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Of this issue of the ELECTRIC RAILWAY JOURNAL 10,000 copies are printed.

Apprentice Schools

The report of the committee of the American Railway Master Mechanics' Association on the "Apprenticeship System," which is abstracted elsewhere in this issue, again calls attention to the benefits of a scheme proposed last fall by Prof. Henry H. Norris in his paper on the "Technically Trained Man and the Electric Railway Profession," read before the American Street & Interurban Railway Association. Prof. Norris suggested a plan for finishing the education of technical graduates and turning out trained men to fill responsible positions on electric railways. The

apprenticeship course outlined in the committee report is intended to recruit young men from the ranks and to encourage them to fit themselves for the higher positions of trust and responsibility. Its aims are far broader than this, however. Experience has shown that it creates a close bond between employer and employee, promotes loyalty to the company and supplies well-trained, competent journeymen mechanics and artisans. The college graduate, however, is given no more favors than the boy with a common-school education in the beginning. He must show his superior ability in competition with the rank and file. The experience of the steam roads that have made a beginning in apprenticeship work has been confined so far to shop employees, but it is significant that the committee adds in the conclusion of its report that the movement "will become the most powerful influence in supplying and preparing the men of the future for the motive power department (and perhaps other departments) of American railroads." Here is another field in which electric railways may profit in the future by the experience of their steam-road competitors.

Depreciation of Equipment Accounts

We publish in this issue an abstract of a hearing before the Interstate Commerce Commission on the subject of depreciation of equipment accounts and the large number of primary accounts in the classification of operating expenses prescribed for steam railways. This hearing was requested by representatives of the steam railways. The electric lines were not represented during the proceedings, but the arguments are of interest because the decisions by the commission affecting roads of both classes have been somewhat similar. The statements of members of the committee made clear their position that operating expenses should show actual expenditures only and not theoretical expenditures. The representatives of the commission have not adopted this standpoint, but defend themselves on the ground that the operating accounts should show all liabilities and that the loss in value of equipment, through depreciation, is a liability and therefore should be stated. The answer of the operating officials to this point of view is that such loss of value is an estimated liability and that proper treatment of operating accounts cannot provide for estimated liabilities any more than it can take into account estimated accretions. As estimates, such liabilities and accretions may be shown properly in the balance sheet and income account, but not in the operating expenses. The railway representatives submitted, in other words, that when an estimated liability became an actual liability, as for example, when a depreciated car or locomotive had to be destroyed and replaced with another car or locomotive, the actual liability thus created should be shown in the accounts.

Exhaust Steam Turbines

Early in the history of turbine design the fact was recognized that a turbine will operate with especial economy under a low pressure of steam. The reason lies in the smaller leakage, since the loss from this cause varies with the reduction in pressure and inversely as the blade length. The velocity of the steam is also lower than in high-pressure turbine and this allows a greater latitude in design to secure commercial speeds. Rateau was perhaps the first to utilize this fact commercially, but recently the advantages of the combination of a reciprocating steam engine and turbine, the latter taking the exhaust from the former, have been recognized in Europe and America. As the loads on the two machines vary, a storage reservoir between the two is necessary, in which the pressure will average perhaps 15 lb. absolute, but will fluctuate within comparatively large limits. Experiments have been tried of increasing the storage capacity of such a vessel with iron, but there seems to be no better heat-storing body than water, which will at once give out its heat as the pressure is reduced. But when water is employed as a heat-storing body the exhaust steam should be introduced throughout its mass so as to cause the water to circulate.

Handling a Convention Crowd

An excellent opportunity was afforded in Chicago during the week of June 15 of demonstrating the capacity of pay-as-you-enter cars to handle enormous crowds. The national Republican convention was held at the Coliseum during that week and there were in attendance at some of the sessions as many as 15,000 people who, after adjournment, eagerly sought a means of transportation to the business district. Passing in front of the Coliseum is a double-track line of the Chicago City Railway, over which are operated the Cottage Grove and Indiana Avenue lines of this company. Both of these lines are equipped with this company's 1907 type of car, which, it will be remembered, is built for the pay-as-you-enter method of fare collection and double-end operation. The ordinary rush-hour schedule on Wabash Avenue in front of the Coliseum has a headway of about 30 seconds and cars were provided for maintaining this schedule at the adjournment of the convention sessions. As the result it is said that no one was obliged to walk who wanted to ride. The efficient handling of this crowd of people, largely unacquainted with the pay-as-you-enter scheme, would serve to disprove many arguments made by those unacquainted with the utility of this type of car for serving severely congested traffic.

The Drag Fit

We are told by those well acquainted with shop practices that the drag fit system of measurement is far superior to the ordinary method, and we are also led to believe that were the advantages of the drag fit better known it would be more widely used. For this reason we describe in this issue a method of drag-fitting wheels, gears and axles as practised in the repair shops of the Northwestern Elevated Railroad Company of Chicago. The scheme is perhaps more difficult to understand from a description than from actual observation. By experimenting certain dimensions have been found which, if used according to the drag fit

system, will give a proper fitting between an axle and a gear or wheel to be pressed on. With these dimensions available and the wheel to be pressed on nearby, where its bore can be calipered, the lathe attendant turning an axle can set his calipers so that it is but a simple task to see whether or not the axle has been finished to the proper size for wheel mounting. The dimensions earlier mentioned as having been determined by experiment are not, comparatively speaking, small, but range in electric railway wheel practice in the neighborhood of $\frac{3}{4}$ in. Any variation in the size of the axle from the desired diameter, if measured by the drag fit, exhibits itself largely magnified. For example: If the shaft is one-thousandth of an inch too large the measuring dimension, according to the drag fit method, will vary by approximately one-sixteenth of an inch. Therefore, the workman can get an accurate fit using only a steel scale and calipers in contrast with the more delicate task of measuring small dimensions with fixed gages or micrometer calipers.

The Single-Phase System

Single-phase installations are becoming so numerous that they attract little attention unless accompanied by some novel features. Motors and control seem to have been largely standardized, but there is still wide difference in practice so far as overhead construction is concerned. The single catenary supported on poles has been generally employed on our interurban lines, but heavier construction seems necessary for trunk line service. The extent of the interest in this subject lends importance to the description published in this issue of the overhead construction used by the Midland Railway in England in electrifying its Heysham-Morecambe-Lancaster division.

The comparatively light traffic on this division made it impracticable to use massive anchor bridges except in the railroad yards, while, on the other hand, a single catenary suspended from pole-connected span wires or brackets was considered unsafe in this populous district. Consequently it was decided to carry the trolley wiring and its auxiliaries from a pair of back-to-back steel angles firmly riveted to brackets on the pole. Unfortunately the accounts which have reached us do not give the strength of these angles nor the weight they have to carry between spans, but it is evident that the design itself is the acme of simplicity.

The catenary construction itself also deserves attention. The messenger cables are duplex instead of single. This has the double advantage of having one cable always ready to carry the suspension if the other breaks and of permitting a better distribution of the strain on the insulators. The working conductor is suspended from a horizontal auxiliary or carrier wire, as is now being done on the New Haven road, but slips freely on the horizontal carrier wire and is provided with tension weight devices every half-mile as in the German installations. As the train enters at the fixed end of each section no kinking is possible.

It will be seen from a perusal of the article that the interesting features are not confined to the line construction and car equipment, for the mixed service power station is equipped with d.c. gas-electric generators while motor-generators are used to furnish single-phase current for the railway.

Car Repair Shop Design

The problem of designing a car repair shop exactly to suit the needs of every electric railway operating 100 cars is a pretty difficult one. There are wide differences of opinion as to what constitutes the best general arrangement of buildings and the amount of floor space to be allotted to each department. Whether or not the plans contained in the committee report presented this week at the Niagara Falls convention of the Street Railway Association of the State of New York meet with the approval of every master mechanic in all of their details, a careful study will show that the committee has not lost sight of the principal points which mark a good shop. Provision is made for future expansion in two directions, fire prevention and protection have been given special consideration, no floor space has been wasted, the unit system of building construction keeps down first cost and the sequence of repair operations is maintained throughout the shop plant. The committee has completed its difficult task in a highly creditable manner and its report, the first of its kind, is worth close perusal.

The arrangement and number of cranes and hoists in the main repair shop are of special interest. The committee recommends two sets of double-pit tracks with the machine and armature shops located in between. Each pit track is long enough to hold two 50-ft. cars or a total of eight cars on the four tracks. Over each pair of tracks are two 10-ton, 30-ft. span crane bridges carrying two 5-ton electric hoists on each bridge. The machine and armature shop bay in the center is spanned by a 5-ton hand hoist on a traveling bridge and two pneumatic jib cranes are provided to serve the truck spans at the end of each pair of pit tracks. The total investment in cranes and hoists in the main shop alone is \$11,800 compared with a total investment in machine tools of \$19,000. This seems to be a rather high ratio, but in the event of future enlargement of the shop no additional cranes or hoists would be needed. With two 10-ton traveling cranes serving only four cars it would hardly seem necessary to invest \$2,500 in jib cranes for the truck spans, although it must be admitted that they are about the handiest appliances in a shop.

In some ways a layout of parallel single-car pit tracks affords advantages over the longitudinal system recommended by the committee. At the Anderson shops of the Indiana Union Traction Company, for example, 12 pit tracks and the transverse truck aisle are served by four 5-ton trolley hoists with two transfer bridges running over the truck aisle. These hoists can be concentrated over any one pit or they can be used on the transfer bridge over the truck aisle. The objection to longitudinal pits, that there may be delay in switching out one car in between others, does not apply to the committee's plan as shown, since cars can be run out of the building at either end. In case the shop was enlarged, however, and the pits lengthened to hold three cars, this objection might be raised, as a car in the middle could not be taken out without switching one of the end cars. In the paint and carpenter shops the use of longitudinal tracks does not involve any delay since the work in these departments requires a longer time and can be arranged on a regular schedule.

The track arrangement in the shop yard provides all of the necessary flexibility for the movement of cars into or

out of any building from either end provided the ladder and entrance tracks are kept clear for switching movements. If space is available it would probably be advisable to provide additional storage tracks other than those shown in the plan on which work cars, summer car bodies and worn-out rolling stock could be stored. There is usually a large amount of company material of this kind which should properly be stored near the car shop.

The plan proposed for lighting the pits with mercury vapor lamps is believed to be new. Five lamps of 700 cp each are shown for each pit. Compared with ordinary methods of pit lighting this is a marked step in advance. If night inspection and repair work are to be done, and most city lines do this work at night, the more light which can be thrown under the car and trucks, the more thorough the inspection is likely to be. The life of pit lamps is ordinarily short, but these lamps are thoroughly protected and should not be subject to accidental injury. The quality of the light should be better than from incandescent lamps and the cost less.

A review of the committee's report would not be complete without commending the unit system of building construction adopted. The chief value of this method is the reduction in cost of concrete forms for roofs and columns and the general uniform appearance of the buildings, inside and out.

Summer Passenger Traffic

The increase in passenger traffic on account of the hot summer weather benefits both urban and interurban electric railways. While the effect of this business is apparent in the current revenues, it has not yet appeared in the monthly reports prepared by the companies for publication. The latter figures contain the final totals of operating expenses as well as revenues and more time is required to complete them than is needed to show only the total gross amount received.

That the summer business is profitable and capable of development is realized by some managers, but not fully appreciated by others. When the tracks of a large system cover adequately the principal thoroughfares of a city and reasonable service is afforded, some business may be lost if an especial effort to attract it is not put forth.

As the present is a time when the companies need to increase their gross revenues as much as possible, the likelihood of development of the summer business should be borne in mind. Purely urban companies may create an interest in evening rides on the part of many passengers who do not ordinarily take trips after going to their homes for dinner. This may be done through the display of posters on the cars, and newspaper or circular advertising in which maps or directions regarding attractive rides are given. The urban company may have a monopoly of its business, but it does not receive all the traffic obtainable unless it is able to produce something besides the use of its lines for business and other necessary purposes.

The advisability of endeavoring in every way to build up traffic is understood better by many interurban managers than by many officials of lines that are operated only within city limits. But on some high-speed lines it may be found profitable to consider the schedules in order to ascertain

whether trains are so arranged that short trips can be taken easily, and that the homeward ride is possible at convenient times.

The Prevention of Motor Breakdowns

There is no more important problem before a well-organized maintenance department in electric railway service than the prevention of motor failures. Economical repairs through an efficient shop force and equipment are well, but the real purpose of the mechanical department is to avoid or at least reduce the number of breakdowns, rather than to repair broken apparatus when it has been brought into the shop. The direct-current railway motor has long since earned a good name for itself in the matter of service reliability, but the need of careful inspection of its vital parts at regular intervals by car-house employees shows no sign of becoming less. Constant observation must be given to the condition of each motor running on a division if a high motor mileage between failures is expected.

The weak spot is the commutator. It has been well said that when commutator troubles are eliminated, 75 per cent of the defects of the modern direct-current railway motor will be no more. We recognize that the importance of giving the commutator close attention has been emphasized a great many times, but the failure of inspectors to measure up to the requirements in this direction justifies renewed consideration of some of the causes which tend to lower the records of individual motor equipments in service. Any sort of irregularity on the surface of the bars tends to cause trouble. Uneven brush tension, high mica or low bars, grooves in the commutator circumference, gummy brush holders, improper spacing of brushes, failure to renew brushes when worn to the low point, absence of accurate gages to assist the pit force in deciding when to remove a commutator, or uncertainty as to the proper wearing diameter of commutator bars on different types of motors, loose leads, poor construction in the winding room or factory, and carelessness in the handling of armatures in the shop—all are contributory causes of increased repair cost and loss of time from service, as well as of delays which interrupt the flow of traffic on a company's lines. It is far better to send in a commutator to be turned a little too often than to err in the other direction.

Care in taking armatures out of motors is worth all that it costs in reduced speed of dismantling. The armatures of some modern motors weigh more than half a ton each, and if too much of this weight is brought to bear upon the individual commutator bar, distortion is likely to result. In this connection loose field coils can probably be better adjusted by canvas pads than by fiber pieces, the tendency of the latter being to crack when subjected to long continued heating. Any looseness of field coils if not adjusted is certain in time to lead to a ground or short circuit. As far as the practice has thus far been tried on a limited scale, it appears that the plan of heating commutators to the point where the varnish becomes fluid and then subjecting the commutator to a pressure of about 20 tons has been effective in forcing out the surplus varnish and tightening the assembled structure, the object being to overcome the irregularities that may be inherent. One large company that is at present paying special attention to pre-

venting equipment troubles in distinction to the policy of leaving faults alone until their occurrence demands drastic action is trying to lengthen the working service of some old W. P. 50 armatures between shop treatments by dipping the whole armature in an insulating compound after it has been thoroughly dried out and heated, to fill up all the small openings and clearances caused by the chafing of insulation. The final results of this treatment are as yet indefinite, but thus far the service has been considerably lengthened. The number of factors that enter the problem of equipment life and service reliability on different roads is so large that there is room for not a little experimental study along these lines. Remarkable records of service reliability are being obtained in these days, but the average and minimum motor performance is still capable of improvement.

New Decision on Transfers in New York State

We had occasion, just one month ago, to discuss editorially a recent decision upon the use of transfers by the Court of Appeals in New York State, an opinion which was notable from the fact that it limited, instead of extending, the length of ride possible on a single fare. No subject has attracted greater attention in metropolitan railway circles during the last six months than that of transfers and the rights accorded by them. It is interesting, therefore, to note that the Court of Appeals of New York State has again had an opportunity of passing on the legal aspect of their employment. Again, also, the court has taken broad ground of reasonable use, construed according to the statute, but also according to the broad grounds of substantial benefit to the railroad companies and, in the end, to the community as well.

The opinion was given June 12 in the case of *Harcourt Bull versus the New York City Railway Company*. The conditions of the case differ materially from that of the *Kelly* suit, discussed last month, in which it was held that a "continuous trip" did not mean round trip. The decision in the *Bull* case still further limits the use of a transfer, first, by more clearly defining the status of the person who can collect a penalty in case a transfer is refused, and, second, by stating what is meant by a "branch line" in a statute which declares that a company shall not charge "any passenger more than 5 cents for one continuous ride from any point on its road, or on any road, line or branch operated by it, or under its control, to any other point thereof, or any connecting branch thereof, within the limits of any incorporated city or village."

In regard to the first point, the law has not been entirely clear as to the collection of penalties when transfers can be refused. The statute of 1902, which relates to transfers, provides, for example, that "for every refusal to comply with the requirements of this section, the corporation so refusing will forfeit \$50 to the aggrieved party." The courts have held the words "aggrieved party" to mean that a person traveling over a street railway simply for the purpose of being denied a transfer in order that he might bring suit for the penalty under the statute, does not come within the protection and benefit of it and cannot recover the penalty. On the other hand, the laws of 1857 provide that "any railroad company which shall ask and receive a greater rate of fare than that allowed by law, shall forfeit

\$50, which sum may be recovered, together with the excess so received by the party paying the same." The construction which has been placed upon this statute by the courts in previous rulings is "that the forfeiture is imposed upon the company for its act, and this is entirely irrespective of the object or motive of the passenger in traveling."

In the case under consideration the plaintiff was an attorney who had been largely engaged in bringing similar suits against the New York City Railway Company and other similar corporations in New York. He boarded a Delancey Street car at the corner of the Bowery, paid his fare and received a transfer to the Eighth Street line, but was informed that he would not be given a transfer from that line to the Avenue C line. Notwithstanding this, after riding a short distance on the Eighth Street line he asked for a transfer to the Avenue C line, but it was refused. Having paid another fare on the latter line, he rode a short distance and then returned to his office. He stated that his purpose in traveling over the lines was "to see what would be done," and that he "rode for the purpose of gaining information." This, however, has now been held not to be sufficient. According to the opinion in the Bull case the statute of 1857 means that a "party" must be a passenger, not only in the sense of paying the fare and traveling over the road, but he must be "a passenger or traveler of a certain character, one who actually desires to reach some point or destination for a purpose only accomplished by reaching that point, or who desires to be carried for some recognized purpose, even though nothing more than recreation, and whose desire is defeated rather than consummated by the refusal to give him the necessary transfer."

Taking up now the second question mentioned, that of transfers between different roads, the Court holds that when the Legislature refers to "main line of road and a (any) branch or extension thereof" it did not intend to include the relation such as existed between the Delancey Street line and the Avenue C line. To use the language of the Court: "It does seem to us that it would be extravagant and unreasonable to hold that the two lines of road mentioned, originally constructed and owned by separate companies and operating different lines of cars and brought into physical relation on the route selected by the appellant only by means of a third intervening line of road, constituted a road and 'connecting branch thereof' or 'main line of road and any branch or extension thereof.'"

Perhaps the most important feature of the decision is shown in the remarks made in the conclusions in which the Court shows most clearly that its decision is based upon broad, equitable grounds and the law of common sense, as well as of that State. The transfer law was passed in 1884, when the roads were small and when it was doubtful whether the right existed enabling a street railway company to lease another parallel line. At that time there were some eighteen independent street railway systems in New York City. All were of limited extent, and the Legislature certainly could not have contemplated the application of the universal fare to any such extensive and complicated network of lines under one management as was afterward created in New York. The intention, evidently, was to cover the condition, which is really expressed in the statute, of a road of ordinary length and its actually connecting

branches and extensions. Conditions have so absolutely changed since that time that the law has lost its reason if not its force. It is gratifying to learn, therefore, that the wording of the act is not such as to limit at least some of the applications of the transfer which it has been claimed to possess.

Purchased Versus Generated Power on Small Railways

Definite figures as to cost of power in small street railway plants would be very interesting if they were sufficient in number and so distributed as to furnish a series of fair averages under different conditions. The practical result of their publication would undoubtedly be to discourage the owners of contemplated small city or interurban systems from the idea of erecting their own power plants when power could be purchased from already existing stations.

Assume, for example, a road 12 miles long running half-hourly service. Four cars will be required to maintain the schedule at a schedule of 12 m.p.h. or better, but to provide for extra cars during periods of heavy travel a station of about 300-kw will be necessary. In rough figures such a station will cost in the neighborhood of \$45,000. The average load throughout the year will probably be not more than 100 kw for 16 hours and 50 kw for 4 hours, so that even if two 150-kw units are installed the station will be run at a very inefficient load. Two engineers and two firemen will be required so that the labor expense, including superintendence and helper about the station, will amount to about \$9 a day. The coal bill for 1800 kw-hours at 12 lb. of coal per kw-hour at \$1.80 per ton would be \$19.44 per day. Interest and depreciation charges at 12 per cent would be about \$15 per day, bringing the total with additional expenses to about \$46 per day. Assuming the average output quoted above of 1800 kw-hours per day, we find that 2.55 cents represents the average cost per kw-hour under the conditions mentioned. We feel safe in saying that many small roads are operating under conditions approximating these and in many instances the charges are considerably higher. Other roads, however, are renting power at from 1 cent per kw-hour to 2 or 3 cents or more. The 1-cent rate is usually obtained only in districts where water power is available, and the other rates are influenced more or less by the cost of fuel. The fact that the interest and depreciation charge on a plant is not usually given the importance that should be accorded it is often the cause of misleading figures as regards the cost of power.

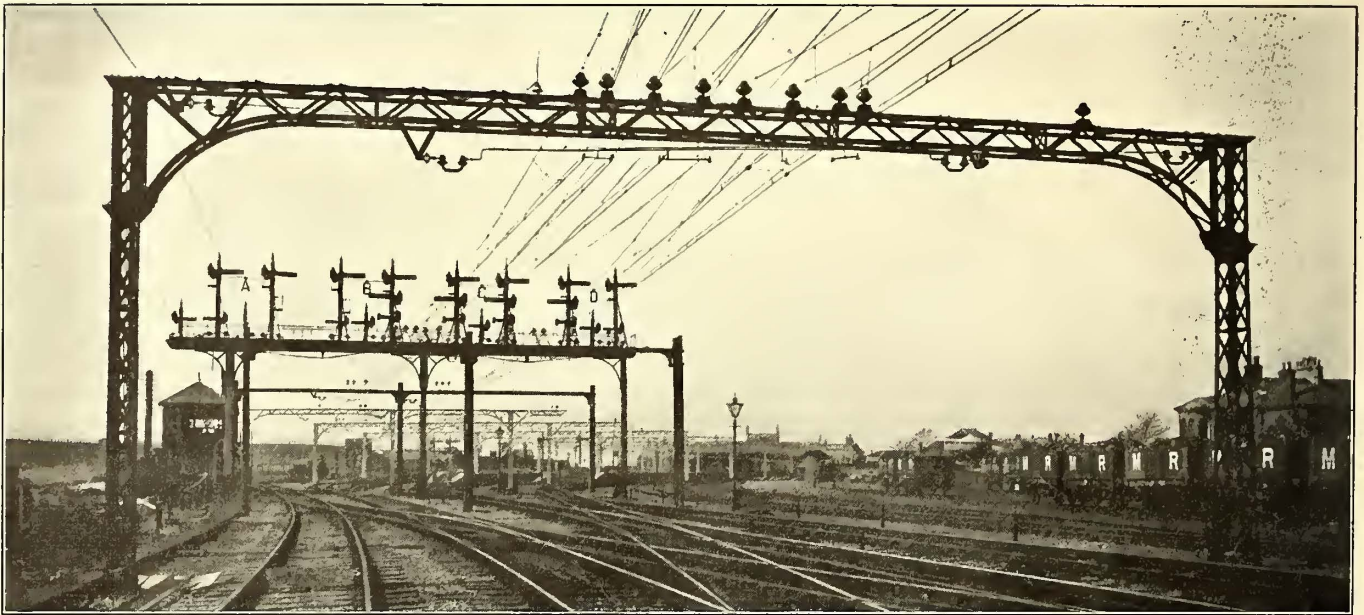
Of course on an interurban line, if power is rented and a substation and high-tension line have to be constructed, their cost should also be included in any estimates of the cost of power. This condition is the common one, because on an interurban line the larger cities with large power plants are usually located at the terminals of the interurban system.

