the line which has been electrified, and which it is hoped will be ready in a few months.

The proposal to construct a new line of tramways to connect Richmond, Mortlake, and Barnes with Hammersmith is meeting with little local support, and, if persisted in, is likely to be strenuously contested. The section is being promoted by the Richmond Electric Light Company and the London Electric Supply Corporation, and the greater portion of the proposed line would traverse high-class residential districts. A representative meeting of ratepayers of Barnes and Mortlake have, by 450 votes to six, protested against the construction of the tramways, and representation by memorial and deputation have been made to the local authority urging that the bill be opposed in Parliament.

The Liverpool Tramways Committee has decided to adopt, with the approval of the Council, a scheme providing for retirement allowances for tramway employes. Mr. Mallins, the traffic manager, has modelled his scheme out of the Glasgow Corporation Tramways Friendly Society, which authorises a contribution of a penny per week, the payments to be made for ten years, when about £30,000 will have been accumulated.

The work of extending the tramways in Dumbartonshire is now in full swing. Operations are in progress both towards Dalmuir and Balloch. In a short time the Glasgow Corporation tramways will be extended to Clydebank burgh boundary. A bridge has to be built over the Forth and Clyde Canal, and when this has been accomplished there will be a tramway line all the way from Glasgow to Loch Lomond. The cost of construction, which is being done by J. G. White & Co., of London, is put down at £144,000, and the scheme when completed will embrace Dumbarton burgh tramways, which have been laid down at a cost of something like £40,000. The whole will be the property of the Dumbarton Burgh and County Tramways Company, recently incorporated with a capital of £155,000.

The London & North-Western Railway Company has informed the Watford Urban District Council that, owing to the unfavorable state of the money market, it does not feel justified at present in attempting to raise the large capital which would be required to construct the new Euston to Watford electric railway. The company will certainly do so, however, it adds, at a more favorable time.

At the annual meeting of the Hastings & District Tramways Company, the chairman referred to the Dolter surface contact system which is now in operation on the line from Hastings to Bexhill. He said that the company's concession required that this line, being on the Front, should be conducted on a plan other than the overhead system. The directors therefore had to fall back on one of the surface-contact systems (the conduit being impossible), although very little was known as to their merits, and practically nothing as to the particular system which the board had put into operation. The company was therefore a pioneer of this—the Dolter system—and at first and for a considerable period it experienced many difficulties, which did

not tend to improve the traffic. By patience and perseverance, however, it had surmounted most of the difficulties, and the line was now working in such a manner as to lead it to hope for fairly good results.

The transfer ticket system inaugurated by Arthur Ellis, tramway manager, at Cardiff, has resulted in a huge success, according to statements made by Mr. Ellis himself. On one fortnight the tickets issued increased about 60,000 over the preceding fortnight, and nearly 40,000 transfers were issued. In many the receipts during the first week of the transfer ticket scheme were up £110 and the second week £120. In fact, every day shows an increase despite the fact that less cars were running and considerably less mileage.

George Balfour has obtained the controlling interest in the Dunfermline tramways scheme, for which Parliamentary powers were recently acquired, and the construction of the lines will be taken in hand some time during the coming summer. The tramways will run through Dunfermline and Crossgates to Cowdenbeath, where one line will branch off to Lochgelly and the other to Keltly. There will also be a branch line from Dunfermline to Townhill. The total length of track is about 15 miles, of which it is intended to construct about 11 miles at present. The line will be partly single and partly double. The portion to be meantime built will require a capital expenditure of about £150,000, and this part of the work should occupy about five or six months in construction. The current will be purchased from the Fife Electric Power Company. Mr. Balfour, it may be added, is already managing director of the Dundee Broughty Ferry, and Monifieth tramways; director of the Mansfield tramways; and advising director of the Dumbarton Burgh and County Tramways. A. C. S.

THE DUBLIN TRAMWAYS

The gross receipts of the Dublin United Tramways Company from passenger traffic for the last half-year were £170,651, against £138,618 for the corresponding half-year of 1906, being an increase of £32,033, or more than 23 per cent, and amongst the other receipts there is an increase of £43 in rents, £224 in parcels, and £52 in advertisements, the total receipts from all sources being £177,502, against £145,146 in 1906. Of course, the operating expenses increased correspondingly, but despite this £19,750 remain after charging the additional cost of working, which amounted to £12,600, being an increase of 16 per cent in working expenses, against 23 per cent increase in receipts. There is an addition to the cost of generating electric current of £1,765, being about 23 per cent, but the consumption increased about 26 per cent, and the cost per unit, viz., 375d., was practically the same as in 1906, although the cost of coal averaged 10s. 8½d., or 1s. 2d. per ton more. The traffic expenses include a sum of £1,201, which was distributed among all the members of the staff in the Traffic Department in recognition of their zeal in the conduct of such a large and unusual volume of business as the Exhibition produced. The only items in the general charges which show any increase are the accident insurance premium and the rates and taxes. The risk of accidents increased with the larger number of people carried and of cars running, and the company had to pay accordingly; while over the rates and taxes, in respect of which the company had to pay the sum of £9,600 during the half-year.

The company proposes to add £1,000 this year to the accident insurance reserve fund, which will bring it up to £5,000, but the chairman, Mr. Murphy, does not think this fund need be further added to. It is also proposed to add £5,000 to reserve, as has been done for some years, bringing that fund up to £36,000. Finally, in addition to the usual dividend of 6 per cent to the ordinary shareholders, it is proposed to add a bonus of one shilling per share, making the dividend for the half-year at the rate of seven shillings per share, or 7 per cent per annum, free of income tax.

At the meeting Chairman Murphy said in part: The year through which we have just passed has been an eventful one in the annals of Dublin, inasmuch as it witnessed the holding of an Exhibition in the suburbs of the city, of unprecedented magnitude in this country, which, as we anticipated, has favorably affected the receipts of the Dublin Tramways to a very considerable extent. The fortunes of the Exhibition also were in a large measure dependent upon the ability of the tramways to convey passengers to and from its gates, and I do not think I am claiming too much when I say that our staff and the

appliances which we were able to place at their disposal never failed to meet the heaviest demands that were made upon them.

I have some figures for the purpose of comparison, taken out from the latest information available in the case of the Glasgow, Leeds, Liverpool, and Manchester Tramways, all owned and worked by the municipalities, and in the case of the tramways owned and worked by this company for the year 1906, the year 1907 being abnormal, I find that in Glasgow there is one mile of tramway to every 11,949 of the population in the area served by the tramways; in Leeds, one mile to 9,066; in Liverpool, one mile to 14,434; in Manchester, one mile to 8,355; while in Dublin we have one mile to serve every 7,662 of the inhabitants. This generous provision of tramway mileage in Dublin serving an attenuated population compared to the other cities named is reflected in the number of passengers per car mile and the receipts per car mile, which are, respectively:

Passengers carried per car mile:

Glasgow	11.02
Leeds	9.92
Liverpool	9.90
Manchester	9.23
Dublin	6.96

The receipts per car mile are:

Glasgow	10.31d.
Leeds	10.56d.
Liverpool	11.22d.
Manchester	11.02d.
Dublin	8.60d.

BRUCE PEEBLES & COMPANY

The secretary of Bruce Peebles & Company, Ltd., has issued the following notice:

REGISTERED OFFICE, EAST PILTON,
EDINBURGH, Feb. 14, 1908.

Dear Sirs—I am instructed by the directors to inform you that it has become necessary to call a meeting of the shareholders for the purpose of putting the company into voluntary liquidation with a view to reconstruction. This step has been rendered necessary owing to the need for further working capital. In April last the shareholders sanctioned an increase of the company's borrowing powers with a view to a further issue of debentures, but by reason of the extreme stringency of the money market it was found impracticable to make such an issue. For the same reason it has been impossible to realize advantageously the securities in which the company is interested.

The shareholders' meeting is to be held on 24th inst. Meantime a provisional liquidator has been appointed by the court, on the company's petition, in order to protect the assets and to carry on the business. The auditors are at present engaged on the preparation of the accounts. Plans for the reconstruction of the company are already under consideration by the directors, and have been submitted to and favorably received by some of the larger creditors, and representatives of the shareholders; and it is hoped soon to put forward a scheme for sanction by the creditors and shareholders. It is expected that, under the scheme, substantial payments on account will be made to the creditors at an early date.