Were the railway company to develop its own power the station would, of course, unless water supply prevented, be erected at the middle point and if the line was not too long direct current would be used and the erection of the substation and high-tension line would be avoided. The losses in efficiency of the system between the meters in the power house and the direct-current switchboard should also, then, be considered as increasing the purchase price.

SINGLE-PHASE ELECTRIFICATION OF THE HEYSHAM-MORECAMBE-LANCASTER LINE OF THE MIDLAND RAILWAY, ENGLAND

An important step in the branch line electrification of British steam railroads was consummated on June 8 by the opening of a 6600-volt, 25-cycle single-phase service on

regular two-track sections of double-angle bridges bracketed to creosoted wooden poles set in concrete. These two angle bridges are riveted to brackets at the ends, but separated for the greater part of their length by 1-in. distance pieces. This makes it convenient to drop the bolts of the insulator saddles in the gap, so that the insulators may be located anywhere along the span without prelimi-

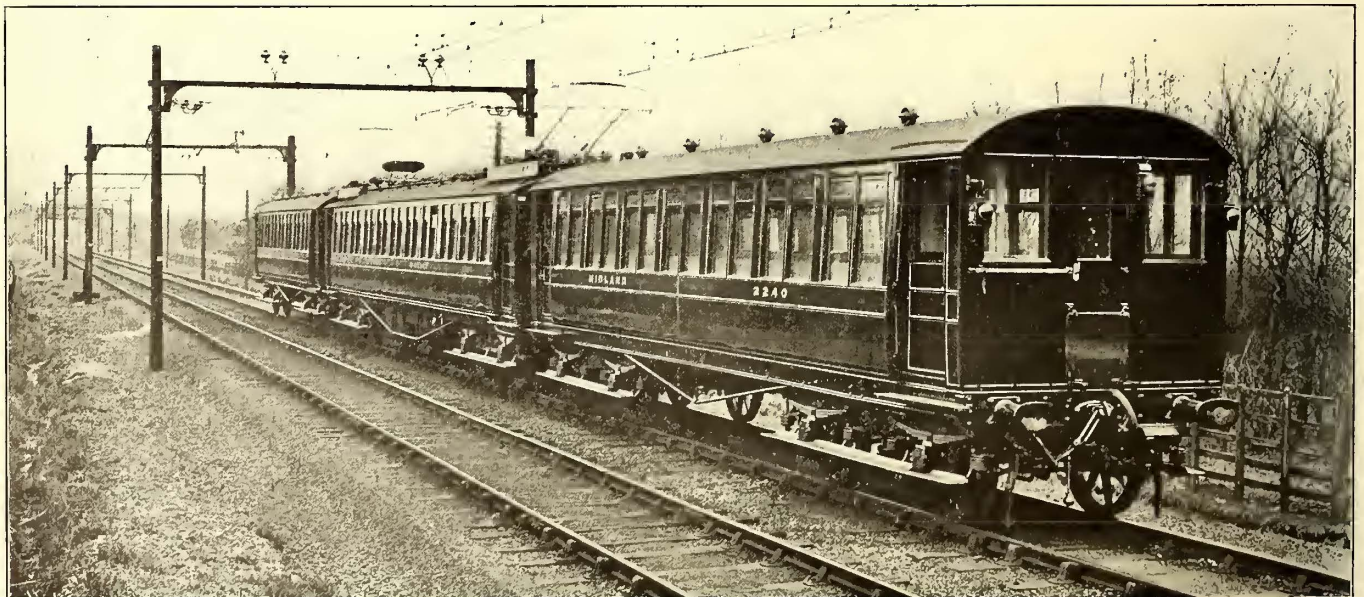


Midland Railway Single-phase Electrification—Four-track Section in the Morecambe Yard, with a Signal Bridge in the Background

the Heysham-Morecambe-Lancaster division of the Midland Railway, which is one of the great railroad systems of England. The portion electrified equals about 8.5 miles of double track and is distinguished by several novelties in overhead construction and in power equipment.

nary drilling. Where crossings are made under roadways, wooden guards have been provided to prevent any possible contact between the catenary system and the steel work overhead.

The bridges are connected by a separate overhead steel



Midland Railway Single-phase Electrification—Three-car Train Consisting of One Motor Car and Two Trailers

OVERHEAD CONSTRUCTION

Two of the most striking features of the line construction are the bridges for carrying the overhead wires and the multiple catenary suspension.

The construction adopted to carry the complete catenary system consists for long yard spans, as at Morecambe, of latticed girder bridges on latticed steel posts and for the

cable, grounded every half mile. The same ground plates are used for the horn lightning arresters, the object being to reduce the number of plates requiring attention and thereby to give better security from danger due to poles being charged by a leaky insulator. This grounded cable has been installed in every case between the contact wire and the nearby telegraph wires, and it is believed that its

presence is influential in greatly reducing the electrostatic induction from the contact wire to the telegraph. While the results so far appear favorable to the idea of avoiding underground conduits for the telegraph and telephone wires, it certainly appears necessary to provide some sort of high resistance leak on wires paralleling a high-pressure single-phase system.

The multiple catenary suspension is similar in many respects to that originally designed by the Siemens-Schuckert Works for the Cologne-Bonn and Blankenese-Ohlsdorf single-phase lines in Germany (see STREET RAILWAY JOURNAL, April 6, 1907), but several changes were necessary to meet the operating limitations and insure greater safety.

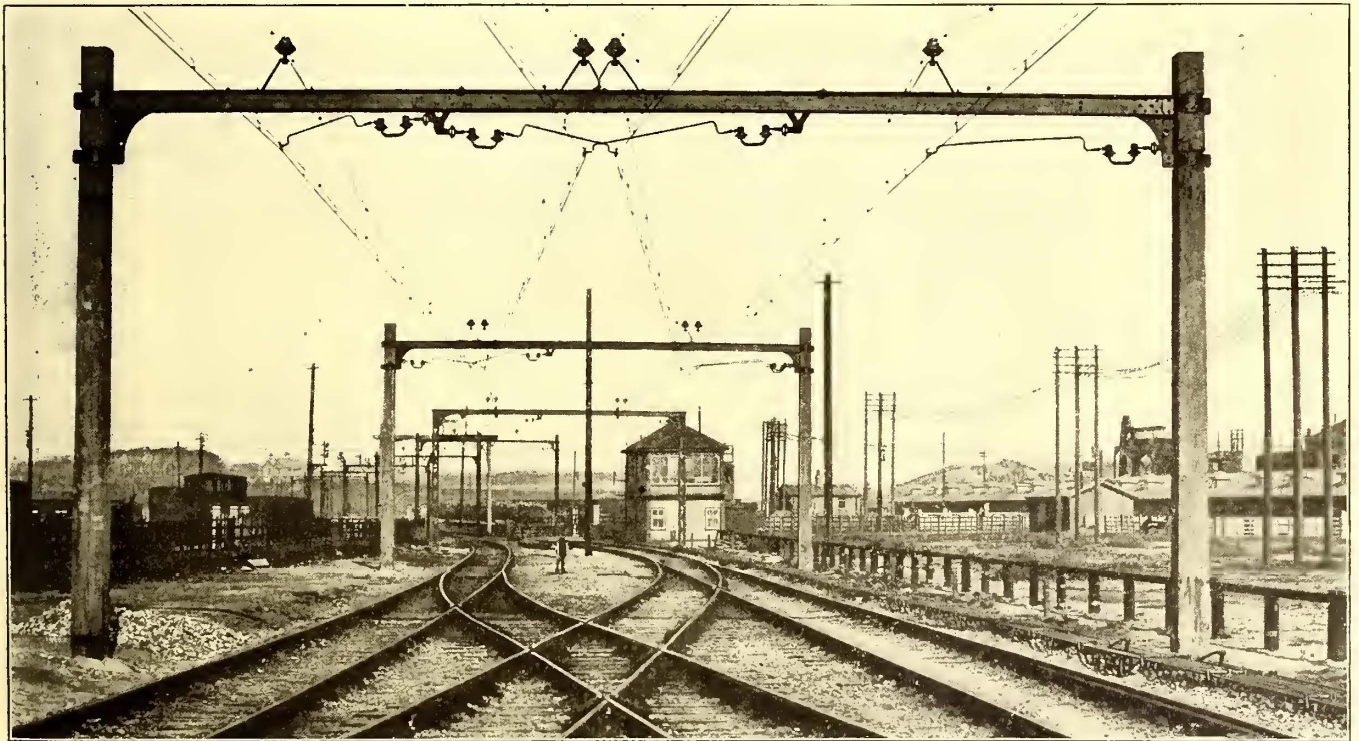
The trolley or contact wire is suspended from a steel auxiliary messenger or carrier wire by connectors about 4 in. long. The lower end of these connectors clamps the contact wire tightly, but the upper end is free to slide along the auxiliary messenger wire. The main catenary from which the auxiliary carrier is suspended by hangers consists of two cables which are clipped together throughout their length except for about 3 ft. on either side of the insulator. At those points the cables diverge to pass through circular grooves on opposite sides of the insulator,

ried, like that on the Blankenese-Ohlsdorf railway, is mounted on a saddle and also has its pin encased with ebonite to secure double insulation. The insulator body is of brown porcelain made especially massive to withstand bad weather and mischievous boys. A good distribution



Midland Railway Single-phase Electrification—Four-track Under-crossing at Morecambe, Illustrating the Use of Wooden Guards between the Wires and the Steel Floor of the Bridge

of the strain on the insulator is secured by using the double cable mentioned and there is no point where the cables are being deformed by the pressure of clamps or where



Midland Railway Single-phase Electrification—View at Heysham Illustrating Overhead Construction at a Cross-over

as shown in the drawing on page 200. The main catenary, therefore, is free to move the width of the insulator and tends to equalize the strains in spans due to unequal loading; at the same time the use of twin cables is effective insurance against disaster from breakage.

The line insulator over which the main cables are car-

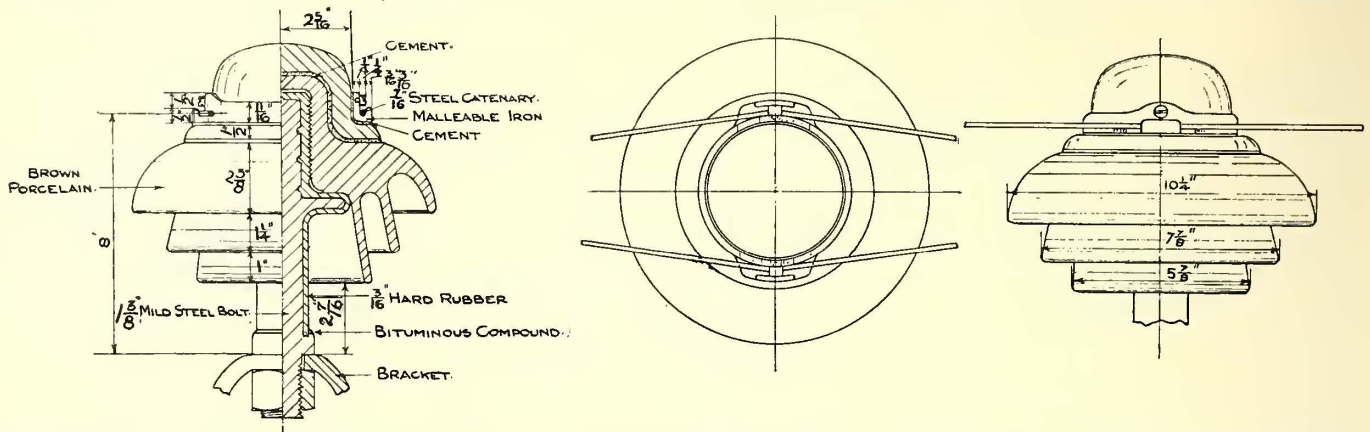
ried, like that on the Blankenese-Ohlsdorf railway, is mounted on a saddle and also has its pin encased with ebonite to secure double insulation. The insulator body is of brown porcelain made especially massive to withstand bad weather and mischievous boys. A good distribution

mechanical wave movement tends to break the wire at a point of reflection. The contact wire, which is of figure 8, No. 000 section, is carried above the rail at a height varying from 18 ft. 3 in. in the open to 13 ft. 3 in. under roadways. It is run in lengths of 2400 ft. to 3000 ft., one end being fixed through

insulators to a terminal bridge, while the other end is attached through pulleys to a weight of about 1200 lb. The train always enters at the fixed end and leaves at the weighted end, so that the collector bow tends to straighten the contact wire. The strain first put on this contact wire was equal to 800 lb. and the horizontal stagger was made

offs and connecting tubing are suspended from the bridges carrying the catenary construction, but in some cases they are also secured to the pole brackets.

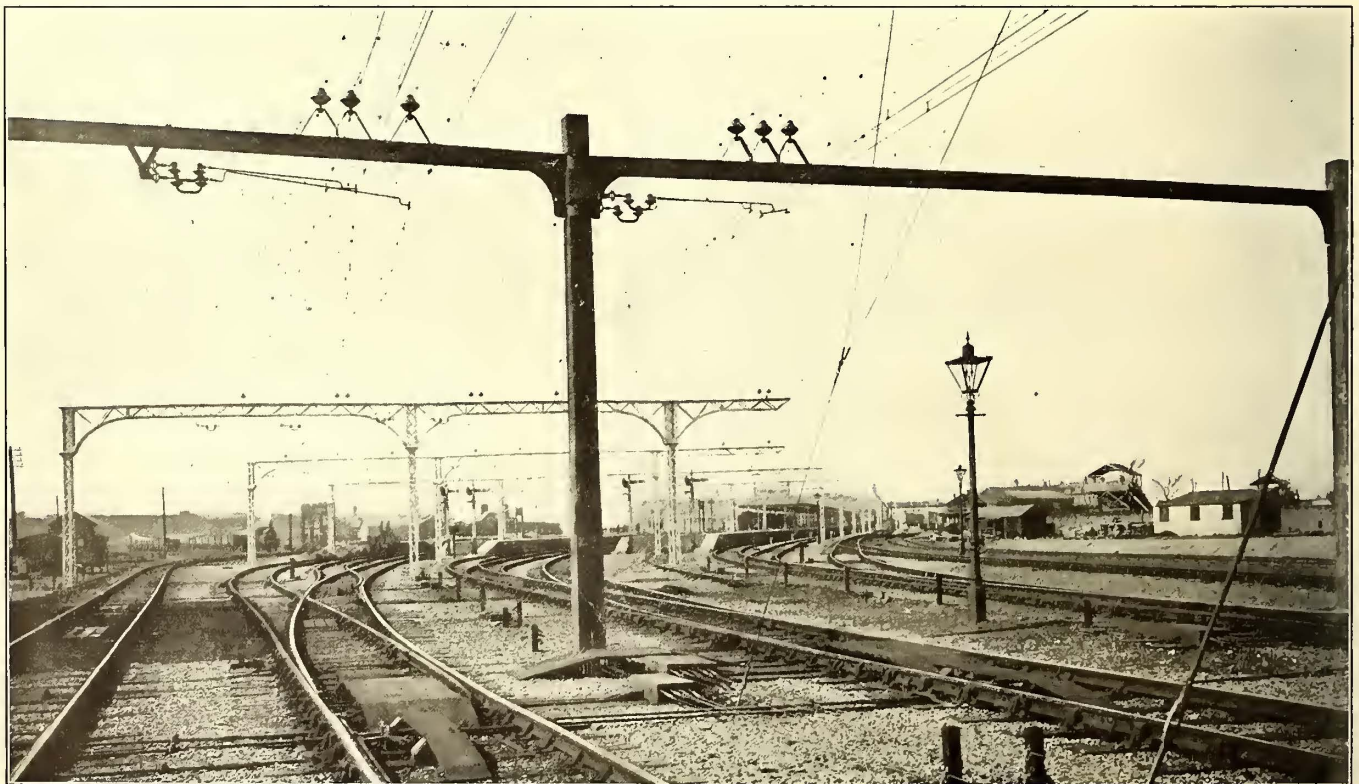
Section switches are installed to isolate the up and down lines and the different branches. These switches are of the double-break air pattern and are fixed on the top of



Midland Railway Single-phase Electrification—Section, Top and Side Views of Insulator Carrying Main Duplex Cable

4 ft., or 2 ft. each way from the center of the car. However, experiments made before operation showed that the total friction of pull-offs, etc., made it necessary to increase the tension to about 1200 lb. for 3000 ft. of contact wire. It was also found that as the bow was only 7 ft. 1 in. wide from tip to tip, a stagger of 4 ft. was too much for high-speed running in this gale-swept country. A 2-ft.

the poles supporting the bridges. Each section switch, in addition, is duplicated and the connection from one contact wire to the section ahead of it is secured by a short section of switch wire which must be connected to the two contact wires before the line is switched through at this point. This arrangement was adopted to get a duplicate break, and, what is more important, a short length of line



Midland Railway Single-phase Electrification—View at Morecambe Yard of the Catenary Construction Carried Over Saddle-supported Insulators Mounted on Two Forms of Bridges

stagger, therefore, was adopted generally, although part of the line uses 3 ft.

The double pull-off insulators are also of the type originated for the Blankenese-Ohlsdorf line. They are applied in a variety of interesting ways, some of which are shown in the accompanying illustrations. In general, the pull-

into which a car can run, without bridging with its bow, two sections supposed to be isolated. The switches are provided with padlocks. A similar switch is used at the stations to enable the attendants to ground the overhead wiring in emergencies.

The overhead construction has been designed and carried

out under the direction of W. B. Worthington, chief engineer of the Midland Railway Company, J. Sayers, the telegraph engineer of the company, and Mr. Argyle, the Northern divisional engineer. The suspension is after the Siemens models, but Mr. Sayers was responsible for the change in the catenary.

BONDING

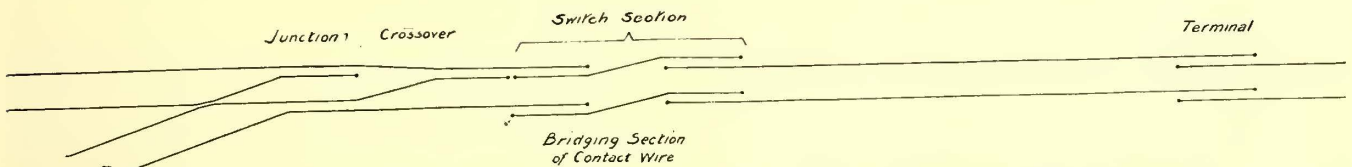
The outer rail on each line is bonded throughout its length with Forest City bonds in duplicate, placed under the fish-plates. At all crossings and junctions all rails are bonded together with ordinary copper cable bonds also used for cross-bonding. Great care was exercised to prevent any moisture getting into the drilled holes or on the bond plugs during the bonding, and no work was done in very wet weather. Protective devices made it possible to work in moderately damp weather, but in the tests carried out when the work was finished the differing resistances of the bonds showed that although they were absolutely first class, those which were carried out in dry weather were distinguishable from those installed in damp weather. The rails are grounded at Heysham harbor in the sea by duplicate copper ground plates; at Morecambe they are grounded at the end of the Midland Railway pier. The latter plates are also of copper, but for protection are dropped into an old cast-iron caisson. At Lancaster the

voltage there are no feeders other than the two contact wires.

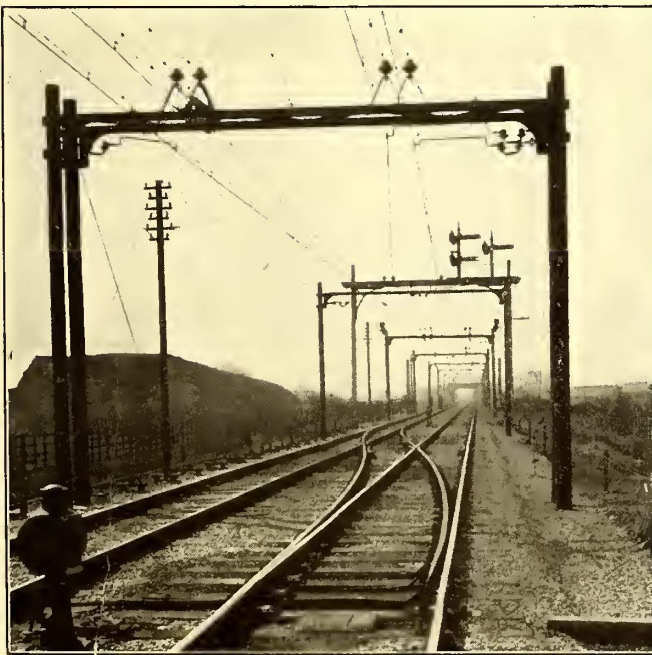
The system is supplied from the existing power station at the Heysham end, to which has been added the machinery necessary to enable it to supply single-phase current.



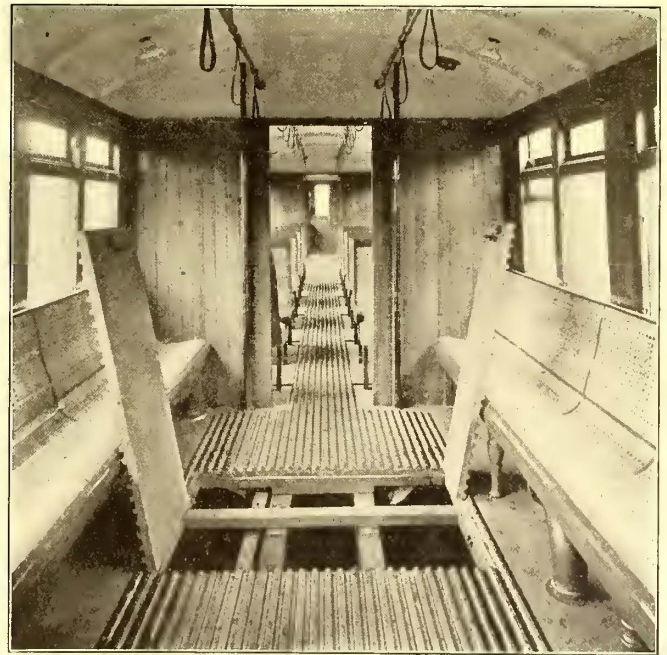
Midland Railway Single-phase Electrification—Construction at a Double Cross-over Consisting of Double Angles Riveted to Brackets Clamped on Wooden Poles



Midland Railway Single-phase Electrification—Diagram of Wiring at Junctions, Cross-overs, Switch Sections and Terminals



Midland Railway Single-phase Electrification—Overhead Construction at a Cross-over on a Tangent Near Torrisholme



Midland Railway Single-phase Electrification—Interior of Motor Car with Trap Door Open

rails are grounded to the cast-iron columns of the bridge in the river bed.