In view of the large contracts in course of completion, it is absolutely necessary to carry on the business of the company without interruption, and the directors hope that the creditors will extend their support to a course of action which they believe will secure the best result to the creditors.

THE MARSEILLES INTERNATIONAL ELECTRICAL EXPOSITION

As already announced, an international exposition of the applications of electricity is to be held in Marseilles this year under the auspices of the city, the Department of Bouches of the Rhone, and the Chamber of Commerce. It will be opened April 19 and will close Oct. 31. The personnel of the American committee has just been announced. It is comprised of 34 members, including the following: French Ambassador Jules Jusserand, H. G. Stott, C. P. Neill, Bion J. Arnold, Charles F. Brush, Maurice Coster, Prof. F. B. Crocker, Lee de Forest, Carl Hering, Peter Cooper Hewitt, Samuel Insull, H. Ward Leonard, J. W. Lieb, Jr., C. O. Mailloux, T. C. Martin, R. W. Pope, C. P. Steinmetz, L. B. Stillwell, Frank J. Sprague, Prof. Elihu Thomson, W. H. Tolman, S. S. Wheeler, W. J. Wilgus and Carroll D. Wright.

Offices have been opened in the Park Row Building, New York.

THE CLEVELAND SITUATION—THE VALUATION FIGURES ARRIVED AT

F. H. Goff, for the Cleveland Electric and Mayor Johnson, for the city, got down to dollars and cents at their meeting Saturday, but the amounts were a surprise to both and to the public at large. Mr. Goff's maximum or extreme figures are about twice the value placed on the property by the Mayor, leaving a wide gulf to bridge over and one that will take some time if the two men do not prepare to give and take very liberally.

Mr. Goff's estimate shows the stock worth \$59.14 a share, based upon the physical value and the value of the grants inside the city. To this he suggested that \$6 be added for the outlying grants, \$5 for a perpetual lease of the property to a holding company instead of a 25-year lease, as had been suggested, and \$10 for good will. Mr. Goff estimated the total value of the inlying franchises of \$5,004,000, giving the Euclid main line grant life until 1914 and full life to the Glenville grant, including the Euclid creek line. A rate of 5 per cent was used for interest and 8 per cent for the growth of traffic. One-ninth was added to the franchise value, as was done in the leasing offer of A. B. DuPont a year ago. This gives \$556,000, which, added to the physical value, based upon \$17,000,000, with a percentage of 36, as agreed upon at a former meeting, give a total physical and franchise value of \$22,980,000. Deducting from this the bonded and floating debt of \$9,141,000, leaves \$13,839,000 as the stock valuation. This divided by 234,000 shares gives \$59.41 as the value of each share.

Mayor Johnson took \$15,000,000 as the physical valuation of the stock, there being a difference of more than \$2,000,000 between him and Mr. Goff on overhead charges and financing. To this he added his estimate of the value of the franchises within the city, \$3,894,920.62, in which no consideration is taken of the length of the life of the Euclid line or other claims made by the old company. He also added \$150,000 as the value of two and a half miles of track running through Euclid village. A mile and a half of the track on East 105th Street was also given an earning capacity up to 1927, which, he said, would add thirty-four days to the average. With some other additions he arrived at a total physical and franchise value of \$19,079,534.60. In this estimate he assumed that the rate of growth is 6 per cent compounded and that the present worth is computed at 6 per cent. The difference of \$2,063,530 on overhead charges, he said, would add \$7.27 a share to the value of the stock; the concession on the Glenville franchise, \$2.31, and the Euclid Avenue contention, 57 cents a share. Taking into account all the differences and the claims that have been made of late, the Mayor says that the value of the stock would be about \$52.

Mr. Goff stated that the suburban lines might be sold to the interurban railway companies and he believed they would be glad to get them, but he felt that it would be bad for the city to have several roads outside in competition with the city system inside. If it is true, he said, that the company has operated the outside lines at a loss to the betterment of the city, then something should be allowed for the good they have done. Mr. Goff also argued in favor of a lease in perpetuity instead of the twenty-five year lease that has been under consideration.

At the meeting Thursday Mr. Goff agreed to take 60 per cent as the proportion of gross receipts used for operating expenses. The Mayor had contended for 60 at least and Secretary Henry J. Davis said that the percentage should not be above 60. Mr. Davis said that the receipts from all sources in 1906 were 4.82 cents per passenger. Taking 64 per cent of this for operating expenses give 3.0842 cents, which is slightly over the rate at which the Mayor proposes to charge for the service. Mr. DuPont claims that the increased business, as induced by this rate, will make up for the charges in operating expenses and result in a profit. As Mr. Goff has not insisted upon fixing a rate of fare for the operating company, it is possible that no figure will be named in the contract or the franchises. DuPont says that a rate will be hard to fix until the system has been operated a year under the holding company plan. Under the claims of the Mayor a committee has fixed the length of the franchises on an average as 3.1929 from Jan. 1, 1908. Mr. Goff claims .2649 of a year more.

The points to be settled still are the overhead charges, length of franchise on some of the lines, value of outside grants and some others of more or less importance.

REVIEW OF THE CHICAGO CITY REPORT

The report of the Chicago City Railway Company for the fiscal year ended Dec. 31 last was published in this paper last week and is worthy of analysis. Although it included the operations of 11 months only, the new ordinance now in effect having been operative from Feb. 1, 1907, it clearly indicates that the company has made rapid progress, both as regards business and improvements as a result of the reorganization work that has been in progress. The returns for the 11 months compared most favorably with previous years. Although the gross earnings were slightly under those for the entire year 1906, as compared with 1905 and 1904, they represented an expansion of \$240,614 and \$893,715, respectively.

Operating expenses, which included taxes, renewals, interest, etc., however, in the late fiscal period were considerably in excess of the immediate years previous. For instance, as compared with 1906, an expansion of \$263,968 was recorded; as compared with 1905, \$767,666, and as compared with 1904 the gain was \$1,488,152. The result of this greatly increased operating charge was that the net earnings for the 11 months' period were less than for several years back. As compared with the full 12 months' period of 1906, the falling off in net was \$572,401; as compared with 1905, \$527,053, and as compared with 1904, the decrease was \$594,138. During the last fiscal year (11 months) the percentage of operating expenses, which, as stated above, included taxes, renewals, etc., was also considerably greater than in 1906. In fact, the tendency of such charges during the past few years has been to increase, rather than diminish. The pamphlet report of the company states that the operating expenses of the company for the 11 months ended Dec. 31 last were arbitrarily fixed at 70 per cent of gross earnings, and, therefore, afford no opportunity for comparison as against the result of previous years. However, if we take the operating expenses, as a whole, including taxes, renewals, etc., we are able to make comparison with previous years. The following table shows the gross and net earnings, dividends paid and operating ratio to gross earnings of the company for the last four years:

	Gross.	Net.	Dividends.	Op. Ratio P. C.
1907 (11 months).....	\$7,562,694	\$1,152,421	\$1,215,000	84.76
1906	7,871,126	1,724,822	1,620,000	78.08
1905	7,322,080	1,679,474	1,620,000	77.06
1904	6,668,979	1,746,859	1,620,000	73.80

In the last fiscal year (11 months) the company, after paying the city of Chicago the sum of \$633,832, which was the 55 per cent of net to which the city was entitled, had left a balance of \$518,589. To this amount there was added \$1,116,387 interest on capital as certified by the Board of Supervising Engineers, which brought the income from operation for the 11 months up to \$1,634,976. Adding to this amount the net income from operation for the month of January, 1907, the total net available for dividends for the 12 months of 1907 was \$1,916,558, which is considerably in excess of the net income available for such purposes for several years back. The amount of dividends paid in the last fiscal year was less by \$405,000 than in 1906. Therefore, the net surplus after all charges, dividends, etc., for the entire year 1907 was \$701,558, which compares with \$104,822 in 1906, \$59,473 in 1905, and \$126,859 in 1904.

The valuation of the property on Dec. 31 last was \$28,168,980. The percentage of annual income on this valuation, therefore, was 6.33 per cent based on the 11 months' operations, while the percentage of net income to capital stock at par was 10.64 per cent.

An interesting feature in the report is the fact that while the number of passengers paying fares increased 3.99 per cent, only 59.83 per cent of the passengers paying fares took advantage of transfers, as compared with 60.59 per cent in the year previous. The insallation of the new "pay-as-you-enter" cars has proved most beneficial to the company, the report states, as they have resulted in almost entirely eliminating the large number of accidents brought about by passengers attempting to board or leave moving cars. It has also resulted in a material increase in the proportion of fares collected.

On Dec. 31 last the company was operating 244.30 miles of single track, and the number of double-truck cars in use was 805, while the number of single-truck cars was 251, making a total of 1056. The growth in passenger travel on the South Side surface lines was clearly reflected in 1907, as the passengers paying cash fares increased by 6,244,785, as compared with 1906.

NEW HAVEN TROLLEY PURCHASES

The report of Winfield S. Slocum, the master appointed by the Supreme Court in the suit of the Commonwealth vs. the New York, New Haven & Hartford Railroad relating to the question of the legality of the road's purchases of electric railways in Massachusetts, has been filed with the clerk of the Supreme Court.

The summary of the master's report is as follows:

The evidence does not show that the defendant corporation, the New York, New Haven & Hartford Railroad Company, has directly acquired or held the stock, bonds and securities of the street railway companies named in the Information.

Upon the question whether it has indirectly acquired or held such stock, bonds or securities, the master made the following summary of the facts found by him:

1. The directors of the New York New Haven & Hartford Railroad Company voted and took action upon the question of acquiring such street railways, and for that purpose acquired the stock and control of the Worcester & Connecticut Eastern Railway Company, which afterward became the Consolidated Railway Company, which acquired additional powers from the General Assembly of Connecticut and did acquire the stocks, bonds and securities of the street railways named in the Information, excepting of the Springfield Street Railway Company.

2. The directors of the defendant corporation holding the entire stock of the Consolidated Railway Company elected its directors and corporate officers, and the directors and officers so elected were substantially the same persons who were corporate officers and directors of the New York, New Haven & Hartford Railroad Company.

3. The Consolidated Railway Company acquired all the stock of the Worcester & Southbridge Street Railway Company, the Worcester & Blackstone Valley Street Railway Company, the Webster & Dudley Street Railway Company, the Worcester & Webster Street Railway Company and a majority of the capital stock of the Berkshire Street Railway Company.

As holder of such stock it controlled the election of the directors and corporate officers of these street railway companies, and such directors and officers were substantially the same persons who were directors and officers of both the Consolidated Railway Company and of the New York, New Haven & Hartford Railroad Company.

4. The Consolidated Railway Company did not directly acquire a majority of the stock of the Springfield Street Railway Company, but it passed votes, acted and entered into agreements for the organization of the Springfield Railway Companies, and made an agreement with that association guaranteeing certain dividends on its preferred stock, and guaranteeing a certain price upon the preferred stock in a certain event; and the Springfield Railway Companies did acquire a majority of the stock and securities of the Springfield Street Railway Company.

5. The officers and trustees of the Springfield Railway Companies are also persons who are directors and corporate officers of both the New York, New Haven & Hartford Railroad Company and of the Consolidated Railway Company.

6. The Springfield Railway Companies by its holding of stock of the Springfield Street Railway Company elects its directors and corporate officers, a majority of whom are directors and officers of the New York, New Haven & Hartford Railroad Company and of the Consolidated Railway Company.

7. The Consolidated Railway Company has continued to hold the entire capital stock of the Worcester & Webster Street Railway Company and of the Webster & Dudley Street Railway Company.

8. Upon June 25, 1906, the voluntary association known as the New England Investment & Security Company was formed, and the Consolidated Railway Company sold and conveyed to it all of the stocks, bonds and securities which it held in the Worcester and Southbridge Street Railway Company, the Worcester & Blackstone Valley Street Railway Company, the Berkshire Street Railway Company and the Springfield Street Railway Company (102 shares).

9. The plan of organization of the New England Investment & Security Company was reported to and approved by the directors of the New York, New Haven & Hartford Railroad Company and an agreement as to the guaranty of its stock was made between the New York, New Haven & Hartford Railroad Company, the Consolidated Railway Company and the New England Investment & Security Company; and the Consolidated Railway Company was a party of the agreement and declaration of trust.

10. Most of the trustees and officers of the New England Investment & Security Company are persons who are directors and officers of the New York, New Haven & Hartford Railroad Company and of the Consolidated Railway Company.

In short, the master finds that the company has not directly acquired the securities of these companies, and also declined to find that the officials of the New Haven were dictating the operation of the electric companies or controlling the election of their officials. He finds that the companies have been managed by their own officials and that the stockholders of the various companies have controlled their election. The point that must now be decided by the courts is whether the laws of the commonwealth have been violated through the ownership of stock in these electric railway companies by a corporation in which the New Haven itself is a stockholder.

JAMES F. SHAW RETIRES FROM THE BOSTON & WORCESTER

Announcement was made early this week of the retirement of James F. Shaw, Jr., as president of the Boston & Worcester Street Railway, and its holding company, the Boston & Worcester Electric Companies. Almost immediately the announcement followed of a receivership for James F. Shaw & Company, Inc., with Arthur D. Hill, a Boston lawyer, as receiver.

Rumors were afloat to the effect that the New Haven Railroad or Boston Elevated Railway interests were securing control of the Boston & Worcester line. The facts, however, were found to be that James F. Shaw & Company, the firm through which the Shaws have built and handled the securities of their street railway projects, had been temporarily embarrassed by the general business and financial depression, and that a receivership had been precipitated by the suit of John McLaughlin, of Cumberland, R. I., who held a promissory note of the company due March 26. In bringing his action he stated that there were 52 notes outstanding amounting to \$700,976.75; that six of them are demand notes for \$101,300; that 15 are time notes for \$167,385, now overdue; that in all the sum of \$268,635 was at present due, that \$35,685 falls due within the month, that \$276,500 falls due in April, that \$73,164.49 falls due in May, and the remainder, about \$47,000, between June and Jan. 31 next. The bill stated that of the entire indebtedness \$133,101.75 was unsecured; that 29 notes, amounting to \$567,875, were secured by shares of stock which could not be sold on change for anything like their proper values. It is further stated that the only assets are equities in these securities of an estimated value of \$880,000.

It is stated that the proceedings are of a friendly nature, to prevent the sacrifice of the securities mentioned at prices that would work hardship and loss to the company. Friends of Mr. Shaw state that the majority of the creditors are disposed to see him through the present difficulty, and that he will not only soon be out of the receivership, but will also resume his old place at the head of his two Boston and Worcester companies. His share in the Boston & Worcester project is stated as one-sixth. Its exact amount is covered, so far as public record is concerned, by the holding company. In the Boston & Worcester Street Railway Company the holding company retains 17,235 shares, while the following hold a single share each: James F. Shaw, Alex. B. Bruce, Arthur E. Childs, Albion R. Clapp, William M. Butler, Charles C. Peirce, P. W. Sprague, C. W. Shippen, H. Fisher Eldridge, Edward P. Shaw, Walter H. Trumbull, George A. Butman, Samuel Farquhar, John J. Whipple, and Adams D. Claffin. Mr. Butler, who has served as counsel for Mr. Shaw ever since the inception of the Boston & Worcester, takes the presidency of the street railway company, while Arthur E. Childs becomes president of the holding company. Both are friendly to Mr. Shaw, and are directors in the street railway company. Mr. Shaw himself retains a similar directorship.

Aside from the Boston & Worcester proposition, the firm of James F. Shaw & Company is interested in the promotion of the Boston & Providence Interurban Electric Railroad and the Worcester & Providence Street Railway, neither of which is yet constructed; and in the following operating companies: Citizens Electric, controlling the Newburyport surface system; the Haverhill & Amesbury, giving through connection between Haverhill and Newburyport; the Providence & Fall River Street Railway.