POWER SUPPLY

Owing to the shortness of the line and the high trolley

The original installation consisted of d. c. generators for the cranes, capstans, lifts and lighting of the harbor at Heysham.

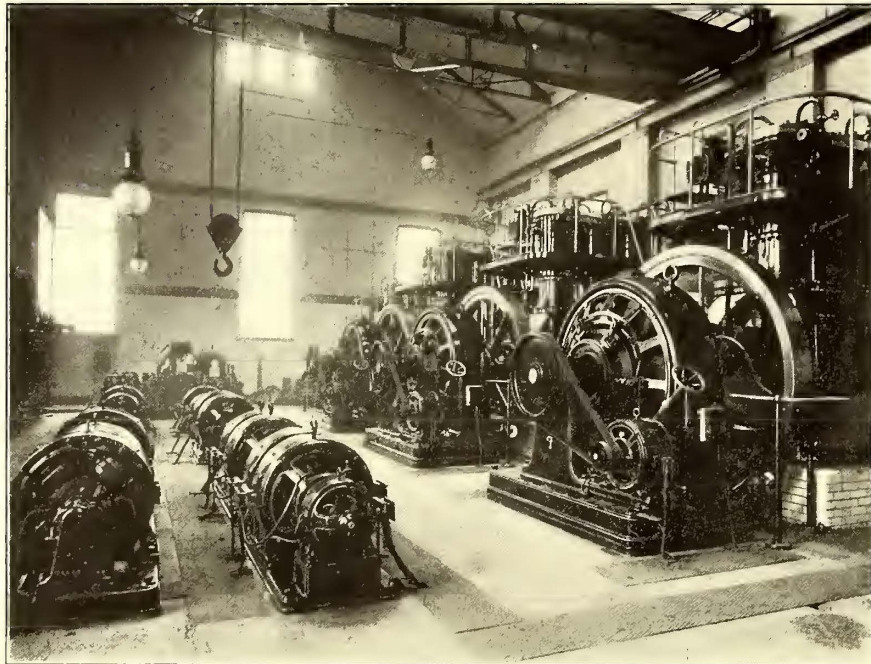
This station is operated with gas engines, supplied from

two 750-hp, 1000-hp Mond producers. The engine room contained originally three 250-hp three-cylinder British Westinghouse Company's engines, driving 150-kw d. c. 460-volt generators and a battery having a capacity equivalent to 100 kw for five hours. The old load on the station, consisting chiefly of high-speed heavy cranes, is very

tion was already on the fields, new series coils would be excessively heavy, added to which was the trouble of entirely dismantling the machines. A simple solution was found in fitting exciters on the engine bed-plate and driving them from a pulley on the generator shaft. In this way the voltage variations of the exciter compound wind-

ings cause changes in the voltage of the main generator fields, so that the existing copper on the latter is fully utilized. This not only proved a much cheaper arrangement than practically any other, the exciters being only of 3-kw capacity, but enabled the whole change to be made in the course of a week, obviating any dismantling or serious stoppage of the generators.

The new generating set includes a three-crank engine, with three sets of cylinders, each two in tandem. Its speed is 300 r.p.m. and its lubrication forced. The motor-generators deserve special mention, not only as forming that part of the generating station most directly connected with the traction installation, but because there are many noteworthy points about them. They are quite exceptional machines and work under severe conditions. The load, indeed, varies from nothing to upward of 1000 kw in very short periods. The specification called for

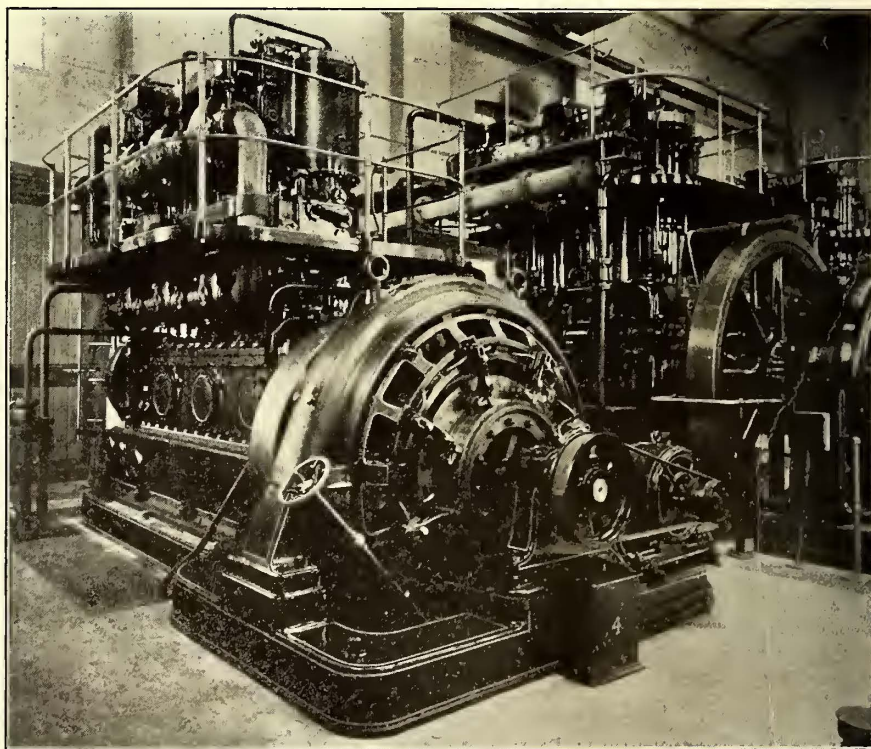


Midland Railway Single-phase Electrification—General Interior of the Heysham Power Station

variable and the battery and a Westinghouse automatic reversible booster have been required to carry the peak loads.

The unit added for the railway service consists of a 350-hp, 235-kw Westinghouse 460-volt d.c. gas-electric set, the single-phase current being obtained through two d.c.-a.c. motor generators furnished by the Electric Construction Company.

From the nature of the traffic the station will have overloads, during which the old gas-electric sets will be operated 20-25 per cent and the new set 10-15 per cent above their rated capacities before the battery is called upon to work up to its full one-hour rate of 750-1000 amp. As the old battery booster is not large enough for these discharges a new three-wire unit, particularly suited for this method of working has been installed by the Lancashire Dynamo & Motor Company. Difficulty was found, however, in that the generator pressure dropped badly as the loads increased. This had been compensated by hand regulation of the excitation, or else during peaks the generators continued to work at their previous loads with the battery to help them out. Both of these courses naturally were inadmissible under the new conditions. Ordinary compound winding would have been an extremely expensive remedy since, as the copper necessary for full excita-



Midland Railway Single-phase Electrification—235 kw Gas-electric Units in the Heysham Power Station

machines each capable of a continuous output of 150 kw to 200 kw with a temperature rise of 80 deg. Fahr., an instantaneous output of 900 kw, 600 kw for 1/2 minute, 500 kw for 3/4 minute and 300 kw for 2 1/2 minutes. Regulation on the a. c. side was required to be within 6 per cent on throwing off a non-inductive load equal to the full continuous load,

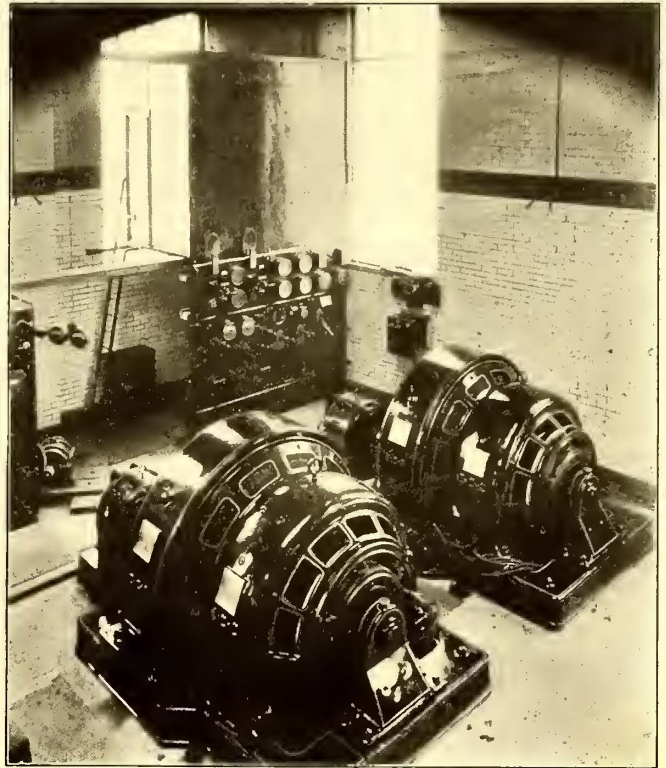
and within 20 per cent on throwing off a similar but inductive load of 80 per cent power factor; further, they were required, with the assistance of external means if necessary, to restore the pressure to normal within 7 seconds of the coming on or throwing off of loads up to 600 kw at 80 per cent power factor, or 300 kw at power factors down to 30 per cent. The maker's specification was 175 kw on continuous rating and during the experimental running of the trains at Heysham each of the sets has several times been subjected to loads up to 900 kw input without the slightest commutator trouble. The a. c. regulation is also up to the specified requirements.

The d. c. motor of each set is compound wound with commutating poles, the series winding being a very slight one, and put in principally to assist the two sets to run in parallel satisfactorily. The a. c. generator has a three-phase star winding so if one winding breaks down the other two may be used for the single-phase supply, otherwise no use is made of the three-phase connections. The machine is of the revolving field type and has its exciter mounted on the end bed-plate and spur-gearred to about 1100 r.p.m. This exciter has laminated fields and is compound wound, its series winding carrying a portion of the main current, so that (so far at least as varying loads of equal power factor are concerned) the tendency of the alternator to drop in volts is compensated.

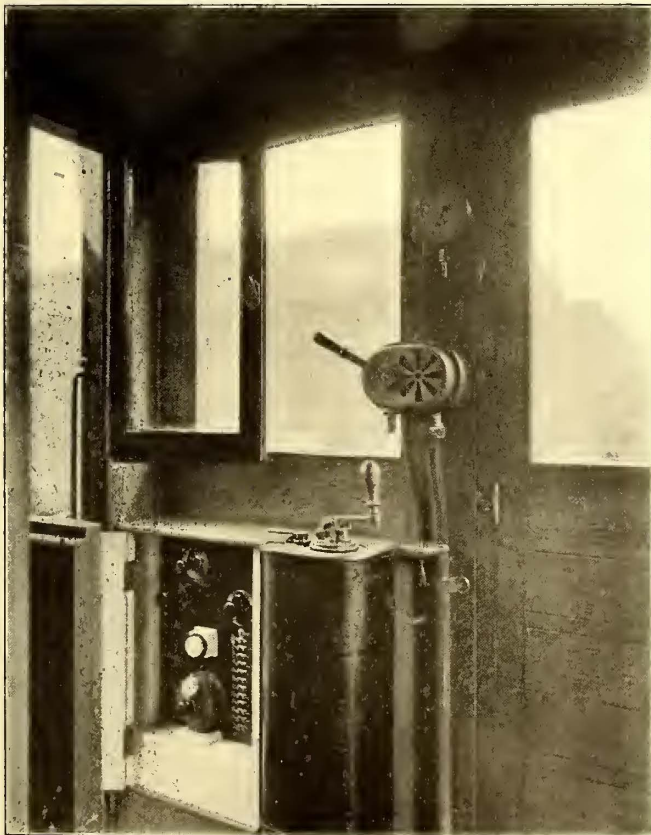
Compensation for varying power factors is effected by

mediate bearing. There are only two main bearings on the machines and these are ball bearings which have proved very advantageous in reducing the starting current. At 460 volts the latter is only about 75 amp and the no-load loss is about 23 kw with the exciter and alternator fully excited.

The switchboard was designed and constructed by the



Midland Railway Single-phase Electrification—Motor-generators and Switchboards in the Heysham Power Station



Midland Railway Single-phase Electrification—Motorman's Compartment

a regulator, designed and constructed by the Electric Construction Company and the first of its kind. This regulator inserts or removes resistance from the shunt field of the exciters by solenoids, which are respectively excited as the voltage exceeds, or is less than the normal.

The a. c. motor armature and the revolving field alternator are carried on the same shaft without any inter-

railway company and the instruments are of the British Westinghouse Company's make. Each of the motor-generators is supplied from the low-tension busbars through a no-voltage and overload circuit breaker. The shunt circuit is excited through a separate double-pole knife switch, with kicking contacts and resistance. Starting resistance is cut out by knife switches. Through a throw-over switch these can be used to start either set of the machines, a heavy triple-bladed knife switch being thrown in finally when the machines are fully started up to connect them direct to the busbars.

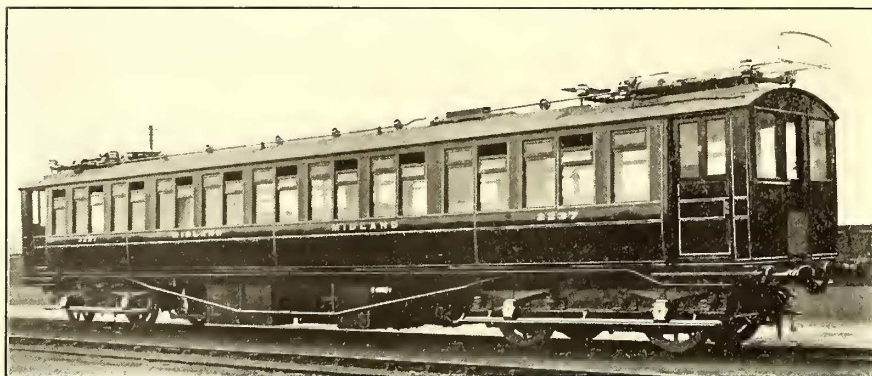
On the a. c. side each alternator is connected to the busbar by a hand-operated oil switch and the current passes from the busbars through duplicate automatic circuit breakers passing out to the overhead lines. All circuit breakers have time limit devices. The exciter shunt fields of the alternators are also connected through double-pole switches with non-inductive contacts and resistances. The instruments comprise an ammeter on each of the d. c. motor circuits, and a volt-meter, ammeter and watt-hour meter on each of the a. c. circuits. The incoming wire from the rails is, of course, at ground potential. There is also an indicating watt-meter between the busbars and the outgoing feeders, and the regulator is connected to the same transformer.

As shown in one of the illustrations, the high-tension apparatus is contained in a locked expanded-metal chamber placed over and at the back of the actual switchboard,

the switches being operated from the handles of the latter through rods. The door of this high-tension chamber is interlocked with the holding-up coil of the motor circuit breakers, so unless the door is closed the motor-generator cannot be started, while if it is opened during running all the machinery stops.

ROLLING STOCK

The rolling stock consists of three trains with one motor



Midland Railway Single-phase Electrification—Siemens Car Showing Apparatus Suspended on Underframe and Type of Bow Collector

car each, two with equipments by Siemens Brothers and one by the British Westinghouse Company. The determining cause of the order being thus divided was purely that Messrs. Siemens were supplying all electric control, which was preferred by the railway company, whereas the Westinghouse Company preferred to adhere to its electro-pneumatic control apparatus; otherwise the proposals were equally acceptable. Besides the motor cars four special trailers have been built, while one or more old coaches will be utilized for carrying workmen, luggage, etc., particularly between Morecambe and Heysham. Each end of the trailers and motor cars is equipped with control apparatus.

The trains are expected to give a 20-minute continuous service between Heysham and Morecambe, which are 5 miles apart, and a 15-minute service between Morecambe and Lancaster, which are 4 miles apart. A single train in each case is used. However, the trains will not be worked up to anything like this service throughout the day.

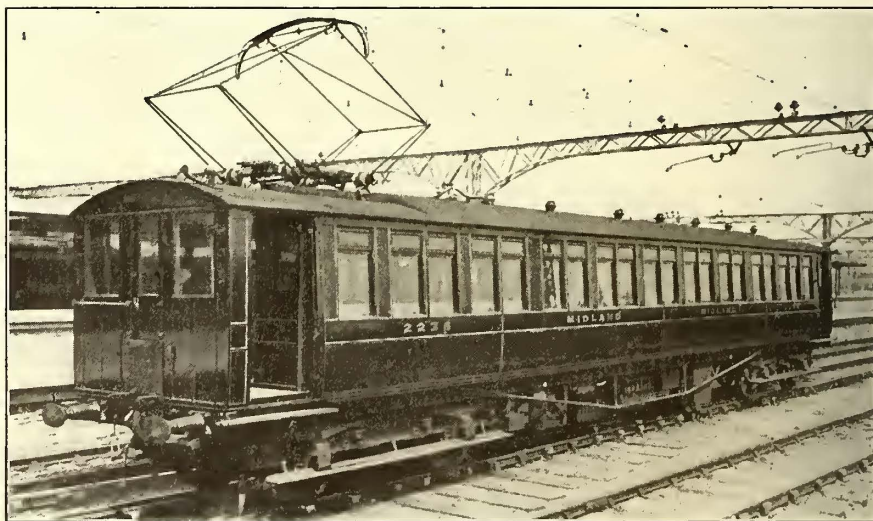
The motor cars are of the open central corridor type, 60 ft. long over end panels and 9 ft. wide. There are three compartments with a total seating capacity of 72 passengers, with the vestibule cabs at each end for the motorman and guard. Of the passenger compartments, the middle one with a length of 25 ft. has the seats arranged transversely, while the two other compartments, each 13 ft. 5 in. long, have longitudinal seats to allow accessible motor trap doors. Ventilation is provided by drop lights in the upper part of the side windows and "torpedo" air extractors in the roof. The motor cars are electrically heated, but the trailers have not yet been fitted with heaters, as it is not anticipated that they will be in extensive use during the winter months. The interior finish is of polished oak, and the seats are covered with perforated

sycamore. The underframe is constructed of Z and channel section steel, with angle knees and gusset plates and supported with truss rods. All the cars are fitted with both hand and vacuum power brakes.

The trailers have a length over end panels of 43 ft. and extreme width of 9 ft.; they consist of one long compartment with a motorman's cab at each end. The seats are placed transversely throughout, and will accommodate 56 passengers. The interior finish, ventilation and lighting are similar to that of the motor cars. The underframing is light, as it has no electrical equipment to sustain; but the two trucks are interchangeable with the trail trucks of the motor car, except that the springs of the former are lighter.

The motor trucks were constructed by the railway company's locomotive department, and owing to the small number required have been specially built up of rolled sections and plates. The axles are of forged steel $6\frac{1}{4}$ in. in diameter and with $4\frac{3}{4}$ in. x 9 in. journals. The wheel base is 8 ft. 6 in. and the driving wheels are 43 in. in diameter when new. The steel side frames of the trucks are of rolled joist section 14 in. x 6 in.; the end frame is of 10 in. x 4 in. channels, and the transom is built of plates and angles.

The lighting is carried out by groups of six 24-volt lamps in series from the 150-volt auxiliary transformer control main. The two side electric tail lights, however, are direct on the 150-volt main circuit. The lamp in the motorman's compartment is specially shaded to throw only a narrow beam of light on the vacuum gage and ammeter, thus allowing the motorman to get a good view of the road outside, his cab being practically dark.

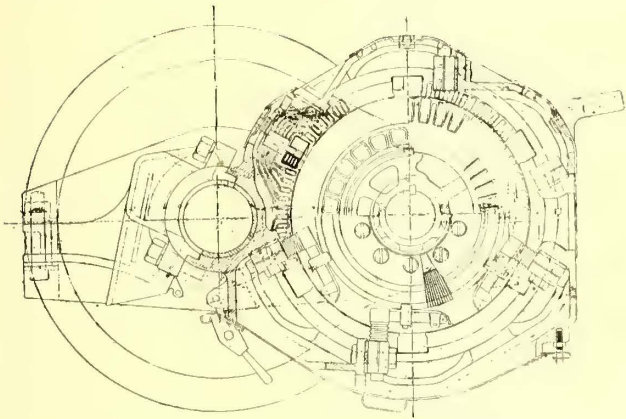


Midland Railway Single-phase Electrification—Westinghouse Car Showing Apparatus Suspended on Underframe and Type of Bow Collector

The specification of the car equipments called for two motors per car to be carried on one truck. The normal train was specified to consist of a motor car and two trailers, its weight without any of the electrical apparatus being 25 tons for the motor car and $17\frac{1}{2}$ tons for each trailer. The motor car seats 72 passengers and the trailers 54. The permissible speed on curves was 25 m.p.h. The capacity of the motor car was to be such as to enable it to

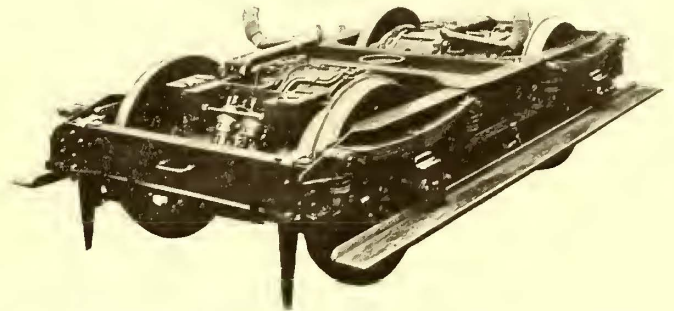
take on occasions two additional main line cars weighing 26 tons each. The specifications also demanded that if the contract was divided the equipments should be capable of working with either master controller. It was considered by the railway company that two 150-hp motors per motor car would be satisfactory. The Siemens motors are nominally rated at 180 hp and the Westinghouse motors

It was found impossible to get the firm's standard inverted pantograph type into the restricted space at disposal between the car roof and roadways. The bow adopted is somewhat similar to the Continental tramway style, but has a small auxiliary bow at the end controlled by parallel motion. This bow, while appearing somewhat simpler than the standard bow, and requiring less room, has the disadvantage that it requires balancing by a wind screen. Both makers' bows are purely spring controlled so far as their working is concerned. The Siemens bow, however,



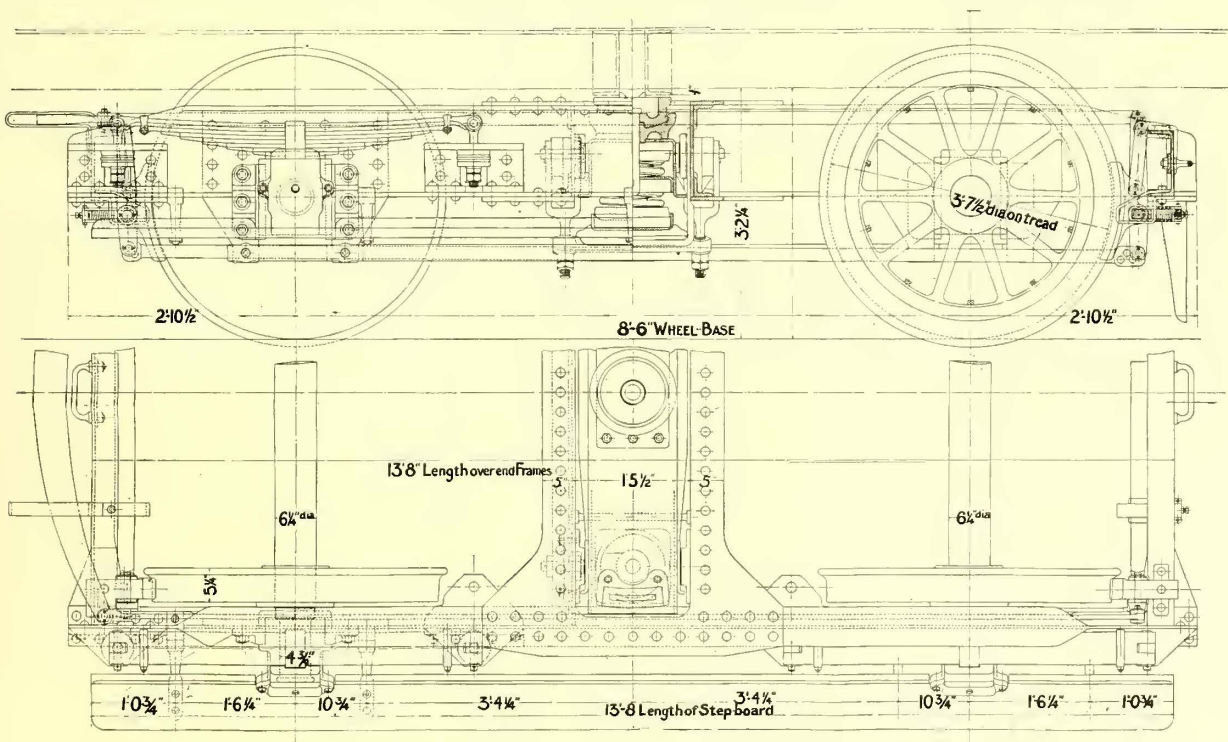
Midland Railway Single-phase Electrification—Cross-section of 150-hp Westinghouse Single-phase Motor

150 hp. On a stand test each motor was required to deliver its declared output for one hour with a temperature rise not exceeding 135 deg. Fahr. and to have a temperature rise not exceeding 90 deg. Fahr. on any portion after having run the three-car train for six round trips as per schedule from Heysham to Morecambe, Morecambe to



Midland Railway Single-phase Electrification—Completely Equipped Motor Truck

is lowered by a master spring which can be thrown out of action by a vacuum cylinder. All the "live" portions of the collector gear in each case were carried on porcelain insulators. The roofs of all the cars have been covered with a grounded wire netting to throw out the station circuit breakers should the overhead wire come down on the



Midland Railway Single-phase Electrification—Side View and Half Top Plan of Motor Truck

Lancaster and return. The main transformer was required to conform to the same test conditions for heating as the motors, an auxiliary transformer being specified to provide for current for lighting, heating and working the control apparatus and brake pump.