AFFAIRS IN NEW YORK

William M. Ivins, special counsel for the Public Service Commission, with the aid of the special accountants assisting him, has prepared and submitted to the commission a chart showing the inter-relation and inter-dependence of all of the corporations directly or indirectly under the control of the Interborough-Metropolitan Company, including the entire elevated, surface and subway railroad system of Manhattan and the Bronx. The chart also shows in detail the capitalization and funded debt of the different companies. The chart shows the Interborough-Metropolitan Company to be composed of forty-eight subsidiary companies, including the controlling corporations, the Interborough Rapid Transit Company, Metropolitan Securities Company, New York City Railway Company, Metro-

politan Street Railway Company and Third Avenue Railroad Company.

The Ninety-seventh Street barns of the New York City Railway Company were destroyed by fire March 31. Several hundred cars were destroyed, and the loss was in the neighborhood of \$1,000,000 on the equipment and \$400,000 on the building.

The Brooklyn Rapid Transit Company, through its counsel, has informally asked for an extension of the time in which to make answer to the Public Service Commission's demand for a reply to the complaint that subsidiaries of the Brooklyn Rapid Transit Company unlawfully and unreasonably charge a 10-cent fare to Coney Island. The reply is not due until Monday, and Chairman Willcox favors an extension of time.

It is stated application will shortly be made by the Interborough Rapid Transit Company to the Public Service Commission to issue bonds for \$50,000,000 to provide for the company's notes and for other requirements. It is expected that the amount of bonds which will be issued at this time will be \$20,000,000.

President Shonts of the Interborough-Metropolitan Company has made a definite offer to the Public Service Commission to sell to the city the Steinway tunnel at the actual cost to the Interborough Rapid Transit Company, which cost is given at \$7,239,476, not including certain real estate used or acquired in connection with the construction of the tunnel but not necessary for its operation. The cost of this real estate is placed at \$412,110. The Interborough would be willing to accept payment of the purchase price in the 4 per cent bonds of the City of New York, at par. In his letter to Chairman Willcox of the Public Service Commission making the offer, he suggests that "upon this purchase, the City of New York should enter into an operating contract with New York & Queens County Railway Company (which is owned by the Interborough) to operate the tunnel in connection with its system of surface railways in Queens for a period of twenty-five years upon the following terms, viz: The expenses of operating to be fixed by agreement at an arbitrary sum to represent the estimated cost, and one-half of said sum to be paid by the city, the balance to be met by the company. A single fare of five cents to be charged between Forty-second Street and Fourth Avenue, Manhattan, and any point on that line of the New York & Queens County Railway. Mr. Shonts says the tunnel could be made ready for operation within sixty days at an additional expenditure of \$310,000.

MINNESOTA RAILROAD COMMISSION WANTS JURISDICTION EXTENDED OVER ELECTRICS

The state railroad and warehouse commission of Minnesota wants to be placed in control of electric railways within the corporate limits of cities and villages. The annual report of the commission for the year ending Nov. 30 recommends that the legislature pass laws placing all electric railways under the jurisdiction of the commission. The report says:

Development during the past year gives greater prominence to and promise of the successful construction of electric railways in this state, which in a more or less degree will take the place of the steam railways as time goes on.

"Under a recent decision of the Supreme Court a certain character of suburban electric railway seems to be placed under the jurisdiction of the commission. In this connection it is contended by some authorities that the jurisdiction would not extend to that portion of the line within the corporate limits of any village or city. It will be apparent that supervision limited, as this would limit it, would be entirely impracticable and useless. Undoubtedly, these electric lines will in many cases be owned and operated by steam railways, and, in the judgment of the commission, the best interests of the state will be served by placing electric railways under the jurisdiction of the commission. We, therefore, recommend legislation to that end."

Other recommendations are:

"We renew recommendation made in the 1906 report that legislation be enacted requiring all parties who may desire to build extensions or new lines of railroads, regardless of the motive power to be used, to secure the written consent of the commission upon application, setting out in detail the contemplated improvement and, after public hearing, the object being to prevent the unnecessary duplication of roads or building of unnecessary lines."

Chief Engineer Seaman, of the Public Service Commission of the first district of New York, has reported to the board that the work of building the Van Cortlandt extension of the subway would be resumed as soon as material necessary for the structure arrives on the ground.

FINANCING THE CHICAGO RAILWAYS COMPANY

Judge Ball, in the Superior Court, Feb. 27 dismissed the bill filed by Clarence H. Venner, of New York, seeking to enjoin the Chicago City Railway Company and the city of Chicago from operating under the ordinance recently granted by the city to the company.

Details of the plan of financing adopted by the Chicago Railways Company have been made public, and it develops that during the life of the first mortgage bonds, a part of which have just been issued and are being offered to the public, a finance committee composed of Chauncey Keep, Henry A. Blair and B. A. Eckhart will have charge of the finances of the corporation. The \$5,000,000 first mortgage 5 per cent bonds of the Chicago Railways Company which were underwritten by the National City Bank of New York and N. W. Harris & Company, New York and Boston, have been largely subscribed for in Chicago by the Illinois Trust & Savings Bank, the Merchants' Loan & Trust Company, the Northern Trust Company, Harris Trust & Savings Bank, the American Trust & Savings Bank, State Bank of Chicago, Central Trust Company of Illinois and Western Trust & Savings Bank. Application will be made to list the bonds on both the New York and Chicago stock exchanges. The first \$2,500,000 of the bonds to be sold will probably be offered shortly by the Northern Trust Company, the Merchants' Loan & Trust Company and Harris Trust & Savings Bank.

In support of the bond issue and in explanation of the plan of organization of the company, Henry A. Blair, chairman of the directory, gives the following data:

The Chicago Railways Company was organized under the laws of Illinois, with a nominal capital stock of \$100,000, for the purpose of taking over the system of street railways formerly operated by the West Chicago Street Railroad and North Chicago Street Railroad Companies.

The capitalization of the company is as follows:

Capital stock which has been made the basis of an issue of participation certificates, as stated below....	\$100,000
First mortgage bonds which will be issued during 1908	5,000,000
Consolidated mortgage bonds, series A, B and C, issued to meet the cash requirements of organization and in exchange for bonds, floating indebtedness and other obligations of the old companies....	37,500,000

The capital stock of the company has been made the subject of a trust agreement under which four series of participation certificates will be issued to the holders of the stocks of the old companies. Dividends earned upon the stock of the Chicago Railways Company will be distributed to the holders of the participation certificates at the rates and on the basis of priorities specified in the trust agreement.

Of the series A consolidated mortgage bonds, included in the \$37,500,000 given above, \$6,767,200 have been deposited as security for an issue of not exceeding \$5,000,000 five-year 6 per cent collateral notes of the company.

The following is a statement of earnings of the properties for the year ended Dec. 31, 1907:

Gross earnings.....	\$10,538,822
Operating expenses, including taxes.....	7,654,419
Net earnings.....	\$2,884,403

It will be noted that the net earnings are more than 11 times the interest charges on \$5,000,000 first mortgage bonds.

The entire proceeds of the first mortgage bonds, including the proceeds of the \$5,000,000, the estimated amount which will be issued during 1908, will be used to reimburse the company for its cash expenditures in reconstructing and re-equipping and extending the properties of the company under the direct supervision of the board of supervising engineers, as required by the terms of the franchise, and the valuation of the existing properties recognized by the ordinance of approximately \$30,500,000 will, therefore, remain as a minimum continuing equity behind the first mortgage bonds.

Consolidation of all the elevated railroads in Chicago and the formation of a \$125,000,000 combine to operate the roads as one continuous system is being planned. Officials of the Northwestern, Metropolitan and South Side Railroads have declined to discuss the proposition, although it was admitted that a

combine of the elevated roads would be the easiest way to adjust the union loop difficulties and place the elevated roads in position to compete with the reorganized surface system.

MEETING OF HAVANA COMPANY

The annual meeting of the stockholders of the Havana Electric Railway Company was held last week, and the annual report of the company was published in last week's issue. The following directors were elected: First class, to serve for one year, Carlos de Zaldo, James Rattray and Frank Steinhart; second class, to serve for two years, Robert Mather, Walter G. Oakman and Heinrich Runken; third class, to serve for three years, Antonio San Miguel, Warren Bicknell and David T. Davis. Warren Bicknell, the president, in his annual report said that, in spite of the labor troubles in Havana in the last year, the most cordial relations now existed between the company and its employees. The track mile earnings in the year were in excess of \$36,000, which is said to be a greater average a track mile than for similar lines in this country. Dividends aggregating 3½ per cent on the preferred stock were paid in the year. In the second six months of 1907, under Mr. Steinhart's management, the net earnings increased to \$846,155 from \$492,210, the net earnings of the first six months.

INTERBOROUGH RAPID TRANSIT FOR YEAR

The Interborough Rapid Transit Company's statement for the year ended Dec. 31, 1907, compares as follows:

	1907.	1906.
Gross receipts.....	\$23,513,172	\$20,916,147
Operating expenses.....	10,316,527	8,793,486
Net earnings.....	\$13,196,645	\$12,122,660
Other income.....	1,146,322	673,598
Total income.....	\$14,342,967	\$12,796,259
Interest on bonds.....	*4,772,568	3,961,991
Taxes	†1,537,971	1,341,074
Total interest and taxes.....	\$6,310,545	\$5,303,066
Net income.....	8,032,422	7,493,192
Seven per cent on Manhattan Ry. stock	4,200,000	3,948,000
Surplus	\$3,832,422	\$3,545,192
Dividends	3,150,000	3,062,500
Surplus	\$682,422	\$482,692
Operating percentage.....	43.90	42.00

*Includes \$3,745,902 interest on bonds, \$1,016,666 interest on three-year notes, and \$10,000 rental.

†Taxes include \$162,940 on real estate, \$202,469 on earnings and \$1,172,567 on structure and personal property.

The surplus, \$3,832,422, after charging off interest, taxes and the 7 per cent guarantee on Manhattan Railway stock, is equal to 10.95 per cent earned on the \$35,000,000 capital stock.

LEGISLATION IN OHIO

Representative Bassett, of Lucas County, has introduced a bill into the Legislature which requires that interurban railway companies shall fence their rights of way and build cattle guards at the crossings. This is really an application of the law that now applies to steam roads.

The Legislature will be called upon to consider one of the important points in the original franchise tax bill proposed some time ago and defeated, as Senator Gayman has framed and introduced a bill that will give the regulation of stock and bond issues of public utilities companies into the hands of the State Railroad Commission. This bill provides that the franchise of a company shall not be capitalized beyond its actual cost and that the capital stock of a merger shall not exceed the combined capital stock of the constituent companies. Under it contracts and leases can not be capitalized, nor can a contract for future consolidation. Senator Gayman said that the representatives of the companies in arguing against the tax measure said that the stock did not represent the true value of the property sought to

be taxed, and he is now trying to get at this and prevent the issuance of more stock than is necessary. The State Railroad Commission will have power to examine the financial condition of companies in order to decide upon the necessity for new stock and bond issues, which subjects are left to this board. Until it gives its consent to such issues a company will not be allowed to contract a debt, either on bonds or notes, for a longer time than twelve months.

The house committee on cities has tabooed the Stockwell bill providing for authority for cities to build street railways and in its place recommended one permitting municipalities to grant one-year franchises, revocable, to street railway companies to construct tracks on bridges, viaducts and other places of the kind. Another bill provides that municipalities may construct such tracks and lease them to operating companies.

Senator Lamb, of Toledo, has come to the front with a bill which provides that where a line is blocked by a steam railroad and a crossing of the tracks of the latter is not granted, condemnation proceedings may be brought to secure the crossing. Another bill, by the same author, gives City Councils the right to grant franchises to interurban roads for entrance into the municipalities in order that they may complete their terminal facilities, if they fail to agree with local lines on a contract for taking the cars in.

The Foster bill, requiring that a list of the names of stockholders of corporations be filed with the Secretary of State each year, was defeated in the House of Representatives. The principal objection was that such a requirement made public the business affairs of people who are interested in corporations only so far as to own a little stock. Representative Stockwell also tried to pin a franchise tax amendment to the bill, and this embarrassed it still further, and probably added to the certainty of defeat.

Representative Hill has a bill in the House making it imperative upon County Commissioners to limit the life of franchises granted to electric railways to twenty-five years, making them in this respect correspond to street railroads. It is believed that this bill will not receive much consideration, as the franchises of railroads would not be worth much if they were hedged in too closely. The measure would retard the development of the electric railway business.

STREET CAR "RUSH PROBLEM" IN BALTIMORE EXPLAINED IN A "FRANK TALK"

The United Railways & Electric Company, of Baltimore, has published the second of its "frank talks" with patrons, and in it tells the difficulties which prevent it solving the problem of providing a seat for everyone during the "rush hours." The "bulletin" first tells of the conditions that prevail. It states that every day between 5:30 and 9:30 a. m. and 5 and 7 p. m. there is a great demand for immediate and quick transportation. In the four morning hours everyone is in a rush to get to the place of employment. In the evening all those who have been accommodated in the four morning hours again wish to be taken home during only two hours. The company estimates the number at 150,000. If it could handle the downtown "rush crowd" like the baseball crowd, the company states, the problem would be more than half solved. At the baseball grounds cars are lined up for a mile, waiting for the crowds, and when the game has ended everyone is accommodated with neatness and dispatch, although all do not have seats. Downtown, however, the bulletin states, this is not possible, because of conditions evident to all. Traffic must be kept moving, and the company can only do as it is now doing—that is, place on extra cars, timed to reach the center of the city for the "rush." The company also points out that because of the hilly topography of Baltimore it is not possible to run crosstown cars between Fayette and Preston Streets, so that all of the traffic must be congested within Fayette Street and Pratt Street, and every street between those is used to its utmost. The bulletin closes thus:

"This bulletin is to convince you that we are doing our best to give you good service, and to give you a broader understanding of our underlying difficulties, so that we will have your cooperation and encouragement. If this sketch appeals to you, try not to kick if you don't get a seat in the evening or if someone casually walks over you. Think it out, and realize some of our difficulties."

BEWARE OF THE TIME-TABLE IMPOSTER

One of our subscribers writes us as follows:

All railroad officials should beware of the Official Folder Time-Table Man. His mission is to see you on important business. He offers to supply you for a year with time tables free of charge, you allowing him to advertise in the same. He agrees to pay you 15 per cent of the net receipts in consideration for a letter of introduction. He presents to you letters of introduction containing the signatures of prominent railway officials and one of these letters you are to copy. This letter seems very simple but, by signing it, you make him your special representative. This letter is the joker and binds you to fulfil whatever agreements he sees fit to make. He collects cash for the advertisements from whomsoever he can and leaves his victims for you to satisfy.

THE PENNSYLVANIA'S REPORT

The annual report of the Pennsylvania Railroad for 1907 was made public Monday, March 2, and shows the highest earnings in the history of the road. The gross earnings amounted to \$164,812,825, an increase of \$16,572,943 over the previous year. Operating expenses, however, amounted to \$17,801,704 more than in 1906, with the result that the net earnings showed a falling off of \$1,492,891. The net income for the year was \$33,575,956, a decrease of \$2,090,244. Out of this, \$21,908,435 was paid in dividends, \$2,500,000 was appropriated for the extraordinary expenditure fund, and \$3,260,651 was expended on revision of grades and other extraordinary expenditures. Through various profit and loss readjustments \$4,648,576 was added to the profit and loss account, and there was charged through this account \$7,000,000 toward the construction of the New York tunnel and terminal. The total amount now charged off on this work, the amount of the cost, in other words, which has not been capitalized, is \$30,000,000. The amount so far added to capital account in connection with this work is \$39,541,414, making the total cost of the work to date about \$69,000,000. The report states that there will be substantial credit arising from the sale of real estate not needed by the railroad.

In regard to the tunnel work now in progress, the report says:

The progress upon the Tunnel Extension has been satisfactory, although it has necessarily been delayed by the engineering, legal and municipal questions inseparable from so extensive an undertaking. It is expected that the entire work upon the tunnels and terminal station will be completed in 1910.