THE SIEMENS EQUIPMENT

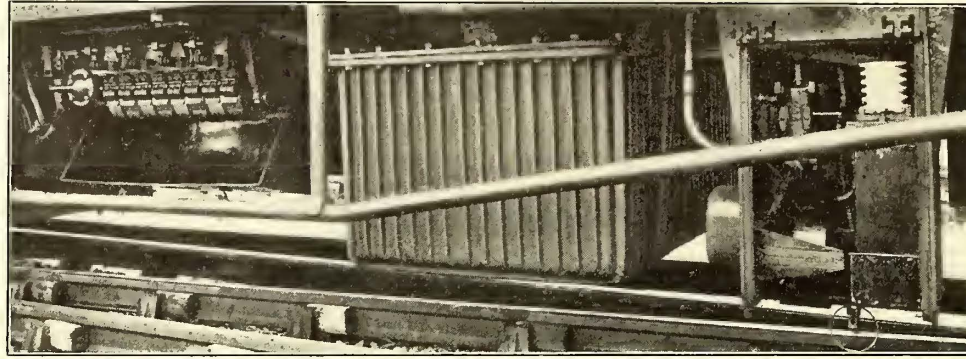
The Siemens cars are provided with two collector bows,

roof. The efficacy of this has been satisfactorily tested in practice. The two bows can be raised or lowered separately, and the vacuum for holding them up is obtained from the train pipe through a ball valve, so that when the brakes are operated the vacuum remains on the bows. Except for the short length down through the car, the high-tension wiring on the Siemens car from the bow down

through the high-tension chamber to the main transformer is all bare wire carried on porcelain insulators on the car roof and underneath the car. The vertical tube through the car is of brass and in this case made removable, being practically part of the wiring. The paper-insulated, lead-covered cable terminates above and below in bitumen sealing chambers with porcelain insulator ends. There is about $\frac{3}{16}$ in. air space between the lead covering and the inside of the tube. Both the lead covering and tube are

added considerably to the weight of the latter, but which can be appreciably lightened in future cases.

The Siemens equipment consists of the two motors, the main transformer, the auxiliary transformer, preventive coil, commutating transformer, high-tension circuit breaker and fuse in the main transformer circuit, high-tension fuse in the auxiliary transformer circuit, contactors, motor fuses which also act as motor cutouts, low-tension fuses in the circuit feeding the control and also a low-tension fuse



Midland Railway Single-phase Electrification—Westinghouse Apparatus on Car Underframe Showing High-tension and Reverser Chambers Open

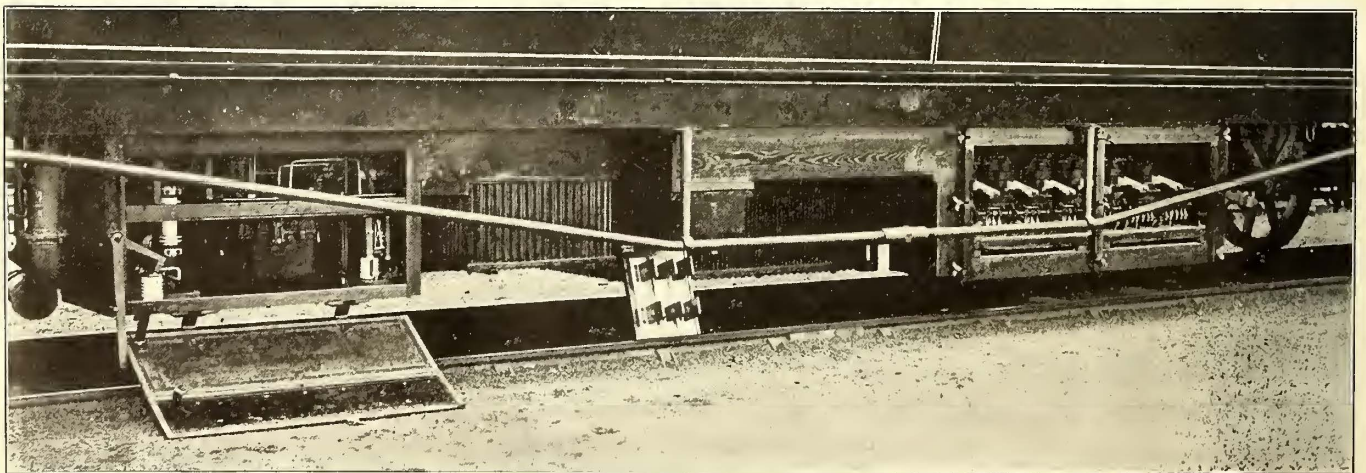
heavily grounded into the high-tension chamber, the door of which is mechanically interlocked with the bows so that it cannot be opened unless the bows are down.

The low-tension wiring is carried longitudinally between the two girders forming the center of the underframe, and it is supported between these two members in wooden frames spaced about 18 in. The low-tension cables themselves are not carried in metal tubing, as probably eddy current troubles would arise if they were, but they are substantially surrounded with metal and the car body and its framing are all covered with sheet iron and asbestos wherever cables are run underneath. Where these cables

in the circuit feeding the blower fan. Intentionally, no fuse has been placed in the brake pump main circuits, the cables for which are carried in special heavy section tubing, so that if anything goes wrong on the pumps the main high tension fuse will blow and it will be impossible to work the car.

The commutating transformer, while apparently an additional complication, probably pays its way in effectiveness, as the sparking of these motors has proved to be no more or even less than that of many d. c. traction motors. During the testing on the line, currents of over 1100 amp per motor were frequently applied without any demonstration at the commutators, even at starting. The brushes on the latter portion of the acceleration, and during free running, were absolutely dark.

The operation of the contactors is also very satisfactory and gives no trouble from humming, chattering or excessive size, although they are along more liberal designs than will be adhered to as standard practice. The master controllers are of the flyback or deadman handle type, but are different from the usual design as the release of for-



Midland Railway Single-phase Electrification—Siemens Apparatus on Car Underframe Showing the High-tension and Contactor Chambers Open

must go crosswise they are carried between the tops of the girders and the floor and spread out fanwise.

The train cable is carried along the outside of the car alongside the side sill in a metal tubing and around the bends in flexible metallic tubing. The high-tension apparatus and contactors are contained in sheet iron cases. The support of these and of the transformers, auxiliary transformers, preventive coil and other apparatus involved considerable special girder work on the underframe which has

ward pressure on the handle by the motorman trips all the contactors at once, without the handle coming back to the "off" position. This insures the maximum safety obtainable from a handle of this type, though the occasional sudden throwing off of heavy loads in this way is a somewhat severe tax on the regulating properties of the power station.

In a test with a two-car train weighing approximately 58 tons, made in the course of ordinary running, one of

the Siemens cars attained speeds of 20 m.p.h. in 41 seconds, and 48 m.p.h. in 80 seconds and a free running speed of 60 m.p.h. in 160 seconds, starting, and running for 1320 ft. after starting on an up-grade of 1 in 200, there being, however, thereafter about 300 ft. of level and then a down grade of 1 in 500 for 1½ miles. This portion of the line also has curves of 198 ft. and 254 ft. radius.

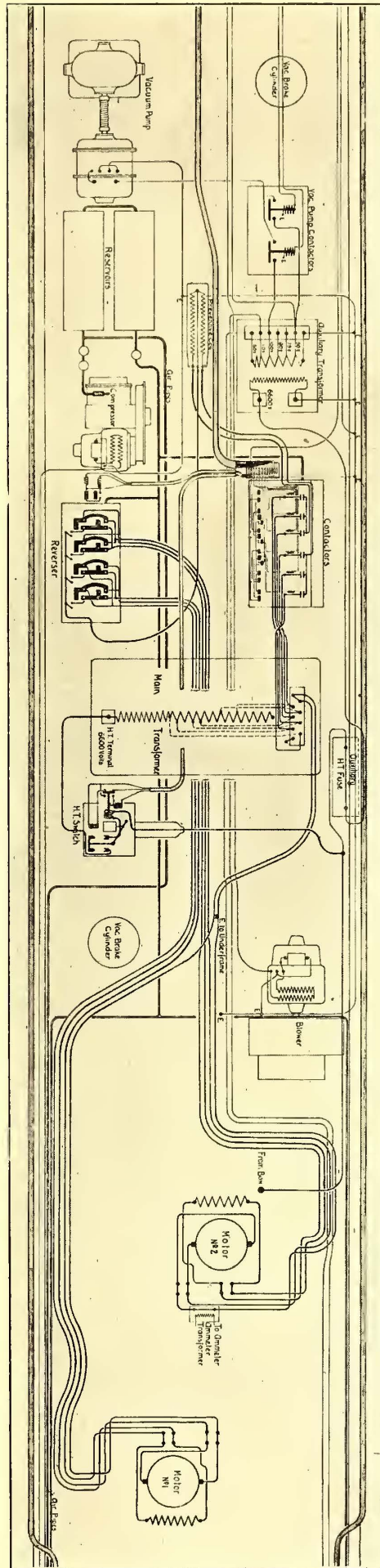
WESTINGHOUSE CAR EQUIPMENT

The Westinghouse bow is of that company's standard pantograph type and the single bow used goes into the available space fairly well. The master spring is raised and lowered by compressed air, a special compressor being installed by the maker in connection with the control gear. A small hand-pump has been installed in each case for raising the bows when first starting out in the morning or at similar times when no compressed air or vacuum is available.

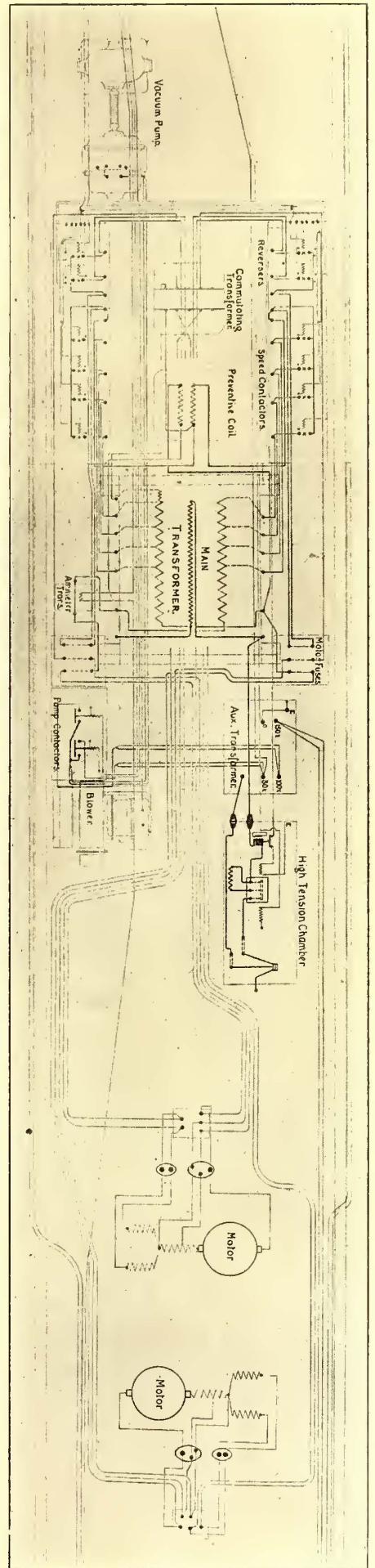
On the Westinghouse car there is no interlocking of the high-tension chamber with the bow, the high-tension circuit breaker and fuse being put in lock-fast cases, the keys of which are kept at headquarters so that the train staff is not permitted access to these chambers at all.

Current is conducted by a lead-covered rubber insulated cable from the pantograph collector on the roof through a heavy brass conduit to the main circuit breaker. This circuit breaker is electro-pneumatically operated and breaks contact under oil. It opens automatically on overload and is closed again from the motor-man's cap by moving the master controller to the

Midland Railway Single-phase Electrification—Connections Outside of Controllers on Westinghouse Car



Midland Railway Single-phase Electrification—Connections Outside of Controllers on Siemens Car



first notch. The current then passes to the high-tension end of an oil-insulated self-cooling auto-transformer, the other end of the winding of the transformer being securely grounded. The low-tension taps of this transformer are connected to the six switches which form the electro-pneumatic switch group, which measures only 43½ in. x 24½ in. x 23 in. and weighs 845 lb. The switches are provided with electric interlocks to ensure closing in proper sequence. Powerful magnetic blow-out coils are fitted between each pair of switches to destroy effectually the arc made on breaking the heavy currents. From the electro-pneumatic switch group the current passes to the two terminals of the preventive coil, from the center point of which the lead to the reverser is taken. The reverser is of the drum type and is electro-pneumatically operated. The magnet valves on the reverser are interlocked with those on the main switch group so that it is impossible to close any of the switches in the latter until the reverser is set in the right position. Cut-out switches are fitted in the reverser case so that either of the two motors may be disconnected if desired.

The motors are of the series compensated type arranged for forced ventilation. The cross-section of the motor shows the field core made up of laminations having six inwardly projecting poles and six sets of brushes. Each pole is surrounded by a form wound field coil which can be readily removed. Semi-closed slots in the pole faces are provided for carrying the compensating winding in series with the armature. Air is admitted to the motor for forced ventilation at openings over the pinion end and passes through the motor and out through the perforated commutator cover. Both the armatures and axle bearings on this motor are equipped with simple oil and pad lubrication.

The equipment was designed for operating in regular service a train weighing 82 tons, including passengers, but it has been possible to operate much heavier trains than this. A train made up of seven ordinary vehicles and this motor car, having a total weight of 161 tons, has been run between Lancaster and Morecambe. On starting with this load each motor takes about 1050 amp, and this current is commutated quite satisfactorily.

GENERAL POINTS REGARDING CAR EQUIPMENTS

The forced ventilation for the motors of both sets of cars has been fairly simple to arrange. For the Siemens car the suction duct has been carried inside under one of the seats, the whole of the air coming in this case from the inside of the car. The Westinghouse car has a similar duct inside, but as more air is required for these motors they have also a suction duct with a filter taking air from the outside of the car. In both cases this duct comes direct into the suction eye of the fan. The delivery duct after leaving the fan splits into two pipes, one of which crosses to the other side of the car and comes up under the longitudinal seat on that side, thus getting across the cross-member of the underframe, and coming down again above the motor, to which the air then proceeds through a rubber concertina pipe. The other half of the duct proceeds direct up under the longitudinal seat on its own side, coming down in a similar way to the other motor.

The auxiliary transformer was adopted chiefly at the instance of Messrs. Siemens with a view partly better to suit their control gear and partly to obviating any possibility of the lights in the cars being extinguished by the coming out of the overload circuit breaker in the high-tension circuit, or by any other accident which would cut off

the supply from the main transformer. Moreover, at stations it is thought there will be a saving of power by eliminating the magnetization losses of the large transformer. On the Westinghouse car, however, the main transformer is kept continuously energized except when the main circuit breaker comes out on overloads.

The respective weights of the two motor cars are as follows:

	Siemens		Westinghouse	
	Tons*	lb.	Tons*	lb.
Car body.....	14	1,680	14	1,680
Trail truck.....	5	80	5	80
Special supports.....	1	912		1,904
Motors with gear case..	7		6	432
Main transformer.....	3	48	2	1,712
Auxiliary commutating transformer and preventive coil...	2	184		1,064
Pumps and compressors.....		1,064		1,792
Contactors and chambers.....	1	520		1,092
Other sundries, including bows, blowers, controllers, etc.....	3	1,504	2	1,592
Motor truck.....	7	672	7	672
Total	46	664	42	20

*Of 2000 lb.

The general scheme for the electrification, the equipment of the power station, and the motive equipments were originated and planned by R. M. Deeley, locomotive superintendent of the Midland Railway Company, and his assistant, J. Dalziel. The cars were designed by D. Bain, carriage and wagon superintendent of the Midland Railway Company, assisted by P. Ellis, chief draftsman of the carriage and wagon department.

MANCHESTER TURBINE CONTRACT

As the tramway and electric lighting departments of the Corporation of Manchester, Eng., are operated with power from the same stations, the growth of the stations has necessarily been very great. The original capacity of the Stuart Street station has been more than quadrupled, and still there is a demand for more power. Only recently a large Siemens-Willans turbine was installed in this issue. Despite this addition it was found necessary to place a contract for another large turbine to cope with the rapidly growing demand. This contract has been secured by James Howden & Company, Ltd., Glasgow.

Seven tenders were considered by the corporation, four for turbines of the Parsons type and three of the Zoelly type. One of the tenders for the latter was from Escher Wyss & Company, of which Mr. Zoelly is the managing director. The Zoelly turbine has made great progress in recent years in France, Germany, Austria and other Continental countries, and though more expensive to construct than the Parsons type, it is said to be more economical than any other turbine when working at less than normal rating, a matter of considerable importance where the output varies greatly. Howden & Company have made the largest turbine of this type in England, one of 2000 kw, or 3000 b.h.p., installed at the Powell-Duffryn Collieries, at Aberaman, South Wales. In fact, the economical results with this turbine, as confirmed by the management of the collieries, was one of the principal factors in influencing the decision of the Manchester Corporation in favor of the Howden-Zoelly turbine. This 6000-kw Zoelly turbine is larger than any other Zoelly turbine now in service and, with the exception of one of the same power of the Parsons type recently installed by the Manchester Corporation, is larger than any other turbine installed in England.

PAPERS AT THE MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, HELD AT ATLANTIC CITY, JUNE 29 TO JULY 2

The annual meeting of the American Institute of Electrical Engineers was held on June 29 to July 2 at Atlantic City. The headquarters of the association were at the Traymore and the meetings were held in that hotel. Two sessions were held each day and 36 papers were presented. A digest of the papers of electric railway interest follows:

CONDUCTOR RAIL MEASUREMENTS

S. P. Fortenbaugh gave results of tests on insulation resistance of the outgoing and return conductor rails in the underground railways of the Underground Electric Railways Company, of London. This company has conductor rails of low-carbon steel, supported on brown stoneware insulators. The type of conductor rails was described in the STREET RAILWAY JOURNAL for March 4, 1905. Tables and diagrams are given showing the results secured from varying the polarity of the conductor rails. The conclusions are summed up as follows:

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

The composition of the conductor rails on the London roads is: Carbon, 0.05; manganese, 0.19; sulphur, 0.06; phosphorus, 0.05; silicon, 0.03. Tests showed that the relative resistance of these rails to copper varied between 6.92 and 8.07, including the feeder, track, jumper cables and the switchboard contact resistance. Deducting the latter the relative resistance to copper varied between 6.72 and 7.75.

SINGLE-PHASE EQUIPMENT OF A SINGLE-TRACK ROAD

Prof. J. B. Whitehead presented a paper describing the Annapolis Short Line, a 25-mile road between Baltimore and Annapolis, Md., which has been changed from steam to electric operation. An article on this road appears elsewhere in this issue so that the account of the equipment will not be repeated here. Prof. Whitehead also discussed in detail the question of the drop in voltage on single-phase lines. After making various assumptions in regard to resistance and reactance of rails and bonds, leakage, etc., the author concludes that "the voltage drop per 100 amp per mile at 25 cycles in No. 000 catenary trolley 22 ft. above track of 80-lb. rails is between 65 volts and 70 volts." The author also considered at length the power consumption for 45-ton cars equipped with 90-hp d.c. motors and 50-ton cars equipped with 100-hp a.c. motors. For a typical run, 1.69 miles in length, and 20 second stops $\frac{3}{4}$ m.p.h.p.s. acceleration and $1\frac{1}{2}$ m.p.h.p.s. braking, the d.c. car would show a consumption of 3.32 kw-hour per car-mile with speed of 28.6 m.p.h. and the a.c. car 3.2 kw-hour for a speed of 29.4 m.p.h. This consumption is measured at the car and the greater consumption of the d.c. car is owing

to the fact that the motors are on resistance more than one-third of the time during which power is applied. The weights of the cars are as follows:

	Direct current.	Alternating current.
Car body.....	32,000 lb.	32,000 lb.
Trucks.....	21,000 lb.	21,000 lb.
Motors and control.....	22,500 lb.	32,000 lb.
Air brakes.....	3,000 lb.	3,000 lb.
Live load.....	9,000 lb.	9,000 lb.
	87,500 lb.	97,000 lb.