On the section between Harrison, east of Newark, where the Tunnel Extension leaves your New Jersey Division, and the western portal of the Bergen Hill Tunnels, substantial progress was made during the year upon the masonry, superstructure and embankment necessary to carry your railroad across the Meadows above the grades of the railways and streets traversing that territory. The two tunnels through Bergen Hill have, with the exception of about seven hundred feet, been fully excavated. The concrete lining is being placed in the Bergen Hill Tunnels and also in the two tubes under the Hudson River, while the excavation is completed from the river to the Terminal Station approach at Tenth Avenue. From Tenth to Ninth Avenue more than half of the work has been finished, and on the Terminal Station site between Seventh and Ninth Avenues in New York City, practically all the retaining walls and foundations are in place. The steel viaducts for the support of the streets adjoining the station site and for the avenues crossing it are also nearing completion, while the steel structure of the station itself is in process of erection. The tunnel excavation from the terminal site eastwardly to the First Avenue shafts on the westerly side of the East River is completed, with the exception of the section between Fifth and Sixth Avenues, and nearly one-half of the concrete lining and other work on that portion of the line is completed. In the construction of the four tunnels under the East River, one of the iron tubes has already been completed, and the remaining tubes will be connected early in the present year.

The tunnels under Long Island City, from the East River to East Avenue shaft in the Borough of Queens, have been completely excavated and iron lined, and two-thirds of the concrete lining is in place. The work between the East Avenue shaft and the western end of Sunnyside Yard, near Thomson Avenue, where the tunnels reach the surface, is under construction.

PROGRAM AT WILLOW GROVE PARK

The Philadelphia Rapid Transit Company has just issued its program for the amusement season of Willow Grove Park during 1908. It includes Pryor and his band, from May 30 to June 27; Victor Herbert's orchestra, from June 28 to Aug. 1; the Theodore Thomas orchestra, from Aug. 1 to Aug. 15, and Souza and his band, from Aug. 16 to Sept. 17.

The pamphlet, which contains 24 pages, and is tastefully printed, gives a sketch of each of these conductors, and an account of all of the various amusement attractions at Willow Grove Park. A sketch of the route followed by the cars to the park is appended.

NEW PUBLICATIONS

SPECIFICATIONS AND CONTRACTS. By J. A. L. Waddell, with Notes on the Law of Contracts, by John C. Wait, New York. Engineering News Publishing Company, 174 pages. Price, \$1.00.

This book is founded upon lectures presented by Mr. Waddell, discussing the preparation of specifications and contracts, and the obligations incurred under them. The text is illustrated by examples of clauses, and includes some notes on the law of contracts by John C. Wait.

AN INTRODUCTION TO THE STUDY OF ELECTRICAL ENGINEERING, by Prof. Henry H. Norris, New York. John Wiley & Sons, 404 pages. Price, \$2.50.

This is an excellent treatise to put in the hands of the ambitious student who has an acquaintance with electrical apparatus through its use, but who desires to know more about the principles underlying operation. To such the most ready path is from the known to the unknown. Prof. Norris, therefore, takes up the lamp, the motor, the generator and power station, the telephone, etc., and explains their construction and the reasons therefor. The book is well illustrated, the text is clear and the style is interesting and explicit. A short history of the development of electrical engineering is included.

THE MOTORMAN AND HIS DUTIES, by Ludwig Gutman, Sixth Edition; revised and enlarged by L. E. Gould, editor *Electric Railway Review*. Chicago, The Wilson Company; 195 pages; illust., and three large diagrams. Price, \$1.50.

The need of a handbook in simple language on the theory and practice of electric railway car operation is evident from the success which has followed the sale of this book. Since it was first brought out it has passed through five editions. In the sixth edition, which has now been published, the book has been revised and brought up to date by Mr. Gould in a thorough way. Many new illustrations have been included and a description of single-phase operation and circuit diagrams of the latest multiple-unit control systems have been added. A comprehensive glossary and an index add to the value of the handbook.

ECONOMIES OF RAILWAY OPERATION, by M. L. Byers, Chief Engineer Maintenance of Way Missouri Pacific Railway. New York Engineering News Publishing Company, 672 pages. Price, \$5.

In steam railroad work, probably more than in electric railway work, the operating forces is so divided into departments that it is difficult for the worker in one to obtain a very clear view of the relation of his work to that of other departments. Nevertheless if promotions are made from the ranks each man may at any time be called upon to exercise broader powers of direction and ultimately may be elected president when he will have to be acquainted with the work of all. For this reason in all railroad work, in fact in any large organization, it is not good policy for the ambitious man to limit his knowledge to that actually required for the task before him. It was with this thought in mind, and for such readers, that the present book was written. The author has accomplished his task well and has placed upon record a wealth of information on railway operation. The chapter titles indicate the scope of the volume. They are: Organization; employment, education and discipline of forces; accounts and accounting; reports; economic operation; analytical betterments. Although exclusively upon steam railroad work the electric railway reader will find a great deal to interest him in this volume.

STREET RAILWAY PATENTS

UNITED STATES PATENTS ISSUED FEBRUARY 18, 1908.

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

879,138. Railway Signaling Device; Frederic Bauer, New York, N. Y. App. filed Oct. 18, 1907. A device whereby the proximity of a train to a crossing is indicated to the motor-man.

879,168. Electric Railway Signal; Frederic M. Hill and William C. Davis, Columbus, O. App. filed Apr. 6, 1907. A pivoted semaphore arm having a rotatable disk or pulley to which is attached a rod which is adapted to be drawn downward and

fastened by a solenoid magnet to thereby raise the semaphore. The semaphore is released by a magnetic trip.

879,256. Railway Switch; David I. Griffith, Frostburg, Md. App. filed Aug. 13, 1907. A pair of oppositely-acting spring-actuated toggles disposed between each switch rail and the corresponding track rail.

879,357. Trolley Catcher and Retriever; Franklin J. Gustine, New Orleans, La. App. filed July 5, 1906. Means whereby the trolley pole is automatically tripped at a certain position in its upward movement so as to fall by gravity below its normal position of use.

879,267. Controlling Means for Pneumatically Operated Devices; Ray P. Jackson, Wilkesburg, Pa. App. filed Mar. 3, 1906. Means for pneumatically controlling a frame of the double-pantograph type which carries a trolley shoe or collector.

879,283. Pleasure Railway; Thomas G. Mayberry & William H. Mayberry, Reading, Pa. App. filed Oct. 10, 1907. The car is made to represent a whale and runs on a partially submerged track.

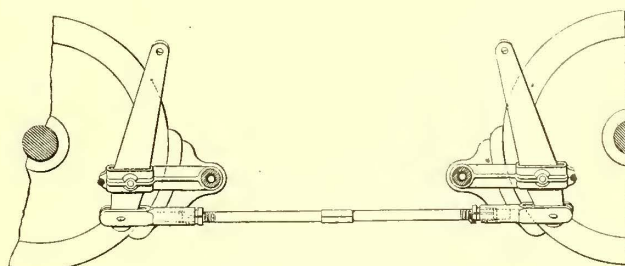
879,384. Railway Car Brake and Other Mechanism; Edward D. Hallman, Larchmont Manor, N. Y. App. filed Sept. 21, 1907. Provides a connecting rod having upon one or both ends a jaw-member adjustably secured thereto and equipped with special means for locking the same upon the rod.

879,297. Air-Brake, Lighting and Signaling System for Railway Trains; William C. Mayo & John Houlehan, El Paso, Tex. App. filed Jan. 21, 1907. Relates to improvements in the electric control of the braking mechanism of railway trains and the lighting of the trains and the signaling between train crew and engineer.

879,475. Railroad Joint; John H. Kochenderfer, Galion, Ohio. App. filed May 1, 1907. Plates are formed on the lower edges of the fish-plates, which plates pass beneath the rails at the joint and support the abutting end of the rail and are rigidly bolted to each other.

879,494. Train Protection for Railways; Benton C. Rowell, Chicago, Ill. App. filed Feb. 13, 1899. Relates to signal and train stop system for railway crossings designed to make it impossible for two cars to collide at said crossings.

879,575. Hanger-Strap or Handhold for Cars, Etc.; John F. Newton, Jr., Boston, Mass. App. filed Oct. 27, 1907. The depending loop of the strap is furnished with a non-absorbent surfacing, a removable facing strip covering one surface of the loop, and a detachable fastening for securing the facing strip in place.