The cost of installation for a line 33 miles long with nine cars and rented power would be:

	Direct current.	Alternating current.
Nine cars completely equipped.....	\$107,300	\$149,300
Catenary trolley, poles, wires and guys.....	.....	75,000
Third rail.....	132,000	.....
Transmission line.....	65,000	36,000
Power house apparatus.....	21,000	62,000
Substation apparatus.....	39,000	8,000
Substation buildings.....	15,000	3,000
Bonding.....	18,000	11,000
	\$397,300	\$344,300

In power consumption the two systems are on about an equal footing, the losses in the motor generators of the single-phase system being offset by the losses in the rotaries and increased power consumption at the car in the direct-current system, due to the small motors and short runs assumed. For longer local runs, the author says: "The single-phase power would go to higher values than that for the direct-current system. The price of power is based on the maximum demand and the total consumption, and for the normal schedule would average about 2.3 cents per kw-hour. The monthly excess of single-phase power would thus be about \$100." Direct-current substations attendance would amount to \$5,400 per year, and at 0.25 cent per car-mile, greater maintenance of the a.c. apparatus, this item would be \$900 per year. Summarizing all of the items, the difference is \$8,865 per year in favor of the alternating-current system under the conditions assumed.

STORAGE BATTERIES IN ALTERNATING-CURRENT SYSTEMS

A paper by J. L. Woodbridge gave an outline of the various methods which have been adopted or suggested for applying storage batteries to the regulation of loads on alternating-current systems. Among the equipments described may be mentioned the 275-cell, 1920 X 1-amp-hour battery used by the Spokane & Inland Railway Company as a load equalizer for its single-phase railway. The battery is connected to the three-phase supply system through a split-pole synchronous converter. Another application of the split-pole converter in connection with a storage battery will be found at Gary, Ind., where a 2200-kw converter is to be connected to a 125-cell, 4320 X 1-amp-hour battery to be used for relieving the alternating-current supply circuits from load variations. The converter provides a commutator e.m.f. range from a minimum of 200 to a maximum of 300 volts. A special alternating-direct-current exciter can be used for varying the voltage of the converter. Such an exciter, consisting of a bipolar armature revolving in a field frame having four projecting field cores, although magnetically bipolar, is described. The armature is connected by suitable collector-rings to the secondary windings of three series transformers whose primaries are the main three-phase supply lines and is rotated by means of a synchronous motor in a direction opposite to that of the field rotation, so that the field remains stationary in space. Such a machine acts as a multiplying device and can therefore be made exceedingly sensitive to small changes in the alternating-current load. It also has other advantages.

LIGHTNING-ARRESTER TESTS

Prof. E. E. F. Creighton presented a paper giving a report in detail of tests made upon lightning-arresters and the study of lightning during the past year along the transmission lines of the Animas Power & Water Company and the Pueblo & Suburban Light & Power Company in Colorado. In discussing electrolytic arresters the author stated that aluminum arresters for direct-current circuits are applicable for e.m.f.'s of from 110 volts to 1200 volts. They are connected directly to the lines without series gaps. There is normally a leakage current of 0.001 amp. The discharge rate at double voltage reaches 1000 amp, the internal resistance being extremely small. When the arrester is used on alternating-current circuits the heating caused by the leakage current is great and a gap is used in series; the gap should be short-circuited at least once per day in order to compensate for the dissolution of the film. This type of arrester is intended for station use. The line-type of arrester is provided with an electrolyte which dissolves the film less rapidly, and may be allowed to stand for long intervals without requiring the series gap to be short-circuited. The author reported the results of tests made with cement resistors. Cement rods having different proportions of sand exhibited a progressive increase in resistance with increase in the amount of sand, leading to the conclusion that the sand acts practically as insulating material distributed throughout the cement. The conductivity of the resistors was found to depend almost absolutely upon the contained moisture, which converts part of the cement into an electrolyte held in place by the remaining solid part of the cement.

OSCILLATIONS IN TRANSFORMERS

A report of tests made with transformers in which oscillations were produced by "arcing grounds" was submitted by E. J. Berg. The "arcing" connections between terminals on the "ground" were made by means of adjustable air-gaps. When oscillations were produced in the transformer, the voltage across the end turns was increased to many times the normal, in some cases from 15 to 20 times. With two transformers connected in open-delta (V-connection) an "arcing ground" causes the e.m.f. across the transformer terminals to reach 2.75 times the normal value. The insertion of resistance or reactance in the "arcing ground" connection had almost no effect on the abnormal voltage produced. Condensers shunting the end turns proved effective in relieving the strain in the shunted coil, but transferred it to the next section. Mr. Berg expressed the opinion that when extra high line voltages are used it may be desirable to resort to some new methods of protecting the windings of transformers. He suggested the use of small electrolytic cells shunting the individual coils, in order to transfer the high-frequency surges from the transformer to the lines. In the event of a fault on a line developing into an "arcing ground," it is advisable to make the grounding permanent until the fault has been remedied, so as to prevent the production of oscillations.

TEST OF GAS-ELECTRIC GENERATING STATION

J. R. Bibbins reported the results of a 30-day test on the generating station equipment of the Richmond Works of the American Locomotive Company, Richmond, Va. The equipment consists of a 23.5-in. x 33.0-in. horizontal, tandem gas engine with a direct-connected direct-current generator operating on producer gas obtained from a pair of 9-ft. (shells) bituminous producers. The generator supplies energy to motors and lamps in the locomotive shops, the load being fairly constant. Table I records the general results of the test.

TABLE I.—GENERAL RESULTS OF TEST.

Nominal load.	Full.	Three-quarters.	One-half.
Length of run, hours.....	223	125	136
Average load, kw.....	312.3	228.3	159.6
Average load, computed hp.....	455.0	333.0	238.0
Load, per cent engine rating.....	91.0	67.0	47.5
Load, per cent generator rating..	104.0	77.2	53.2
Coal, gasified, lb.....	115,289	54,143	47,775
Coal, gasified, per hr.....	517.0	433.0	351.0
Output, kw-hr.....	69,650	28,540	21,710
Lb. coal per kw-hr.....	1.654	1.697	2.20
Lb. coal per kw-hr, guaranteed..	1.93	2.10	2.64
Lb. coal per boiler hp-hr.....	1.14	1.31	1.56
Average heat value of coal, B.t.u.	14,392	14,392	14,392
B.t.u. per kw-hr.....	23,700	27,280	31,650
B.t.u. per boiler hp-hr.....	16,415	18,710	21,670
Per cent thermal efficiency, brake.	15.51	13.6	11.75
Per cent thermal efficiency, elec.	14.35	12.65	10.78
Coal.—Pocahontas run-of-mine; avg. heat value dry sample; 14,703 B.t.u. per lb; as fired, 14,392; volatile matter, 22.8 per cent; ash, 4.5 per cent; sulphur, 1 per cent.			

Test.—August 12, 7 a. m., to September 7, 12 m.

In comparing the cost of producing electrical energy in the above plant with an equivalent steam-turbine plant for the same duty, the author stated that at the price of coal prevailing in Richmond (\$2.70 per ton) the gas plant shows a 13 per cent gain over steam at full-load and 5 per cent at half-load. The estimates include interest, etc., on the cost of the complete gas plant at \$138 per kilowatt and of the steam plant at \$100 per kilowatt.

LOCATION OF ELECTRIC RAILWAY SUBSTATIONS

G. B. Werner presented a paper in which there was developed an equation for expressing the number of substations, or the distance between substations, that will render the total annual charges on the installation a minimum. The charges considered were those relating to the investment in substation apparatus, and overhead conducting material and the cost of losses in the substations and on the line. By expressing each of these four charges algebraically and determining the value for each which will render the sum a minimum, it was found that the cost of copper should be equal to that part of the cost of the substation which is independent of the output.

ELECTRICITY AND FIRE PROTECTION

In a paper discussing electricity from the viewpoint of the insurance engineer, C. M. Goddard called attention to the fact that while the annual per capita loss by fire in Austria, Denmark, France, Germany, Italy and Switzerland averages 33 cents, that in the United States is \$2.47, the average total annual loss in this country for the last 32 years being \$134,000,000. He claimed that at least 50 per cent of the fires are due to carelessness. He expressed his belief that it was most fortunate for the electrical interests that fire underwriters had begun to appreciate the necessity of fire protection before electricity was generally introduced, so that they immediately began to surround it with necessary and proper restrictions. No small part of the progress of electrical engineering has been due to this fact. At the present day all undue hazards from electricity are being guarded against. Electricity furnishes the safest illumination, and the safest source of energy, for industrial purposes. He entered an urgent plea for co-operation between electrical and fire underwriting interests, so that restrictions shall not obstruct, but safeguard, the advance of electrical undertakings.

LARGE GENERATOR FOR NIAGARA FALLS

A paper by B. A. Behrend described a 12,000-volt, three-phase, 25-cycle alternator rated at 6500 kw recently built for the Niagara Falls Hydraulic Power & Manufacturing Company, which is remarkable on account of its high speed of 300 r.p.m. The generator was designed to be safe at the runaway speed of the turbine, 506 r.p.m. A disk of nickel-steel without a hole in the center forms the middle part of the revolving element. Two nickel-steel rings are mounted on each side of this well and are bolted and keyed to it.

The nickel-steel has an ultimate strength of 80,000 lb. per square inch and is of high magnetic permeability; it contains 3.5 per cent of nickel. The weight of the complete rotor is only 92,900 lb. The weight of the stator is 116,700 lb. and the weight of the entire machine is 275,000 lb. The full-load efficiency at 90 per cent power-factor guaranteed was 96 per cent; the efficiency under test was found to be 97.66 per cent. The regulation is 8.4 per cent at full-load and unity power-factor at 12,000 volts. The machine has 10 poles and 120 armature slots. The rotor diameter is 126 $\frac{3}{4}$ in.; the diameter of the bore of the armature is 130 in.

THE DESIGN OF TRANSMISSION-LINE STRUCTURES

D. R. Scholes presented a paper discussing certain fundamental considerations governing the design of transmission-line structures. The data given by the author relating to transmission-line towers refer to experience with windmill towers that have been in use for many years. Towers should have strength to resist loads on their members due to a wind pressure of 40 lb. per square foot, being constructed with a factor of safety of from 1.5 to 2.0. The wind pressure on cables of long spans should be taken as not less than 30 lb. per square foot, and a factor of safety of 2.0 should be used. In Northern localities a thickness of sleet of at least $\frac{1}{2}$ in. should be assumed in calculating the exposed area of the wire.

INDUCTION MOTORS IN CASCADE

The operation of two induction motors connected in direct and differential concatenation and as single machines in order to obtain variable speed was discussed in a paper by H. C. Specht. Two 60-cycle motors, one having 10 poles and the other 6 poles, have a synchronous speed of 450 r.p.m. when arranged in direct concatenation, a speed of 720 when one motor is used alone, a speed of 1200 when the other is used, and a speed of 1800 r.p.m. when the machines are connected in differential concatenation. The disadvantages of a cascade set are its lower power-factor and efficiency compared with two independent motors for the same duty, while its advantages are greater latitude in design, a more flexible and simpler speed control and safer operation. The change from low speed to high speed can be made gradually without causing any mechanical jarring or electrical disturbance, by inserting high resistance across the circuits interconnecting the two motors and decreasing the resistance gradually with increase in speed until the rotor reaches the normal speed of the leading motor.

THE TESTING OF LINE INSULATORS

C. E. Skinner read a paper devoted to proposed standard specifications for the testing of high-voltage line insulators, which embodies information received from manufacturers and users of porcelain line insulators. The specification is divided into three parts, designated as routine tests, design tests and methods of testing. The routine tests are those made on each individual insulator to show whether or not workmanship, materials and dielectric strength are adequate. Each part of a built-up insulation is required to withstand for five minutes three times its proportion of the line e.m.f., and the completed insulator must withstand for five minutes 2.5 times the line e.m.f. at which it is to be used. The design tests cover mechanical test, rain test and dew test. According to the last test, the insulator must withstand 1.25 times the normal e.m.f. after the insulator has become thoroughly covered over its entire surface by moisture condensed from the atmosphere. The author expressed the opinion that this test determines the behavior of the insulator under the most severe condition which it will ever

be called upon to meet in practice. Specific instructions are given for conducting the tests.

DOUBLE-DECK PLANTS

J. R. Bibbins described the West Point & Ft. Wayne stations, both of which are of the double-deck turbine type. The former covers a floor area of 2 sq. ft. per kilowatt and the latter 1.42 sq. ft. per kilowatt. The latter is of 8500 capacity and cost \$66.25 per kilowatt, as follows: Building, \$10.97; turbines and electrical equipment, \$30.55; boilers, stokers, piping, feed pumps, etc., \$13.92; condensers, piping, pumps, etc., \$3.98; coal-handling plant, \$0.94; erection and engineering, \$5.94.

THE APPRENTICESHIP SYSTEM IN STEAM RAILROAD SHOPS*

Your committee, recognizing the fact that there is a wide difference in organization and local conditions as to available material and facilities for instruction, considers that a hard-and-fast general apprenticeship code is impracticable.

To assure the success of the apprenticeship system, the following code of basic principles seem to be vital, whether the organization is large or small:

First—To develop from the ranks in the shortest possible time, carefully selected young men for the purpose of supplying leading workmen for future needs, with the expectation that those capable of advancement will reveal their ability and take the places in the organization for which they are qualified.

Second—A competent person must be given the responsibility of the apprenticeship scheme. He must be given adequate authority, and he must have sufficient attention from the head of the department. He should conduct thorough shop training of the apprentices, and, in close connection therewith, should develop a scheme of mental training, having necessary assistance in both. The mental training should be compulsory and conducted during working hours, at the expense of the company.

Third—Apprentices should be accepted after careful examination by the apprentice instructor.

Fourth—There should be a probationary period before apprentices are finally accepted; this period to apply to the apprentice term if the candidate is accepted. The scheme should provide for those candidates for apprenticeship who may be better prepared as to education and experience than is expected of the usual candidate.

Fifth—Suitable records should be kept of the work and standing of apprentices.

Sixth—Certificates or diplomas should be awarded to those successfully completing the apprentice course. The entire scheme should be planned and administered to give these diplomas the highest possible value.

Seventh—Rewards in the form of additional education, both manual and mental, should be given apprentices of the highest standing.

Eighth—It is of the greatest importance that those in charge of apprentices should be most carefully selected. They have the responsibility of preparing the men on whom the roads are to rely in the future. They must be men possessing the necessary ability, coupled with appreciation of their responsibilities.

Ninth—Interest in the scheme must begin at the top, and it must be enthusiastically supported by the management.

*Abstract of committee report presented at the Atlantic City convention of the American Railway Master Mechanics' Association, June 22-24.

Tenth—Apprenticeship should be considered as a recruiting system, and greatest care should be taken to retain graduated apprentices in the service of the company.

Eleventh—Organization should be such as graduated apprentices can afford to enter for their life work.

For the purpose of obtaining data as to the conditions on various roads of the country, information was secured which is summarized as follows:

Fifty-five roads report 301 shop plants having apprentices and 67 shop plants in which there are no apprentices. A total of 7053 apprentices are employed in these 301 shop plants. The average ratio of apprentices to mechanics in each trade is as follows:

Machinist	1 to 4.8	Molder	1 to 8.2
Boilermaker	1 to 6.8	Electrician	1 to 8.6
Blacksmith	1 to 13.9	Painter	1 to 19.2
Patternmaker	1 to 3.3	Upholsterer	1 to 11.3
Cabinetmaker	1 to 23.3	Carpenter	1 to 72.4
Tinner-pipefitter	1 to 5.1		

vention of June, 1907. The following roads and systems of roads have made substantial progress in this work:

	No.	Apprs.	Estab.
Union Pacific	1 school	Omaha	71 1906
	1 " "	Cheyenne	21 1907
Michigan Central	1 " "	St. Thomas	36 1907
Santa Fé	10 schools		363 1908
Southern Railway	1 school	Knoxville, Tenn.	1907
	1 " "	Spencer, N. C.	1907
Delaware & Hud.	3 schools	{Green Isle}	86 1907
		{Oneonta}	
		{Carbondale}	

Substantial progress has also been made on roads having schools previously established, on the Grand Trunk, Central R. R. of N. J., Boston & Maine, Union Pacific, Minneapolis, St. Paul & Sault Ste. Marie and New York Central Lines. The Canadian Pacific and the Erie advise they intend to install the improved plan of apprenticeship during

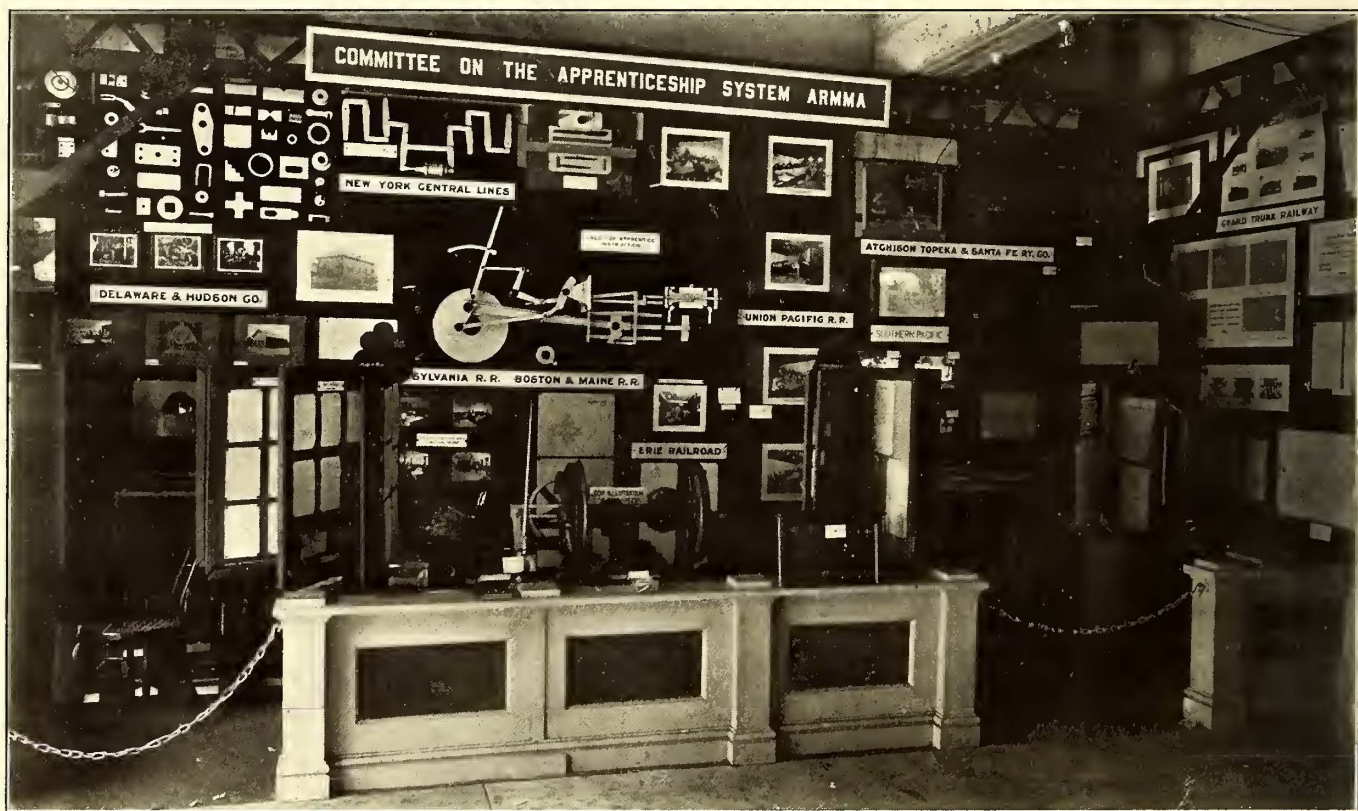


Exhibit of Railroad Shop Apprentices' Work at Atlantic City Convention

The majority of replies indicate difficulty in securing apprentices in some of the trades, but no difficulty in others. A few replies state no difficulty in securing apprentices. This is apparently due to local conditions.

Out of a total of 55 replies, 10 indicate special instruction in trades is given apprentices, 45 do not provide for special instruction, 16 have an established school system and 39 have no school system. Eighteen replies favor day schools and three favor night schools. Fifteen replies show 37 schools with 1567 apprentices attending. The majority of the schools were recently established. Of the above schools, 28 are held in working hours and 9 are held in the evening. Thirty-four schools are compulsory and three are optional. Only 12 roads pay the apprentices for time spent in school.

Modern apprenticeship training has been introduced in 17 shops on four roads with 506 apprentices since the con-

vention of June, 1907. Other important roads have the subject under contemplation.

The new apprenticeship, which combines instruction in the trade with mental training, is progressing rapidly on railroads. A large field is available for the new apprenticeship. The strongest part of the committee's report was embodied in the practical exhibit of apprentice training and methods in a booth on the pier. In this exhibit, a photograph of which is reproduced herewith, the work of apprentices in the shops of the following railroads was represented: Central Railroad of New Jersey, Grand Trunk, Atchison, Topeka & Santa Fé, New York Central Lines, Union Pacific, Erie, St. Louis & San Francisco, Canadian Pacific, Pennsylvania.

The exhibit showed in a striking manner a new method of teaching, devised to meet the special needs of apprentices in the shop. The instruction is of a direct, practical,

hand-to-hand type, using every-day problems, with the actual objects for illustration. Apprentice instructors are everywhere working out their own instruction sheets, and are drawing on their local shops for examples and problems.

One distinctly American feature of apprenticeship which could not be fully shown in the exhibit, is the system of special shop instruction. This feature as used by a number of the roads exhibiting makes possible an immediate increase in the shop output of apprentices.

The school outfits required are of a simple and inexpensive character. The drawing tables shown were built in the company shops. Many of the locomotive, car and machine-tool parts used for demonstration and drawing in the classrooms are condemned parts valued only as scrap, which are, however, just as useful for illustration purposes.

The report concludes as follows:

"It has often been said that apprenticeship is a thing of the past. This certainly is not true of American railroads to-day where a new apprenticeship has sprung up and has attained a healthy growth with brightest promise for the future. Your committee does not hesitate to characterize the new apprenticeship as the most important influence introduced into railroad organizations during the present generation. This development is sure to be rapid, requiring great wisdom, combined with conscientious and systematic efforts in its control. We believe this movement will become the most powerful influence in supplying and preparing the men of the future for the motive-power departments (and perhaps other departments) of American railroads; because the movement trains men in the ideal way, and because men properly prepared for their work constitute our greatest problem to-day."

THE DRAG-FIT METHOD OF ASSEMBLING WHEELS, AXLES AND GEARS

A special method of measuring wheels, axles and gears for press fits is used at the repair shops of the Northwestern Elevated Railroad Company, Chicago. J. E. Osmer, master mechanic, has introduced here the so-called "drag fit." In his previous experience in assembling wheels and axles in steam railroad work, Mr. Osmer found that the sense of feeling with calipers could not entirely be depended upon to make fits accurate enough for mounting car wheels and gears. The use of a micrometer or fixed gages also is objectionable from some viewpoints in repair-shop work where it becomes necessary to change wheels from axle to axle.