PATENT NO. 879,384

879,582. Trolley Retriever; Richard Phillips, Washington, D. C. App. filed June 8, 1906. Flaring arms are pivoted on the trolley harp and have gear connections with the trolley pole so as to be raised and lowered automatically.

879,593. Trolley Wheel; Jacob M. Siegrist, Oswego, N. Y. App. filed Sept. 4, 1907. The wheel is of the type having spirally arranged grooves adjacent to the main groove so as to guide the conductor thereon. Has special supporting means by which the wheel is removable and lubricating features.

879,606. Brake Mechanism for Car Trucks; Walter S. Adams, Philadelphia, Pa. App. filed July 27, 1907. Provides inside hung brake shoes, a lever fulcrumed so as to operate the shoes in opposite directions, a second lever fulcrumed to a support and having its end fulcrumed to the said first lever.

879,636. Trolley Wheel; Edward J. Harrison, South Bend, Ind. App. filed July 18, 1907. The spokes of the wheel are

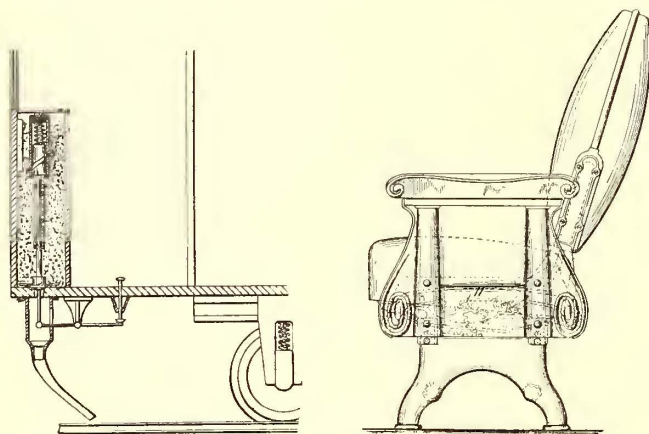
hollow and communicate with an oil cup within the wheel so as to lubricate the peripheral groove where it engages the conductor.

879,648. Means for Automatically Closing Electric Circuits; Fayette W. Keeler, Temple, Tex. App. filed Aug. 8, 1906. This system enables the train dispatcher to communicate with all the operators at once, as well as selectively ring alarm bells at particular stations.

879,658. Sanding Device; Benjamin C. Loring, Edgewood, R. I. App. filed May 6, 1907. A device for agitating the sand so that it will not become too closely packed.

879,683. Protector for Third Rails; Frank D. Sharp, Altoona, Pa. App. filed Jan. 19, 1907. The third rail is held in inverted relation between insulating blocks inserted in spaced cast iron supports on the exterior of which are bolted a protecting cover of wooden boards.

879,700. Graduated Release Valve; Walter V. Turner, Edgewood, Pa. App. filed June 27, 1906. Means for effecting a partial or graduated release of the brakes, comprising a reservoir charging valve device and a valve device operative by movement of the triple valve piston for controlling the reservoir charging device.



PATENTS NOS. 879,658 AND 879, 730

879,709. Pressure Governor for Pumps; Henry H. Westinghouse, New York, N. Y. App. filed Dec. 13, 1902. Relates to pressure governors for motor driven air compressors such as are employed on cars for supplying compressed air to the main reservoir of the air brake system.

879,729. Trolley Pole Head; George C. Buchanan, Dubois, Pa. App. filed Apr. 21, 1906. The trolley harp is pivoted on a vertical axis so as to swing laterally, the lateral movement being limited by spring abutments.

879,730. Car Seat; Edward G. Budd, Philadelphia, Pa. App. filed Aug. 9, 1906. Details of construction of a "walkover" car seat.

879,742. Car Fender; Albert L. Cole, Newton, Mass. App. filed June 17, 1908. Details of construction.

879,750. Railway; George Dippel & Christian Koenig, Pittsburg, Pa. App. filed Aug. 22, 1907. A double-deck elevated railway structure on the two tracks of which trains can be run in the usual manner, and means whereby suspended trains may be run on tracks under the two first mentioned tracks.

879,752. Wheel Guard; Maurice F. Doty, Chicago, Ill. App. filed May 29, 1907. A metallic shield or fender adapted to be secured to the truck of a car and projected down near the track in front of the wheel. The shield is of such shape that it will push obstacles out of the way of the wheel while the car is under motion.

EXTENSION OF EASTERN PENNSYLVANIA RAILWAYS

On Feb. 27 service was inaugurated by J. G. White & Company, managers of the Eastern Pennsylvania Railways, over the new extension of the properties between Tamaqua and Middleport. This completes the through 35-mile interurban connection between Pottsville and Mauch Chunk, one of the principal improvements planned when the Eastern Pennsylvania Railways Company was organized. The older properties incorporated in this new interurban route are the Tamaqua & Lansford Railway, between Mauch Chunk and Tamaqua, and

the Pottsville Union Traction Company's line between Pottsville and Middleport. At present the service is hourly, with three of the new cars in operation. The extension parallels the tracks of the Philadelphia & Reading Railroad, is single track, and well constructed with 70-lb. rails and cinder ballast. Long sidings are provided at intervals of two miles. Power is furnished from the Palo Alto station of the Pottsville Union Traction Company, which has been enlarged for the purpose to a capacity of 3000 kw, the addition being two Wetherill cross compound engines, direct connected to 1000 kw Allis-Chalmers alternators.

This is one of the most important electric traction developments of recent date in Eastern Pennsylvania. The populous centers of Schuylkill and Carbon counties are directly connected. Pottsville is brought into closer connection with many points in the eastern part of the state, and the new route to New York is made by taking the Lehigh Valley Railroad at Mauch Chunk. Ascending the western ridge from the bank of the Lehigh River, the line affords beautiful mountain scenery for many miles, and will be popular with excursionists.

PERSONAL MENTION

MR. S. E. MAHAN has resigned as assistant claim agent of the Twin City Rapid Transit Company.

MR. H. C. GREEN has resigned as superintendent of the Muncie & Portland Traction Company, of Portland, Ind.

MR. W. H. HOOVER, superintendent and master mechanic of the Lykens & Williams Valley Street Railway Company, of Williamstown, Pa., is dead.

MR. CHARLES B. HOUCK has been appointed general manager of the Wilkes-Barre & Hazleton Railway Company, with headquarters at Hazleton, Pa.

MR. A. H. WALCOTT has retired as superintendent of the Blue Hill Street Railway, of Boston. Mr. Walcott was the first superintendent of the Rockland & Abington Street Railway, with which he remained until the company was sold out.

MR. ARTHUR L. SMITH, whose resignation as superintendent of the Central Kentucky Traction Company and the Lexington Railway was previously mentioned, has accepted a position with the Cincinnati Northern Traction Company, Cincinnati, Ohio.

MR. CHARLES H. DALTON, for more than thirteen years a member of the Boston Transit Commission, died Feb. 23, at the age of eighty-two years. He served as chairman of the commission from Jan. 1, 1894, to Oct. 11, 1906, when he resigned from the body.

MR. CHARLES L. ROGERS, of Uxbridge, superintendent of the Uxbridge & Blackstone Street Railway Company, has also been appointed superintendent of the Milford, Attleboro & Woonsocket Street Railway, succeeding Mr. Ernest A. Potter, resigned.

MR. H. E. FARRINGTON, who returned several weeks ago to Boston from San Francisco, where he had been connected with the United Railways, has accepted the position of superintendent of motive power of the Boston & Northern Street Railway Company. Mr. Farrington's territory takes in the company's lines on this side of Boston, and extending as far north as Nashua, N. H.

MR. H. C. HUSTON has been appointed superintendent of the Detroit, Monroe & Toledo Short Line Railway, with headquarters at Monroe, Mich., succeeding the late Mr. Murdock McAulay, whose death occurred on Feb. 11. Mr. Huston formerly was a conductor on the Detroit, Ypsilanti, Ann Arbor & Jackson Railway, and more recently has been carhouse foreman of the Detroit, Monroe & Toledo. Mr. Fred M. Benson, who has been conductor on the line since it began operation, has been appointed assistant superintendent, with headquarters at Monroe.