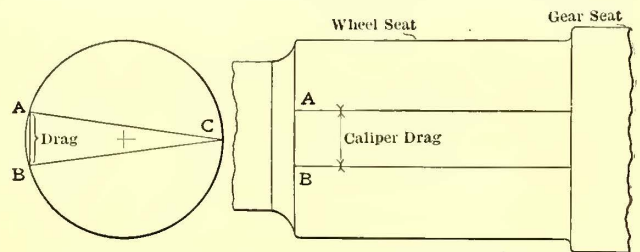
The blank form used in the Northwestern Elevated shops as an assembly record of wheels, axles and trucks was reproduced in the STREET RAILWAY JOURNAL of June 22, 1907, with a letter from Mr. Osmer. This sheet indicates for the various diameters of the fits the pressures in tons at which the wheels should be pressed on and the length in inches of the caliper drag corresponding with these pressures. The lathe attendant has this information available when he is turning axles and with the wheels bored ready for mounting he finishes the wheel fits on the axles so that the caliper drag will be as required for the stated number of tons mounting pressure.

In describing this method of obtaining diameters for fitting it should be said that one of the reasons for its acceptance is that the probability of error is reduced and therefore the mechanic turning the axles can work to a greater degree of accuracy if he measures by the drag system than he could by working to fixed diameters.

The method of taking measurements in the drag system probably can best be illustrated by referring to the accompanying sketch of a journal showing a top and end view. With the wheel already bored to a finished diameter and the axle in the lathe, the lathe attendant turns down the axle to a diameter safely larger than the bore of the wheel and then prepares for making the fit as follows:

Let it be known that the so-called drag is the length of the cord *AB*, as shown in the end view. Assuming that a steel wheel is to be pressed on an iron or steel axle, the length of the drag is found by adding $1/32$ in. for each diametrical inch of the wheel fit and $1/32$ in. for each longitudinal inch of the wheel fit. Where cast-iron wheels are used, the same method of obtaining the drag holds except that $1/16$ in. is used instead of $1/32$ in. for each inch of length and diameter of the fit.

Referring again to the pressing on of a steel wheel: If the diameter of the wheel fit is 5 in. and the length 6 in., then allowing $1/32$ in. drag for each inch of diameter we



Top and End View of Wheel Fit to Show Drag-fit Measurements

have $5/32$ in. + $6/32$ in. = $11/32$ in., or the length of drag represented by the distance between *AB* on the sketch.

Assuming that an $11/32$ -in. caliper drag is required to obtain the desired mounting pressure the machinist at the lathe sets a pair of dividers so that the points will be $11/32$ in. apart. He then lays a straight edge along the wheel fit parallel with the axis of the shaft and draws the points of the dividers so that they leave two lines $11/32$ in. apart scratched on the wheel fit. Next he sets a pair of outside spring calipers to the exact diameter of the wheel bore. With the calipers thus set to the exact diameter of the bore of the wheel hub, he places one leg (*C*) of the calipers on one of the lines scratched on the axle and moves the other leg to a point (*A*) where it just touches the opposite side of the wheel fit. Referring again to the sketch, one leg of the calipers is at *A* and the other at *C*, the distance *CA* equaling the diameter of the bore of the wheel hub. He next springs the leg at *A* over the full diameter of the axle and draws it lightly back toward *B*. In so doing, if the shaft has been turned to the exact diameter, which will give the required tons pressure when the wheel is pressed on, the leg will just touch along the line through *B*. If the leg touches before it reaches the line, the diameter is too large, and if it passes inside of the line the fit is too small and the wheel will not remain tight on the axle if applied.

This drag method of measuring fits has been used by the Northwestern Elevated Railroad for about three years, and it is said that not a single wheel has had to be taken off on account of error in the shops. The scheme is also used in fitting motor gears and armature shafts. As a recommendation for its reliability, the same method of making press fits is employed in steam railroad work in fitting crank pins, wheels and similar parts on which great dependence must be placed.

OPERATING AGREEMENT BETWEEN CHICAGO CITY RAILWAY AND CALUMET & SOUTH CHICAGO RAILWAY

The Transportation Committee of the Chicago City Council has reported favorably on an ordinance granting the consent of the City Council of the City of Chicago to an operating agreement between the Calumet & South Chicago Railway Company and the Chicago City Railway Company. The ordinance was presented for the approval of the Council and accepted on June 29.

Briefly, the ordinance is a contract between the two street railway companies, the Chicago City Railway agreeing to operate the Calumet & South Chicago property until Feb. 1, 1927, and return to the owners of the Calumet & South Chicago 75 per cent of the money saved by reason of the more economical operation which can be given the combined property, including power supply and repair shops.

Some of the more interesting clauses of this operating agreement follow:

(1) The City Company shall, during the period of this agreement, operate the street railway system of the Calumet Company, in compliance with all the terms and conditions of said ordinance of March 30, 1908, and subject to the conditions hereinafter specified.

(3) The City Company shall supervise the operation of the street railway system of the Calumet Company through an operating staff employed by it (the City Company) for that purpose. The City Company shall not be liable, except as herein expressly provided, for any injury to person or property, loss, damage, or other obligation, in any way arising or growing out of the operation of the street railways owned by the Calumet Company except through a breach of this contract.

(4) The City Company agrees that it will maintain, for the operation of the street railways owned by the Calumet Company, a separate organization which shall include a general manager and the following departments: Conducting transportation, maintenance of tracks, road and overhead lines, and real estate, which shall be independent from the corresponding departments having charge of the railway system owned by the City Company.

(5) The Calumet Company shall pay to the City Company monthly for the services of the departments specified in paragraph 3, the actual cash cost to the City Company for the work performed by the employees of the City Company, the charge to be on the basis that the gross receipts of the Calumet Company bear to the gross receipts of the City Company, and in addition thereto such proportion of the office expense, rents and supplies of each such department as may be fixed by the Board of Supervising Engineers as is properly chargeable to the Calumet Company. The City Company shall have the right to appoint one representative to act with said board in the determination of such proportion.

In addition to the cash cost of said services the Calumet Company shall pay to the City Company monthly three-fourths of the actual savings in operating expenses effected by the operation of said street railway system by the City Company, instead of by the Calumet Company. The amount of said savings shall be determined by the Board of Supervising Engineers.

(7) On the request of the Calumet Company, and after reasonable notice, the City Company shall supply or procure a suitable and sufficient amount of electrical energy for the operation of the present and future railway system of the Calumet Company (including the electrical energy for the operation of the street railway lines of the Hammond, Whiting and East Chicago Electric Railway Company required to be supplied by the Calumet Company) at the actual cash cost to the City Company of the electrical energy so supplied, and also in addition thereto the proper proportion of the part applicable thereto of the reserve fund specified in the ordinance Feb. 11, 1907, and of the

5 per cent interest return on the capital investment specified in said ordinance.

(9) On request of the Calumet Company, and after reasonable notice, the City Company shall perform and make the general repairs of the cars of the Calumet Company (including the general repairs of the cars of said Hammond, Whiting & East Chicago Electric Railway Company) in the car repair shops of the City Company. The Calumet Company shall pay the actual cash cost to the City Company of such general repairs, including its proportion of the general shop expenses and the cost of maintenance, repairs and renewals of the car repair shops and shop tools used for the general repairs of such cars; and also in addition thereto the proper proportion of the part applicable thereto of the reserve fund earlier specified, and of the 5 per cent interest return on the capital investment specified in said ordinance of Feb. 11, 1907.

(11) The Calumet Company shall furnish, as required, the funds necessary for the work of rehabilitation of the Calumet property, but such work shall be performed by the City Company through its proper departments, subject to the approval of the Calumet Company. The Calumet Company shall pay to the City Company monthly for such services of such departments the actual cash cost to the City Company thereof.

(12) The Calumet Company shall provide for and establish and maintain the funds for maintenance, repairs, renewals and depreciation. All such work of maintenance, repairs and renewals shall be performed by the City Company, subject to the approval of the Calumet Company.

(13) During the continuance of this contract transfers shall be given to and accepted from passengers using the railway lines owned by the City Company, and the railway lines owned by the Calumet Company within the respective transfer zones.

(14) The City Company shall have the right, and hereby agrees to establish and maintain, within the respective transfer zones, such through routes as shall, from time to time, be provided for by the Board of Supervising Engineers. The cars necessary for operation over such through routes shall be provided by the City Company.

(15) All fares collected on the City Company cars operating on such through routes, while the same are being operated upon or over the lines of the City Company, shall belong to and be retained by the City Company; and all fares collected on the City Company cars operated on such through routes, while the same are being operated upon or over the lines of the Calumet Company, shall belong to and be paid monthly to the Calumet Company; and the Calumet Company shall pay to the City Company monthly the actual cash cost to the City Company of operating said cars of the City Company on such through routes upon and over the lines of the Calumet Company. Said actual cash cost shall include the proper proportion of the maintenance and repairs of such cars operating on such through routes, and in addition thereto the proper proportion of the part applicable thereto of the reserve fund specified in the ordinance of Feb. 11, 1907, and of the 5 per cent interest return on the capital investment specified in said ordinance. Said proportion shall be determined by the Board of Supervising Engineers.

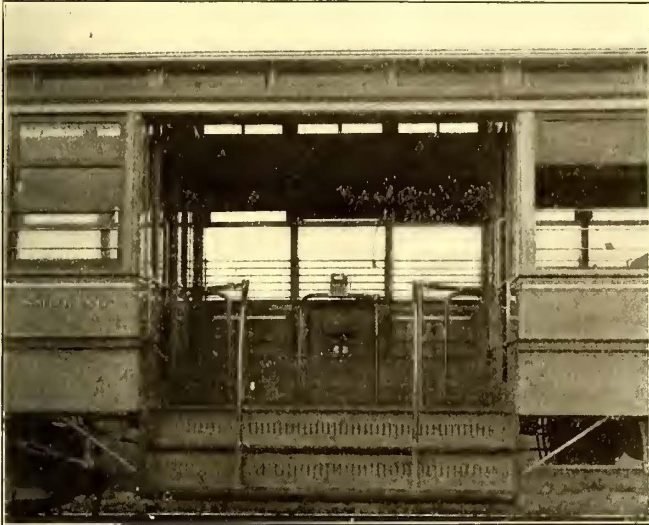
(20) Either party hereto or the City Council of the City of Chicago may terminate this contract on the first day of February in any year, by giving one year's previous notice in writing of its intention so to do.

(22) The net revenues derived by the Chicago City Railway Company under this agreement shall be held and considered as a portion of the gross receipts of the street railway system and property of the said Chicago City Railway Company under the terms and provisions of the ordinance of the City of Chicago passed on February 11, 1907. The revenues derived by the Calumet & South Chicago Railway Company under this agreement shall be held and considered as a portion of the gross receipts of the property of the said Calumet & South Chicago Railway Company under the terms and provisions of the ordinance of the City of Chicago passed on March 30, 1908, and in disposing of said revenues and in carrying out this agreement, the said Calumet & South Chicago Railway Company shall comply in all respects with the provisions of said ordinance applicable thereto.

MONTREAL'S SIDE ENTRANCE PAY-AS-YOU-ENTER CAR

The Montreal Street Railway Company, originator of the pay-as-you-enter car for city service, built about a year ago and has now in operation on its Montreal Park and Island Railway division a pay-as-you-enter car designed for suburban and interurban lines. The car is about 50 ft. long and has no rear platform, but instead passengers may enter or leave by way of the platform which divides the

windows and transverse seats especially commending themselves to the riders on this scenic line. The finish of the car is cherry, natural color. The passages and aisles are covered with interlocking rubber tiling of a suitable design. The car is well lighted throughout, with group lights along the middle of the roof and individual lights over the seats. The fittings on the car are of polished brass. The ventilation is of the latest approved method so that the car is free from dead air. The car, including trucks and



Side Entrance to Pay-as-You-Enter Car

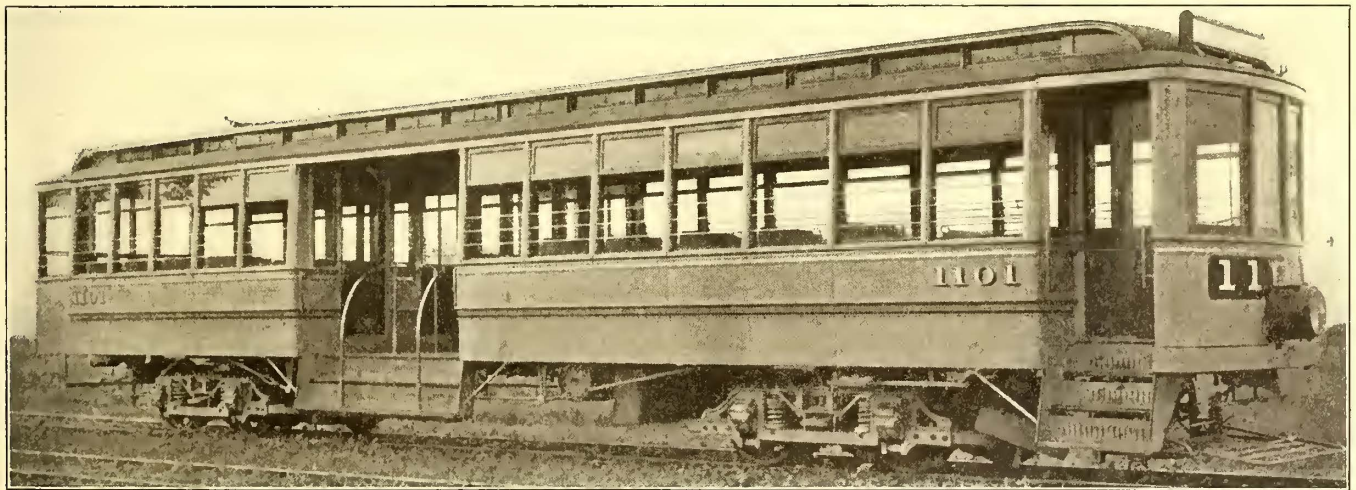


Passenger Section of Side Entrance Pay-as-You-Enter Car motors, was built at the Montreal Street Railway Company's shops, Hochelaga, at a cost of \$11,000. The car body alone cost from \$4,000 to \$5,000.

regular passenger compartment from the smokers' quarters in the rear. Passengers from the front compartment may also leave by way of the motorman's vestibule.

Riders are not permitted to stand at the entrance, thus ensuring a clear road in boarding or leaving cars, and as the conductor is always stationed at the entrance the possibility of platform accidents is reduced to a minimum. The car is entered between the two bars on the platform and

Mayor Miller, of Lakewood, a suburb of Cleveland, on the west, stopped the cars of the Lake Shore Electric Railway from passing through the municipality Tuesday, June 23, because the conductors would not accept transfers from the lines of the Municipal Traction Company, of Cleveland.



First Side Entrance Pay-as-You-Enter Car Built for Suburban Service by the Montreal Street Railway Company

the passenger after depositing his fare may enter either compartment. After the passengers leave the car the conductor closes the exit door by pressing a pneumatic pedal.

Owing to the elimination of the rear platform there is no overhang and the trucks therefore are better disposed for the easy riding essential on a line with long-trip passengers. The capacity of the car is 26 seated passengers and 22 in the rear compartment. The car body design and furnishings are up to date in every particular, the large

The village officials say that the operation of the cars of the Lake Shore Electric Railway is in the hands of the Municipal Traction Company after the tracks of the latter are reached and that the cars must be operated under the same conditions as govern the Municipal Traction Company. Although Superintendent Cook threatened to stop all cars if the village persisted in its course, Mr. Miller declared that no more cars of the company should pass through the village until transfers are exchanged.

A MODEL CAR REPAIR SHOP *

In the design of a model car repair plant for a road operating 100 cars it is necessary to keep in mind certain conditions and requirements. Among these might be mentioned:

The possibility of an extension of the shops to meet future developments of the property.

The idea of securing the greatest possible facility and ease, as well as proper sequence, of the different operations necessary in the repair of modern electric rolling stock.

The safeguarding of the property and contents against fire risks.

The provision of adequate space and facilities to develop the highest efficiency of all machine tools and their operators.

The proper lighting and method of access to and communication between the different departments of the group.

The greatest economy in first cost of the plant consistent with good construction, including the elimination of areas covered with costly roof structures used only for transfer tables, etc.

In planning the shops, which are herewith presented, it has been assumed that the site is a fairly level stretch of ground having a frontage of 570 ft. or thereabouts and a depth of not less than 450 ft. This land should preferably be some distance from the main line of the company within easy access to a spur from the steam railroad line serving the locality, direct freight communication being especially desirable. It is recommended that the site be removed from the main line of the railway in order to secure a suitable tract of land (for a moderate price) and avoid the congestion of the main streets, as well as for other advantages. The entire property is to be enclosed by a fence not less than 6 ft. high and access to shops should be obtained only through one main entrance consisting of a gate house and two entrance gates for cars, as shown in Fig. 1. Stationed at this point is a gate-keeper, who has entire surveillance over car movements in and out of the property, as well as admittance of all employees and visitors to the plant. The time clock is placed here as well as a telephone exchange to the different departments.

The scheme of shop buildings is next to be considered. Realizing how necessary it is to minimize all fire risks in a plant of this type, it seems essential first absolutely to eliminate the possibility of combustion in the building itself as well as injury to it from fire arising from without or from the contents of the building, so that the only inflammable material within the shop shall be the car bodies themselves. So long as wooden car bodies are used in railway work they must of necessity be vulnerable to this danger. Unprotected structural steel as used in a large number of even the latest type of car houses and repair shops for structural members, is absolutely at the mercy of a conflagration where the wooden car bodies below or adjacent to it furnish abundant fuel to distort and weaken the vital parts of the building. Nor can ceiling sprinklers be relied upon to eliminate this great danger inasmuch as side line sprinklers are quite out of the question in car repair shop practice.

In reinforced concrete, however, these risks are minimized, if not entirely eliminated, as regards the strength of the building itself, so that in case of a fire the means of combating it can be concentrated upon the contents. Reinforced concrete therefore is used in this shop for the entire roof structure and the columns supporting the roof, as well as for any crane loading or curtain wall details which the demands of each shop may suggest. (See Figs. 3 and 4.) This structure, with columns, transverse girders and longitudinal beam arrangements, etc., is a monolith or unit to which are added the necessary exterior and interior brick curtain walls, which support only their own weight. Brick is used for curtain walls in preference to concrete because of its flexibility; that is, its ease of removal or adaptation to minor changes which might be made in the wall and also because of its superior appearance. Sufficient cement is added to the ordinary lime mortar (about one bag of cement to each barrel of lime) in laying these brick to give the necessary strength to the wall.

We assume that this reinforced concrete system if properly designed and constructed is indestructible, and instead

of deteriorating, gains strength with age. It is therefore necessary so to design the shops that as far as the roof structure is concerned it must be considered as permanent, but possessing the necessary flexibility to possible future alterations by the shifting of curtain walls. A unit bay 32 ft. wide center to center of columns transversely with 14 ft. center to center of columns longitudinally is adopted and obtains throughout the entire plant. With the width of 32 ft. tracks may be placed 14 ft. on centers and allow 9 ft. from center of outside track to center of the adjacent wall. This arrangement gives ample room between and alongside tracks. The extension to each bay, as shown in Fig. 1, is accomplished by the addition at the rear of as many 14-ft. sections as the case demands or the limits of the property prescribe. With a depth of 450 ft., four sections or a total of 56 additional ft. may be added, equivalent to a 33 1/3 per cent enlargement of the plant, and still retain a 50-ft. straight run of track outside of the building before reaching the curves.

To secure proper lighting in the bays, which are entirely dependent upon overhead light, and to supplement such side light as may be secured from windows in exterior walls, a uniform continuous skylight 10 ft. wide is placed in the roof of each bay on its axis. (See Figs. 3 and 4.) Over the concrete roof slab is placed a standard five-ply slag roof with copper flashing extending not less than 1 ft. up the side of the parapet wall. All drainage leaders from the roof are carried down inside of the building so as to prevent freezing during winter weather and the frequent troubles in connection with outside gutters and conductors. Pit, floor or toilet drainage is not connected with the roof drainage system, thus eliminating any chance of flooding in case of stoppage in the roof system.

The general arrangement of the shops is shown in Fig. 1. A car sent to the shop for repairs is switched to track No. 4, 5, 6 or 7 and is brought in over the repair pit, which is served by pit jacks and by two 10-ton electric traveling cranes in each bay, each crane being equipped with two 5-ton electric traveling hoists. The cranes are used to remove the car body from the truck. If the car body needs either carpenter repairs or painting, it is moved to an adjacent track in the bay and is lowered to a pair of shop trucks. It is then hauled to the carpenter or paint shop. If the car body does not need repairs it is shifted by the cranes to a pair of repaired trucks of the same type and returned to service. For ordinary repairs the trucks are left over the pit where the car body was removed and are placed in condition to receive the body after it has been returned from the paint or carpenter shop or another car body of the same type. For more extended repairs to trucks or motors the truck is hauled by an overhead crane to the truck space in the rear of the shop. This space is served with a jib crane between tracks equipped with an air hoist. This hoist can be used to remove armatures from motors and other similar operations in motor and truck repairs. In case of armature removal the jib crane places the armature upon a hand car running upon the 24-in. gage track which leads to the armature room. With forge shop repairs a similar operation takes place.

Tracks Nos. 5 and 6 are equipped with wheel-changing pits over which a truck may run. The wheels are lowered to the pit floor and the journal boxes are changed to new wheels which are then replaced in the truck. Wheel turning, pressing wheels on axles and wheel work in general are done in the rear of the machine shop. Wheel storage space both for wheels mounted on axles and for separate wheels is provided at the rear of the building. Six 8-ft. diameter turntables, as shown in Fig. 1, facilitate the handling of wheels and are large enough to accommodate a complete truck. The machine shop, the room for heavy stores and the forge shop are each served with an overhead hand crane of 5 tons capacity and with one hand traveler. All machine tools where feasible are individual motor driven to eliminate shafting and secure economy of power.

The stockroom, which is located to the left of the machine shop (see Fig. 1), is lighted entirely from the skylight above and is accessible to all departments by the narrow-gage track service. It is, however, sufficiently isolated from the main workshop to restrict an indiscriminate observation of the stock.

Oil storage is provided in a separate building adjacent

*Committee report presented at the Niagara Falls convention of the Street Railway Association of the State of New York, June 30, 1908.

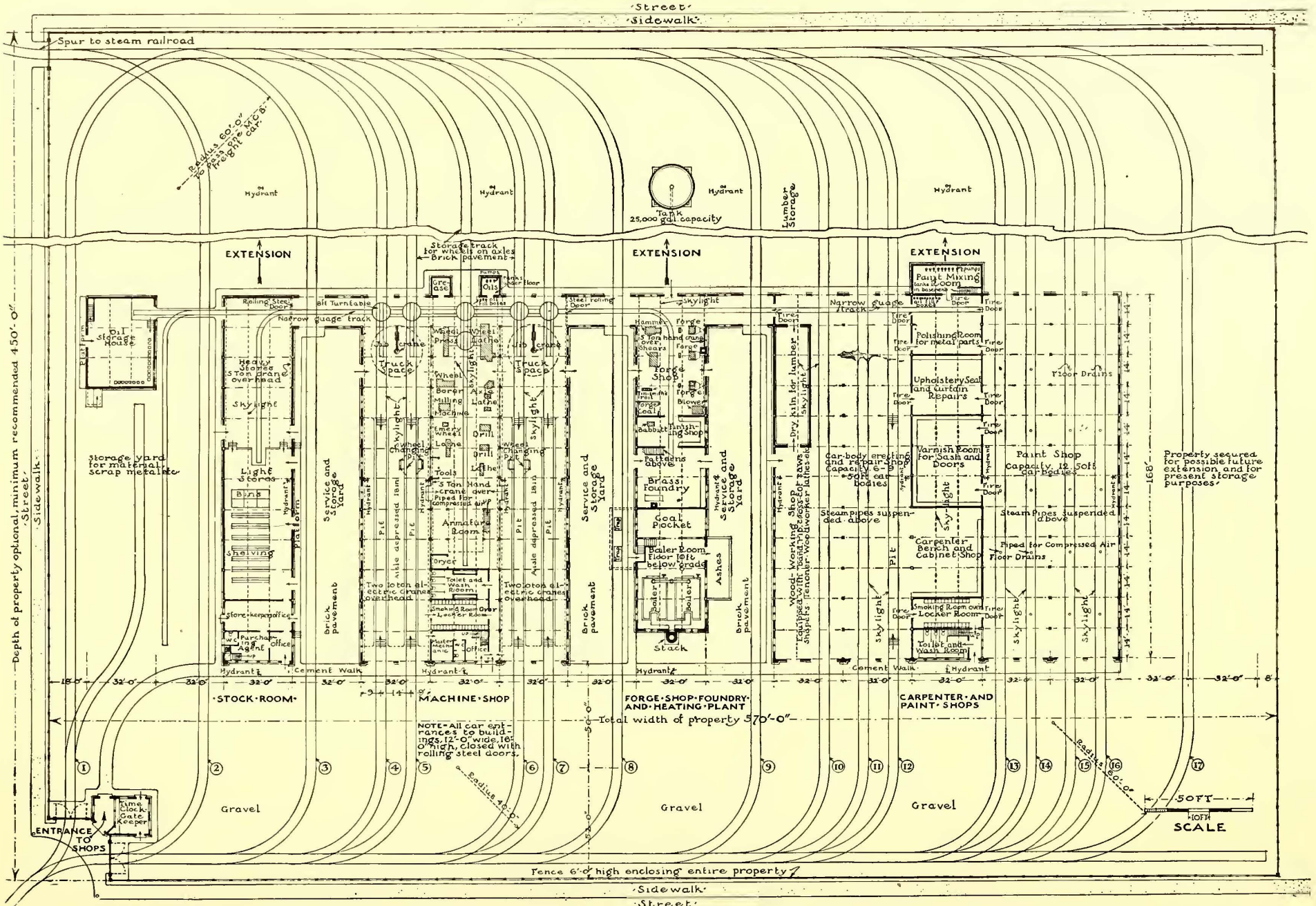


Fig. 1. Model Car Shop Report—General Group Plan of a Car Repair Shop for a Street and Interurban Railway Company Operating One Hundred Cars

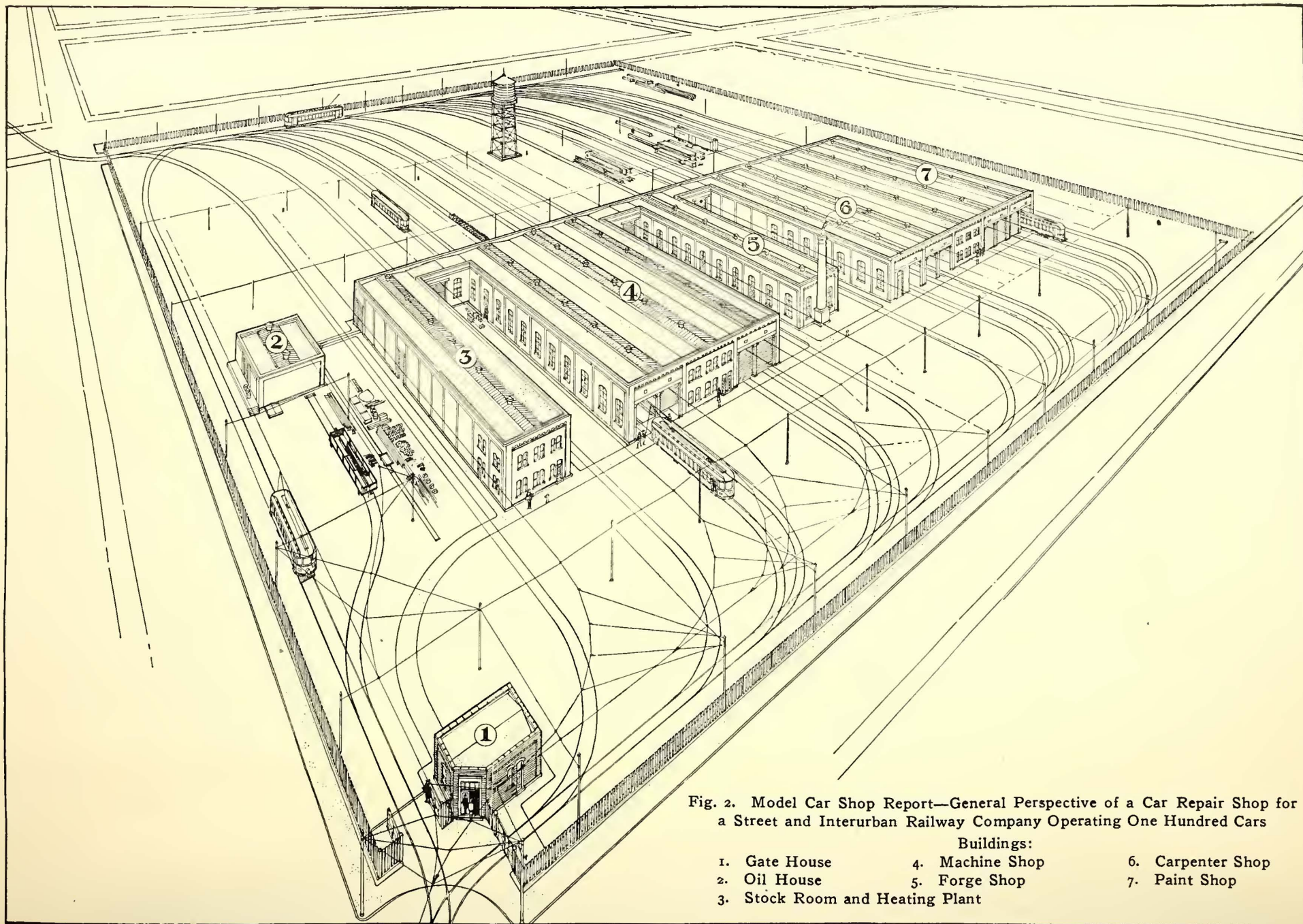


Fig. 2. Model Car Shop Report—General Perspective of a Car Repair Shop for a Street and Interurban Railway Company Operating One Hundred Cars

Buildings:

- | | | |
|---------------------------------|-----------------|-------------------|
| 1. Gate House | 4. Machine Shop | 6. Carpenter Shop |
| 2. Oil House | 5. Forge Shop | 7. Paint Shop |
| 3. Stock Room and Heating Plant | | |

to the stockroom. In the basement of this building are storage tanks each of 5-bbl. capacity for kerosene, signal and machine oils. Each tank is connected with a measuring pump on the first floor. Outside the oil house, below grade, is one cylindrical tank of 10-bbl. capacity for gasoline and also one of 3-bbl. capacity for wood alcohol, both being connected with long-distance measuring pumps on the first floor of the oil house. All of these tanks are filled through fill boxes in the floor of the oil house. Deliveries from the oil storage house to the oilroom at the rear of the machine shop and to the paint-mixing room are made by means of the narrow-gage track service. The oilroom opening from the machine shop is equipped in the basement with four rectangular metal tanks of 2-bbl. capacity each for screw-cutting oil, light machine oil, kerosene and truck paint, and each is connected to a measuring pump in the oil room. In the basement of the paint-mixing room are rectangular metal tanks of 2-bbl. capacity for linseed oil, body varnish, rubbing varnish, japan, shellac and turpentine. Outside of the paint-mixing room below grade is a cylindrical tank for naphtha. All of the tanks mentioned are connected with measuring pumps in the paint-mixing room. Those in the oil and paint-mixing rooms are filled from connections through fill boxes in the floor near the narrow-gage track, where barrels or supply tanks from the oil storage house can be discharged by siphon or gravity. The tanks for volatile oils, however, are filled outside of

ing plant. The carpenter shop is isolated with fire walls and doors from the adjacent paint shop to prevent the spread of fire and the communication of dust. The paint shop is supplied with a floor drainage system to provide for proper car-cleaning facilities. Compressed air is supplied to the paint shop as well as to the machine and forge shop.

The artificial lighting of the shops is supplied by a combination of Cooper Hewitt mercury vapor lamps and incandescent and arc lamps. Mercury vapor lamps have been tested for pit lighting and have proved very satisfactory for this purpose. The arrangement of lights in the repair pits is shown in Fig. 5. These lamps are rated at 700 cp each and operate at 3½ amp, five in series for 550-volt direct-current circuits. One series of five of these lamps is placed in each repair pit, tracks Nos. 4, 5, 6 and 7 (see Fig. 5). They are placed at intervals of about 20 ft. and are staggered on alternate sides of the pit walls. Two additional series of these lights are used in this section of the plant—three lamps overhead between roof and crane clearance, over tracks Nos. 4 and 5; three over tracks Nos. 6 and 7, and four over the machine-shop space. One series of five mercury lights is also used overhead for lighting the car body and carpenter shops. Owing to lack of red rays in the light from these lamps and consequent distortion of color values, they are not recommended for use in the paint shop and its accessories where incandescent and arc lamps are used. Incandescent lighting is used in the offices,

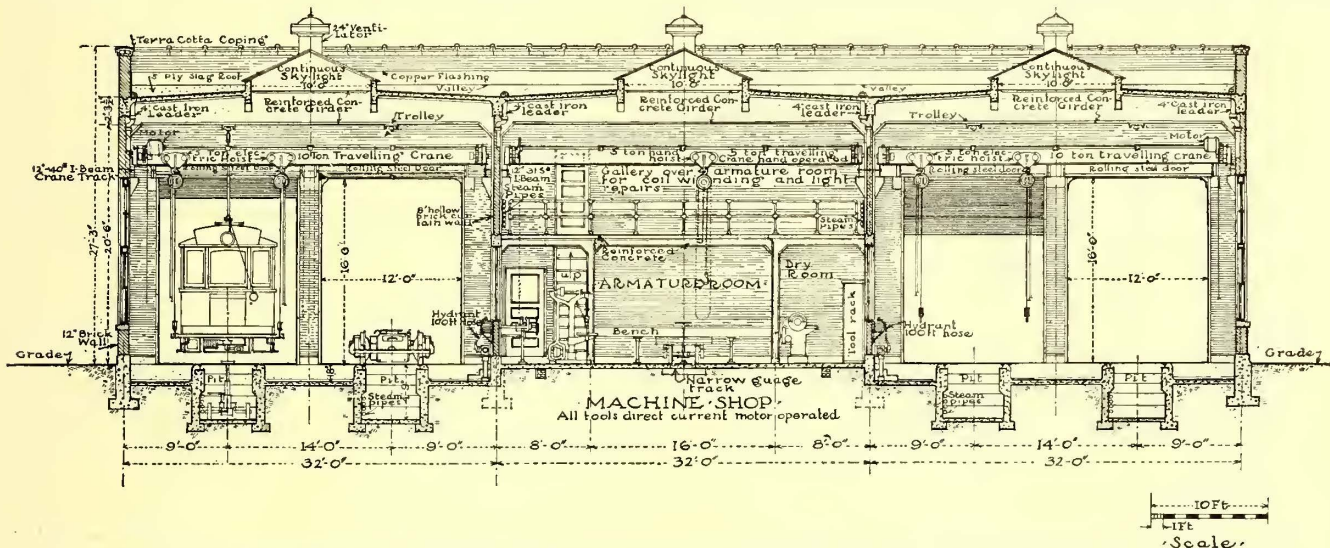


Fig. 3. Model Car Shop Report—Transverse Section Through Machine Shop, Looking Toward Front of Building

the building. By this method of handling oils, maximum fire protection and economy in space, oil and labor are secured.

A brass foundry and finishing shop are provided adjacent to the forge shop. It is often convenient to have facilities for the casting of car fittings, etc., without carrying an unnecessarily large variety of parts in stock and a well-equipped brass foundry, while not continually in service, is considered a necessary adjunct to a model shop.

The floor of the heating plant is lowered 10 ft. below grade, thus facilitating the handling of coal and condensation returns to the boiler. It is also centrally located in the general plan. Pipe radiators are placed in repair pits, as shown in Fig. 5, on the walls of the machine shop, as shown in Fig. 4, and suspended from the ceiling in the stockroom, carpenter and paint shops. The latter arrangement is to prevent the injurious drying out of car-body panels, etc., which happens where wall and floor heating systems are used. All steam mains leading to the bays are installed in transverse pits so that they are easily accessible along their entire length. While hot air and various systems of forced hot water circulation are in use in carhouses and shops, it seems that the weight of experience would recommend a system of steam heating, and it is so designated for this shop.

The car body or carpenter repair shop is equipped with the necessary machine tools, a list of which is hereto attached in the general estimate of cost, as well as a dry kiln for lumber supplied with live steam from the heat-

stockroom, forge shop, heating plant and other minor shop sections. Exterior lighting is secured by arc lights.

To afford efficient fire protection for the contents of these shops, a thorough system of hydrants both inside and outside of the buildings is provided, as shown in Fig. 1, all hydrants being connected to a 25,000-gal. pressure tank at the rear of the property, as well as to the city water supply. As the buildings themselves are non-inflammable and "side-line" sprinklers for car-body protection are impracticable in a shop, no sprinkler system is recommended.

In the track layout a standard 80-lb. T-rail is adopted with ladder tracks at both the rear and front of the property. It is undoubtedly desirable in a plant of this character to make it accessible to M. C. B. steam railroad freight cars. However, the longer the radius of curve adopted the more space will be taken up, and this consideration might prove of some weight where the property is of restricted depth and of considerable value. A 60-ft. radius curve is used at the rear of the buildings allowing the handling of a single standard freight car, while in front of the buildings a 40-ft. curve is adopted which would serve street railway equipment. These short curves are supplemented by a 60-ft. radius curve (track No. 17, Fig. 1) securing a loop around the entire plant upon which steam equipment could be handled. If the property were available a 60-ft. radius curve could be used to advantage in front as well as at the rear of the shops. A 50-ft. stretch of straight track between the buildings and the curve is considered necessary. In this track arrangement the transfer table is entirely dis-

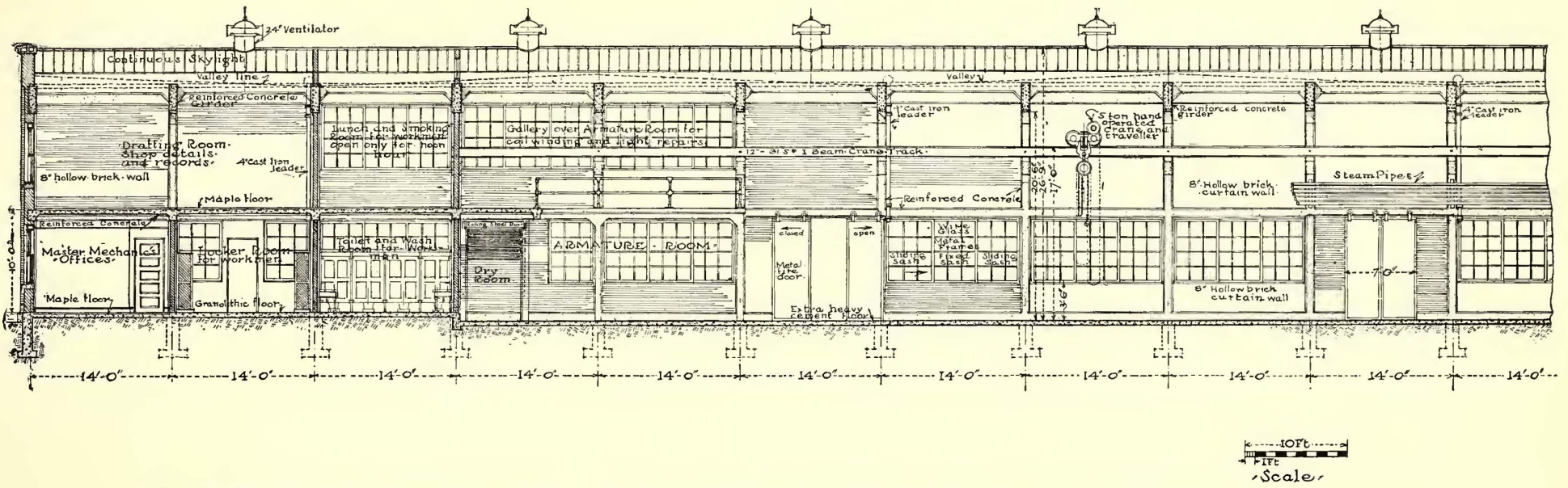


Fig. 4. Model Car Shop Report—Longitudinal Section Along Axis of Machine Shop, Showing Reinforced Concrete System of Construction

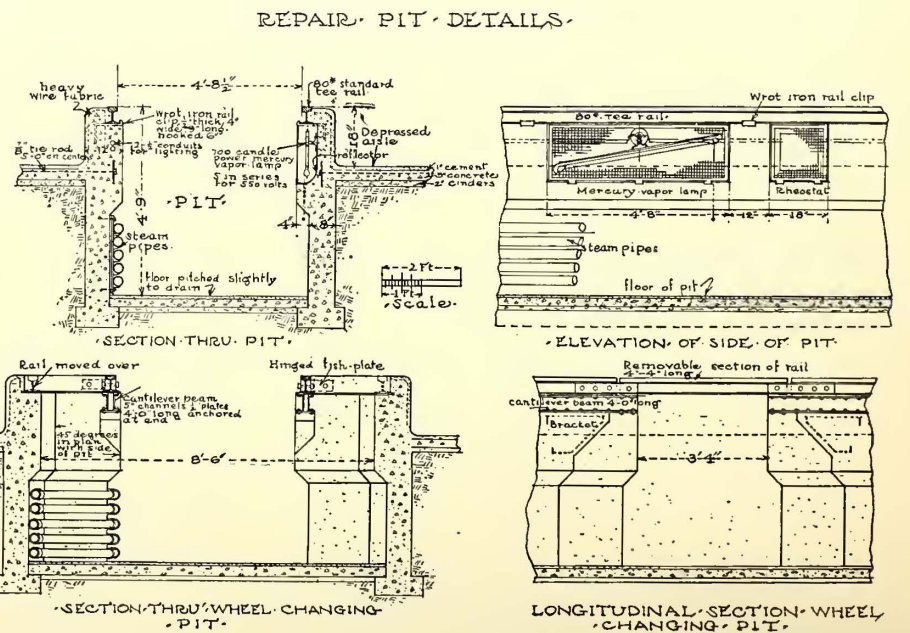
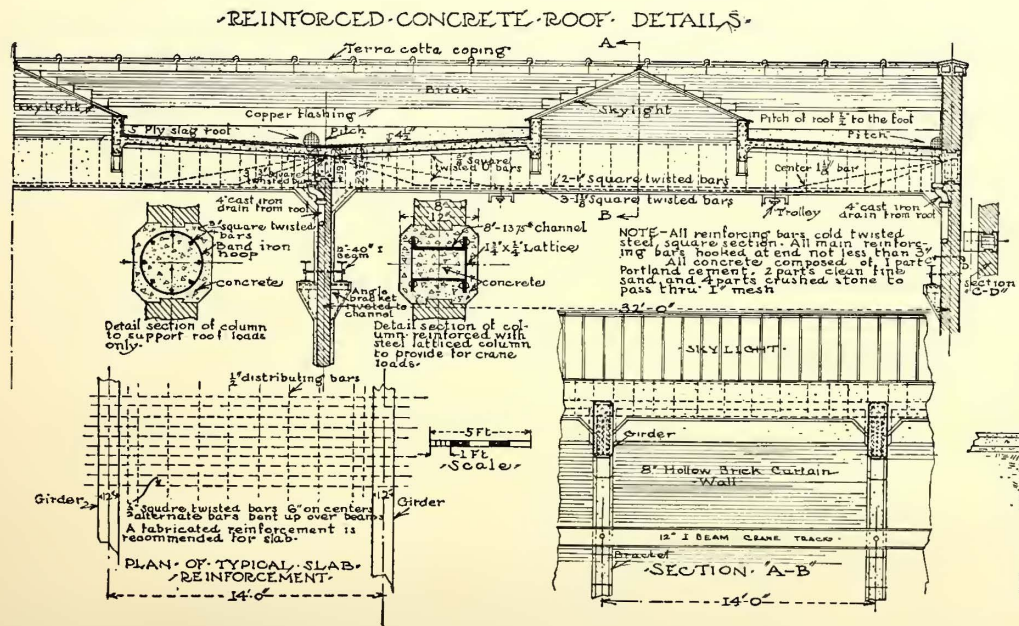


Fig. 5. Model Car Shop Report—Structural Details

pensed with. The special work at the rear of the property should be placed as far back as allowable so as to need no alteration in case of the extension of any part of the plant in that direction.

Small smoking-rooms or, perhaps more properly, lunch-rooms are provided in connection with the machine shop and also the car-body repair and paint shops. This should prevent the workmen from appropriating the cars in the shop for use during the noon hour, which is undesirable. Adequate toilet, washroom and locker space is also provided. The toilet in connection with the machine shop is equipped with a system of forced ventilation.

In conclusion it might be said that the shop as herein presented possesses no radical features of design as have recently been proposed in connection with "Model Car-Shop" discussion. The aim has been toward simplicity and uniformity. For example, all rolling steel doors with perhaps one or two minor exceptions close uniformly an opening 12 ft. wide and 16 ft. high; all interior metal fire doors close openings 7 ft. wide, 10 ft. high; all interior metal frame sash are 4 ft. 6 in. wide, 6 ft. high; all exterior window openings are 6 ft. wide and 12 ft. high. All other details of the shop buildings and their equipment are similarly standardized where possible.

The following is an estimate in detail and total cost of the shops and their equipment:

APPROXIMATE ESTIMATE OF COST OF A CAR REPAIR SHOP FOR A STREET AND INTERURBAN RAILWAY COMPANY OPERATING 100 CARS, TO ACCOMPANY DRAWINGS OF SAME.

ITEM No. 1—COST OF PROPERTY.