MR. F. F. BARBOUR, for many years with the General Electric Company, of San Francisco, has been appointed assistant to the president of the Portland Railway, Light & Power Company, with headquarters at Portland, effective March 1. This is a new position, made necessary by the large increase in business being enjoyed by the consolidated lines of the Portland Railway, Light & Power Company, comprising the Oregon Water Power & Railway Company, Portland Railway Company, Portland General Electric Company, Salem Street Rail-

way, Light & Gas Company and Vancouver, Washington, Electric Light & Power Company.

MR. R. W. SHEPHERD, who for many years was connected with the United Gas & Improvement Company of Philadelphia, and later was auditor and assistant comptroller of the Rhode Island Company, has been appointed auditor of the Portland Railway, Light & Power Company, with headquarters at Portland, Ore. This is in reality a new position, brought about by the resignation of Mr. S. G. Reed, treasurer, who retired from the company to take the position of president of the German-American Bank of Portland, and the consolidation of the positions of secretary and treasurer of the Portland Company under Mr. Charles M. Huggins, formerly treasurer and auditor.

MR. C. B. BUCHANAN, superintendent of transportation of the Virginia Passenger & Power Company, of Richmond, Va., has been appointed general superintendent of railways of the company. In this position he will have charge of all railway lines, as well, according to the official announcement, as of all bridges, trestles, shops, car houses, stables, viaducts and parks. Mr. George H. Whitfield has been appointed general superintendent of light and power, and will have charge of power houses, substations, dams and canals, overhead and underground light and railway wires, lamps and meters. The office of general manager of the Virginia Passenger & Power Company, made vacant by the resignation of Mr. S. W. Huff, who has become president of the Coney Island & Brooklyn Railroad, as previously announced in this paper, has been abolished.

MR. THOMAS CARSON BARR died last week at his home in Orange, N. J., aged 50. Mr. Barr was educated for the law, but early gave up his practice to enter railway affairs in Philadelphia and was elected president of the People's Passenger Railway Company in that city. Then he became interested in railways in northern New Jersey. With other capitalists he purchased all the Newark surface roads, except the South Orange Avenue line, and incorporated them into the Newark Passenger Railway Company, which was later changed to the Consolidated Traction Company and then to the North Jersey Street Railroad Company. The Public Service Corporation is the present owner. Mr. Barr carried his interests and activities to Worcester, Mass., and operated roads there for a short time, but returned to New Jersey and became president of the Elizabeth, Plainfield & Central Jersey Railway Company. When the Public Service Corporation was organized he was made a director. He was a member of the board of governors of the Orange Club, the Essex County Country Club, the Union League, of Philadelphia; the Lawyers Club, of New York; the Essex Club, of Newark; the Trenton Country Club and the Lotus Club, of Newark.

MR. WILLIS G. MELOON, general manager of the Atlantic Shore Line, has withdrawn from the management of the corporation to accept a more lucrative position with the present owners, A. H. Bickmore & Company, of New York, and will take the management of a larger interest in the South or West. Mr. Meloon came to Maine first as superintendent of the old Portsmouth, Kittery & York Electric Road and has seen the property grow from that beginning to its present system of more than a hundred miles. Although the system has changed hands four different times, he has remained as operating head of the company. The Portsmouth, Kittery & York division soon after took over the line to Dover and South Berwick and later built the cross country line from Rosemary to York. Subsequently the line from Biddeford, Kennebunk and Sanford was taken over and it became known as the Atlantic Shore Line, and this past summer the connecting link between the eastern and western divisions of the system was made, giving a direct line from this city to Biddeford, as described in the article on the system which appeared in the STREET RAILWAY JOURNAL for Dec. 14, 1907. Mr. Meloon was largely responsible for harmonizing the constituents.

MR. ALEXANDER JACKSON, chief despatcher of the Brooklyn Rapid Transit Company's surface lines, has resigned, and Mr. John Weigel has been appointed to succeed him. Mr. Jackson leaves the Brooklyn Rapid Transit Company to accept a similar position with the Public Service Corporation, of New Jersey. Both Mr. Jackson and Mr. Weigel have worked up from the bottom, the former having started as a conductor in 1895, and the latter as a motorman in the same year. Mr. Jackson served only a short time as conductor. He was promoted to inspector and in 1897 began his service in the general

offices as clerk in the time table department, eventually being made chief of that department. In July, 1903, he resigned from the Brooklyn Rapid Transit Company to take charge of the schedules of the Public Service Corporation, returning to the Brooklyn system Aug. 15, 1906. Mr. Weigel has alternated much of the time with Mr. Jackson. He went into the shops first. Soon thereafter he became in rapid succession, inspector, general inspector, assistant division superintendent, clerk and then chief of the time table department and finally chief despatcher of surface lines. He went to the Public Service Corporation when Mr. Jackson came to the Brooklyn Rapid Transit Company two years ago, and now exchanges positions with him.

MR. THOMAS MILLEN, whose resignation as master mechanic of the New York City Railway Company and retirement from railroad service were announced last week, was



THOMAS MILLEN.

tendered a complimentary banquet by his recent associates and other railroad friends on the evening of Feb. 29, at Shanley's. About one hundred and thirty persons were present, and all united in expressing their regret to the guest of the evening upon his decision to retire from railroad work, but complimented him upon his fine record of forty-two years of active and honorable railroad service. Mr. A. C. Tully, purchasing agent of the New York City Railway Company, acted as toastmaster, and the speakers included Mr. H. H. Vreeland, president of the New York City Railway Company; Mr. F. S. Gannon, president of the Norfolk & Southern Railroad Company; Mr. John D. Campbell, of the firm of Campbell & Co. and formerly of the Manhattan Railway Company; Mr. Frank Hedley, vice-president and general manager of the Interborough Rapid Transit Company; Mr. Otis H. Cutler, president of the American Brake Shoe & Foundry Company, and Mr. Daniel M. Brady, of the Brady Brass Company. In referring to Mr. Millen, Mr. Vreeland said: "In forty-two years of active railroad work Mr. Millen has never sought employment, never left one position except to take a better, never been off a pay roll except during the period involved in changes, and has never had a vacation of fifteen consecutive days. The loyalty of Thomas Millen to friends, family and associates is to them and will continue to be to him a treasured memory, and should be an inspiration to them all. That he won the support and loyalty of his subordinates is shown by the fact that in all these years no labor dispute or strike occurred under his various administrations." Mr. Vreeland also gave a sketch of Mr. Millen's railroad experience. He said that at an early age Mr. Millen entered the Cooke Locomotive Works, at Paterson, N. J., first in the molders' department, then entered the machine shop. In 1866 he went to the Hampton shops of the Central Railroad of New Jersey as apprentice and machinist, and continued there until 1872, when he was appointed machinist and engine dispatcher of the Delaware, Lackawanna & Western Railroad. The following year he returned to the Hampton shops as machinist and gang boss, and in 1874 was appointed general foreman of shops on the Utica division of the same road. The following year he was appointed engine dispatcher of the New Jersey Midland Railroad, now the New York, Susquehanna & Western. He continued there until 1884, when he was appointed master mechanic on the New York City & Northern Railway Company, under Mr. Frank S. Gannon. In 1894 he accepted the appointment of master mechanic of the Metropolitan Street Railway Company, the position which he has just resigned. At the close of Mr. Vreeland's speech Mr. Tully handed Mr. Millen a handsome silver loving cup, which was a gift from a number of friends outside of the railroad company. Mr. Tully said that these gentlemen wished to give a testimonial which he could always keep as a memento of their esteem. The members of the committee in charge of the banquet were Messrs. A. C. Tully, W. E. Dougan and T. A. Delaney. Mr. Millen has purchased a farm in Sussex County, N. J., where he will live in the future.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement, "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit. ‡ Including Rapid Railway system, Sand-

Table with columns for COMPANY, Period, Total Gross Earnings, Operating Expenses, Net Earnings, Deductions From Income, Net Income Amount Available for Dividends, and corresponding columns for a second set of companies on the right side.