Size 570 ft. front, depth optional, not less than 450 ft. recommended. A depth of 450 ft., allowing extension to present plant of 33 1/3 per cent., still retaining 50 ft. straight run of track at rear of building. Arbitrary value....\$20,000.00

ITEM No. 2—COST OF BUILDINGS.

	Cost per bay 32 feet wide.	Total cost 10 bays as shown.
Reinforced concrete roof structure, including column structure to support same.....	\$3,500.00	\$35,000.00
Skylights and ventilators for roof.....	1,500.00	15,000.00
Five-ply slag roof over concrete.....	200.00	2,000.00
Copper roof flashing.....	200.00	2,000.00
Exterior wall space, including openings therein, 12-in. brick wall. (Brick figured at \$18 per 1,000 laid).....	3,000.00	30,000.00
Interior wall space, including openings therein, hollow brick curtain walls, fire walls, partitions, etc.....	800.00	8,000.00
Concrete foundations and pit walls.....	750.00	7,500.00
Cement floors.....	850.00	8,500.00
Rolling steel doors.....	800.00	8,000.00
Plumbing and fixtures.....	100.00	1,000.00
Finish of locker rooms, offices, smoking rooms, drafting room, including fixtures, benches in machine shop, armature room, carpenter shop, paint shop, shelving in stock room, etc. Interior finish in general.....	400.00	4,000.00
Paint for metal work, exposed concrete surfaces, window sash and frames, metal doors, etc.....	300.00	3,000.00
Cast iron drainage leaders from roof.....	150.00	1,500.00
Separate drainage system for leaders from roof, separate systems for toilets, separate system for pit drainage and floor drainage in paint shops, etc.....	400.00	4,000.00
Excavating, grading, leveling, etc.....	500.00	5,000.00
Total.....	\$13,450.00	\$134,500.00
Plus 5 per cent of above total for superintendence, incidentals, etc.....	672.50	6,725.00
Total.....	\$14,122.50	\$141,225.00
Adjacent buildings to shops, as shown, oil storage house, gate-keeper house.....		4,500.00
Total cost of buildings.....	\$14,122.50	\$145,725.00

ITEM No. 3—CRANES AND HOISTS (INCLUDING TRACKS FOR SAME).

Four 10-ton capacity electric motor cranes, 30-foot span; each equipped with two 5-ton electric hoists for handling of car bodies.....	\$7,100.00
Three 5-ton capacity span, 30-ft. hand-operated cranes with hand travelers, each \$1,250.....	3,750.00
Two jib cranes with pneumatic hoists for working over trucks, each \$1,250.....	2,500.00
680 ft. 0 in. 12-in.-40-lb. I-beam crane track.....	746.00
400 ft. 0 in. 12-in.-31.5-lb. I-beam crane track.....	378.00
Erection, wiring and incidental charges in connection with above.....	\$300.00
Total.....	\$14,774.00

ITEM No. 4—MACHINE TOOLS FOR SHOPS.

(a) Machine Tools for Machine Shops. (Motor Drive Where Feasible.)	
One 42-in. wheel turning lathe.....	\$5,460.00
One 200-ton wheel press.....	1,300.00
One 42-in. car wheel borer.....	2,285.00
One double axle lathe.....	1,860.00

One milling machine.....	1,580.00
One 40-in. drill press.....	1,080.00
One 21-in. drill press.....	225.00
One 30-in. lathe.....	1,805.00
One 20-in. lathe.....	1,180.00
One emery wheel.....	250.00
One compressor outfit.....	300.00
Six pit jacks, at \$185 each.....	1,110.00
Incidentals, tools, bench tools, etc., for machine shop.....	200.00
Total.....	\$18,635.00

(b) Tools for Armature Room.

One 24-in. banding machine.....	\$375.00
Incidentals, tools, bench tools, etc., for armature room.....	200.00
Total.....	\$575.00

(c) Tools for Forge Shop.

One punch and shears.....	\$50.00
One pneumatic hammer.....	200.00
Three forges with anvils, at \$60 each.....	180.00
One blower outfit and motor.....	250.00
One tinsmith's roll.....	50.00
Three hoods over forges and connections.....	75.00
Incidental tools, bench tools, etc., for forge shop.....	100.00
Total.....	\$905.00

(d) Apparatus and tools for brass foundry and finishing room.....

300.00

(e) Tools for Wood Working Shop.

One band saw.....	\$175.00
One rip saw and cutting-off saw.....	240.00
One combined jig saw and spindle shaper.....	200.00
One tenoner.....	295.00
One mortiser and borer.....	325.00
One 4 in. x 8 in. molder.....	460.00
One combined universal wood worker and molder.....	850.00
Improved panel sander.....	180.00
Incidental tools in connection with carpenter bench shop, shafting, etc.....	600.00
Total.....	\$4,125.00

(f) Tools for Varnish Room, Paint Shop, Upholstery Room and Buffing and Polishing Room for Metal Parts.

One huffing wheel.....	\$50.00
One compressor outfit.....	300.00
Incidental bench tools.....	100.00
Total.....	\$450.00

ITEM No. 5—HYDRANT SYSTEM.

Hydrant system, consisting of 8 outside hydrants and 10 inside valve connections to hydrant mains, all connections, necessary valves, and one 25,000-gal. pressure tank.....	\$7,000.00
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ITEM No. 6—HEATING SYSTEM.

Steam heating system, consisting of two 250-hp boilers and all necessary mains, radiators, returns, etc., complete.....	\$10,000.00
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ITEM No. 7—LIGHTING.

(a) Cooper Hewitt Mercury Vapor Type K Lamps, 700-cp each, Five in Series for 550 Volts, d.c. Circuits.	
Five in repair pit track No. 4.....	
Five in repair pit track No. 5.....	
Five in repair pit track No. 6.....	
Five in repair pit track No. 7.....	
Three over tracks 4 and 5.....	
Four overhead in machine shop.....	
Three over tracks 6 and 7.....	
Five overhead in carpenter shop.....	
Thirty-five total mercury lamps at \$30 each.....	\$1,050.00

(b) 16-cp Incandescent Lamps.

Offices, etc., armature room in connection with machine shop.....	50 lamps
Stock room.....	100 lamps
Forge shop and brass foundry.....	50 lamps
Heating plant.....	25 lamps
Carpenter shop.....	25 lamps
Varnish room, locker room, polishing room, upholstery, etc.....	100 lamps
Paint shop.....	50 lamps
Oil storage.....	10 lamps
Gate house.....	10 lamps
Total, 420 lamps at \$1.00.....	420.00

(c) D.C. Arc Lamps.

Paint shop.....	5
Exterior lighting.....	10
Total, 15 lamps at \$8.....	\$120.00
Wiring, switches, incidental expenses in connection with lighting.....	400.00
Total.....	\$1,990.00

ITEM No. 8—TRACK WORK.

(80-lb. A. S. C. E. Standard T-rail Used.)

9,500 ft. of standard gage track, including curves, special work, ties, switches and labor complete....	\$20,000.00
Six 8 ft. 0 in. turntables at rear of machine shop, \$200 each.....	1,200.00
Narrow gage track (24-in. gage), 40-lb. rail as shown complete.....	1,500.00
Total.....	\$22,700.00

ITEM No. 9—OVERHEAD TROLLEY CONSTRUCTION.

Cost complete (tubular metal poles used).....	\$3,000.00
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ITEM No. 10—OIL STORAGE.

Oil storage and distributing system.....	\$3,000.00
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ITEM No. 11—OTHER IMPROVEMENTS TO PROPERTY.

Concrete walks inside property line.....	\$1,700.00
Vitrified brick pavement in service and storage yards adjacent to tracks Nos. 3, 8 and 9 and wheel storage space at rear of machine shop; 2,000 sq. yd. at \$2.25.....	4,500.00
Gravel fill between tracks in front of buildings 12 in. deep, 2,500 cu. yd. at \$1.....	2,500.00
Wooden fence around entire property, including two entrance gates at front and one at rear.....	2,000.00
	\$10,700.00
Grand total	\$263,879.00

OBSERVATIONS ON PAY-AS-YOU-ENTER CARS BY THE MECHANICAL MAN*

BY W. H. EVANS, MASTER MECHANIC, INTERNATIONAL RAILWAY COMPANY.

As you are possibly all aware, the Montreal Street Railway Company, under the direction of William G. Ross, managing director, and Duncan McDonald, general manager, began as early as 1904 investigating the problems of reducing and preventing, as far as possible, the number of boarding and alighting accidents, and also improving the manner of collecting fares and lessening the labor of the conductor to such an extent as to avoid as far as possible the liability of its missing or neglecting to collect a fare from each passenger riding. Under the old system of fare collection it was found practically impossible for the conductor to collect all the fares and at the same time give the necessary attention to the operation of the car, particularly in starting, when he was engaged on the inside of the car.

With this end in view they made a great many experiments and from the results obtained and researches made in that direction, they designed and put into operation the first pay-as-you-enter car on St. Catharine Street, in Montreal, in 1904. This car was arranged for single-end operation, and did not differ very materially from the general make-up of the cars previously in service, with the exception that the rear platform had been lengthened to 7 ft., and on subsequent cars was even extended to 9 ft., to give better accommodations to smokers, who were permitted to remain and ride on the rear platform behind a railing which designated the place provided for smokers.

They started with one car at a time in Montreal and kept putting them on, one by one, until they reached a total of 20 cars the first year. There was very little trouble experienced with the public in introducing the pay-as-you-enter car, and what little objection there was died away in a short time and instead, the passengers shortly preferred the pay-as-you-enter car to the old type car, as it was more comfortable in many ways, and the passengers were not subjected to any annoyance after they had once paid their fares and entered the car; and the results in that city, I am advised, have been very satisfactory throughout.

While we are indebted to the officials of the Montreal Street Railway Company for originating and developing the pay-as-you-enter car as applied to their system, I am inclined to think really, the forerunner of this system was that which was inaugurated by the Twin City Rapid Transit Company as early as 1894, in Minneapolis and St. Paul, when it applied what has become commonly known as the Minneapolis gates, as these avoided to a very large extent the boarding and alighting accidents, and made it possible for the conductor to collect the larger proportion of the fares on the platform, and a very small percentage, if any, was missed in collection. In fact, I am advised that the installation of the safety gates by the Twin City Rapid Transit Company reduced the number of accidents, occasioned by boarding and leaving moving cars, from 1655 in 1894 to 349 in 1896, this improvement being entirely due to the installation of the safety appliances. Record further shows that over 50 per cent of the amount expended in the settlement of claims by the claim department during

the year 1894 was for accidents which come under the above classification. This arrangement of gates has also given the conductors in these cities a considerable advantage in collection of fares, since they were in a much better position than the employees of most roads, in that every one had to pass the conductor, both in boarding and alighting from the car. You will readily see, however, that in both of these instances the operation of the cars was for the single-end system.

While we are indebted to the Montreal Street Railway Company for originating and developing the pay-as-you-enter idea, I think that possibly more credit is due to the officials of the Chicago City Railway Company and the International Railway Company, of Buffalo, but especially to Mr. Thomas E. Mitten in particular, for having developed in every detail the pay-as-you-enter car for double-end operation, and of a design now well known, as well as having the courage to inaugurate the pay-as-you-enter system, widely differing from the previous manner of fare collection, in cities of such complex populations as Chicago and Buffalo.

During the year 1907 the Chicago Railway Company inaugurated the pay-as-you-enter system with 300 cars, and is now preparing quite an additional number, and the International Railway of Buffalo commenced with 50 cars in the same year and is now changing over 100 of its regular cars to the pay-as-you-enter type. Early this year the Metropolitan Street Railway system of the New York City Railway Company placed 155 cars in operation, which are almost identical in construction and detail with those used in Chicago and Buffalo, and I am advised have given very general satisfaction. The Public Service Corporation of New Jersey has introduced the system in Jersey City and Newark with 150 cars, these cars, however, being arranged for single-end operation, after the general plan of the standard cars of that company. I am advised that a number of the larger systems in the country are considering the matter of inaugurating the pay-as-you-enter system, and, in fact, I understand that some of our most conservative companies have some pay-as-you-enter cars already under construction.

In the inauguration of the pay-as-you-enter system, as well as with almost any other innovation in the operation of public transportation facilities, it is very necessary that the operating and mechanical departments work closely in touch with each other in order to develop to the highest degree that which will best suit the purposes desired, and I am inclined to think that the success of the pay-as-you-enter car thus far is largely due to the fact that the above has been the case in the developing of this new system of pay-as-you-enter. You will readily observe that in the operation of cars for the double-end service, as is the case in Chicago, Buffalo and New York, considerably more difficulties were encountered, and details had to be worked out in order to provide for reversing the car and make each end equally adapted for the purpose of the motorman or conductor alike, alternating and arranging each end of the car each time it is reversed for the purpose of facilitating the boarding and alighting of the passengers. Following the plan as originally adopted by the Montreal Street Railway Company, a much longer platform was adopted for the purpose of accommodating as many as possible of the passengers who would board the car at one time, as well as to provide for the accommodation of smokers, which was taken care of at the motorman's end of the car.

On our regular pay-as-you-enter cars the platform was made 6 ft. 11 in. long on the inside, which makes quite a roomy platform, some 15 in. longer than the platform of our older type cars which we are changing into pay-as-you-enter cars, these being 5 ft. 8 in. on the inside. In both cases practically 8 in. or 10 in. of the rear end of the platform is taken up with the controller, folding doors, braking arrangement, etc. I am frank to say that so far as our experience has gone with the cars changed over, the shorter platform gives very good satisfaction with the pay-as-you-enter arrangement. The extra length necessarily added considerably to the weight of the platforms and to the difficulty of properly supporting them, and from experience gained in operating cars in Buffalo, it has been found that passengers board and pass into the body of the car very

*Paper read at the Niagara Falls convention of the Street Railway Association of the State of New York, June 30, 1908.

much more rapidly than was the case with the old system, thus rather demonstrating that it is rather unnecessary to provide an exceptionally long platform for the purpose of caring for any extra large number of people who will want to board the car at one point.

There is also considerable question as to how much extra platform should be provided for the purpose of accommodating smokers, as on many trips at certain times of the day it is practically impossible to provide for all those who will care to smoke and at other times few, if any, avail themselves of the privilege of smoking on the platforms. Previous to the inauguration of the pay-as-you-enter car in Buffalo, smoking was not permitted, and, in fact, is not now permitted on any other cars, with the exception of the four rear seats on open equipment and regular smoking compartments on interurban cars.

It is a very serious question and worthy of very careful consideration to what extent and extra expense a company should go in order to provide for the accommodation of passengers who desire to smoke on the platforms of our cars; as stated above, it introduces considerable mechanical trouble in supporting the platforms, as well as serious problems of properly cleaning and ventilating the cars.

If it is considered desirable to maintain these excessively long platforms it will no doubt be necessary to go to steel underframe construction in order to get sufficient strength without unnecessarily increasing the weight of our cars; in fact, this, no doubt, will be the result of a few more years' development in the street-car business, and steel will enter very largely in the construction not only of the elevated and subway cars, as at the present time, but also of the surface cars.

With the improvement in pressed steel shapes and in regular commercial forms it is possible to very materially increase the strength of our platforms and the car bottoms generally by the use of steel without increasing the weight, and, in fact, with a considerable reduction in weight; and this should be the object of car builders at the present time—to design a car which will accommodate the maximum number of passengers with the least amount of dead-weight load.

On account of the efforts being made to reduce the weight of cars as well as to simplify the operation of equipment, and particularly in connection with the pay-as-you-enter system, it occurs that this is a most opportune time for a company to inaugurate equipment arranged for the single-end service, where the conditions and cities in which they operate are such as will permit this arrangement, as with comparatively slight expenditure for the necessary track arrangement, which will facilitate the operation of cars on the single-end plan, a very decided improvement can be made in the reduction of the weight of cars, and in designing a stronger, more comfortable and a generally more satisfactory car than can be arranged for in double-end operation.

This saving in the construction per car will easily offset the expense for the rearrangement of the tracks to permit single-end operation, and, in fact, most cities are so arranged that with slight changes, single-end operation can be installed with very little expense. This is the case with some of the pay-as-you-enter cars at the present time operated in Chicago, and also on the Niagara Street line of Buffalo, where the cars make a loop at each end of the line and run continually from one end, except in case of interrupted service on the lines.

The entrance and exit arrangement for the pay-as-you-enter car should necessarily receive very considerable attention and preferably be under control of the motorman and conductor, permitting the passengers to alight only when the exit doors are open for them. In all probability later on a system will develop which will permit passengers to board the cars only when some character of gate arrangement is open to admit them, thus making the car absolutely safe from accident at all times when it is under motion.

A great deal of care and study has been given in connection with operating devices on the pay-as-you-enter cars in order to reduce the liability of accidents to a minimum as well as to insure the greatest comfort to the passengers.

In the inauguration of the pay-as-you-enter cars not the least important feature is the system which is to be installed

for the collection of fares, by many considered the all-important feature. I am, therefore, pleased to direct your attention to what is called the Buffalo idea of fare collection, inaugurated when the pay-as-you-enter cars were put in service on Niagara Street, Jan. 5, 1908, and which has given such excellent results that the officials are more than pleased with the system, notwithstanding it is radically different from anything of the kind which has been previously used on the platform of a surface car. This arrangement consists of a fare box, or car safe, as it is called, with a suitable receptacle for receiving fares at the top with a tripping device from which they are dropped into an inner cash box, where the fare is securely deposited until it is conveyed directly to the counting table in the treasurer's office. The small cash boxes are received from the treasurer's office unlocked, and in that position are placed on the inside of the car safe and receive all the fares collected on the car from the time it goes into service until it is returned to the car station, when the cash box is taken out of the safe by the receiver and deposited in the station-master's vault until it is conveyed to the treasurer's office. The detail of the mechanical work of a safe of this character must be such that it can be operated and subjected to the severest treatment without getting out of order, and in the case of the Buffalo boxes this has been done to a very satisfactory degree, and a fare collected goes directly from the passenger to the treasurer's office.

There is manifestly no occasion for the fare register and consequently this troublesome mechanism is dispensed with as well as the register brackets, cords, etc., which, when removed, gives a more pleasing appearance to the interior of the car, as well as avoiding a considerable annoyance from the operation of the register by the conductor; in fact, this system of fare collection has met with generally satisfactory approval, not only by the riding public, but by the press as well, and naturally the officials of the International Railway Company are very much pleased over the success of this rather novel system of fare collection on one of the most important lines in the city. Not the least important result is the disposition of the platform men themselves in regard to this system of fare collection, as it has been most enthusiastically received by the men, from the fact that it very materially simplifies and reduces their work and practically eliminates all the disagreeable features which have made their life a burden for years.

The moral advantage of this system of collection is self-evident, not only from the fact of removing entirely from temptation the employees of the railway company, but as well as to educate the public generally to the observance of one of the most important legal restrictions which has almost become a dead letter in many localities so far as the payment of street-car fare is concerned, in that it is very difficult for many people to connect the fact that they have failed to pay their street-car fare with the particular commandment which says, "Thou shalt not steal!"

THE PAY-AS-YOU-ENTER CAR FROM AN OPERATIVE STANDPOINT *

BY CHAS. A. COONS, SUPERINTENDENT OF TRANSPORTATION,
INTERNATIONAL RAILWAY COMPANY

While yet in its infancy, it would appear from the results obtained thus far that the pay-as-you-enter car and the Buffalo system of fare collection are no longer experimental, but, on the contrary, can be considered a tried-out and well-proven success, and we expect that before many months have elapsed our entire Buffalo service will be of the type of the "pay-as-you-enter" car.

At the time this system was proposed there was an unlimited amount of skepticism and conjecture as to the outcome, but, with the methods that we applied in Buffalo, the results so far achieved have been very gratifying to say the least, considering the depression in business which obtained in our city in common with many others.

However, at the outset, in the writer's opinion, wherever the system is to be introduced, in order to make the P-A-Y-E car a success from an operating standpoint, there

*Paper read at the Niagara Falls convention of the Street Railway Association of the State of New York, June 30, 1908.

are numerous requisite essentials to be kept in mind before inaugurating a change from the old to the new style of equipment, chief among which are special instructions to conductors and motormen, which should clearly set forth the necessity for intelligent co-operation with the management of the company in order to obtain the good will of its patrons.

For the exclusive use of our trainmen, we issued thorough and self-explanatory instructions in book form, containing various necessary cuts to convey proper understanding of objects sought. These instructions were distributed among the trainmen by one of our old and experienced conductors, who acted as a demonstrator while making the distribution, going into all details in a most thorough manner.

In addition to these instructions to trainmen, folders containing photographs and cuts were distributed among our patrons along the line in advance and during the inauguration of the change in equipment. These folders showed the correct position of conductor on car, the entrance and exit portions of platform, a passenger depositing fare in the receiver, the proper movement of passengers when entering or leaving car, and the place provided for smokers. Special effort was made to attract attention to the good points of the car, such as the elimination of jostling of passengers by the conductor in crowding through the car to collect fares, the reduction of accidents, and better ventilation. The co-operation of our patrons was earnestly requested by us in asking passengers to enter car at rear, or entrance portion of rear platform, back of dividing rail; by having the exact fare in hand before boarding car, and depositing same in receiver while passing to interior of car; by having transfers unfolded when presenting same to conductor, and making requests for transfers from conductor at time of paying fare, and by alighting from car at front exit as much as possible.

We have found that the P-A-Y-E car has become highly popular with our patrons and employees operating them, the sentiment in this respect having been very emphatically expressed by our patrons and employees, as well as the public press. This is further demonstrated by the fact that they are now demanded by patrons using the other lines not so equipped. We are now extending our efforts and endeavors with a view of satisfying the traveling public by placing at their disposal a car in which it is a pleasure to ride and a system of fare collection which would be objectionable to none; hence, why have we not found a panacea for the betterment of transportation service (which should be our constant aim), and why are we not entitled to the gratitude and good will of our patrons in general as a result of the adoption of the P-A-Y-E type of car?

Among the various advantages and merits of the P-A-Y-E car from an operating point of view, I might mention the following:

1. The increase in revenue due to fares previously missed and otherwise appropriated, and which are now dropped into the receiver and fare box. With the use of the fare box there is no middle man to handle and account for the company's cash, and there is no change left over in the pocket of the negligent conductor, as occurs with the present method of accounting by the use of the registers now in operation on a great many lines throughout the country. It is the change found in the pocket of the careless conductor, after making settlement of the first day's work that sows the seed of his future dishonesty and so vitally affects our earnings. This we believe is what the fare box is overcoming; it takes the temptation out of the conductor's hands; it gives him encouragement in his work and sets a higher standard of integrity; it allows him to devote his time to the safety of his passengers and the issuance of transfers, and he is also able to closely scrutinize the fares deposited in the receiver, and immediately correct any mistakes which might occur and thereby assist in reducing complaints to a minimum, while, perhaps, the question of most importance to the company is solved by our knowing that the fare of every passenger deposited in the receiver of the fare box reaches our counting room. Fares formerly overlooked by the conductor because of his inability to do the work required of him are now certain to find their way into the treasury of the company, and thoughtless, if not dishonest, patrons no longer are entitled to avail themselves of free

transportation by feigning earlier payment. With the use of modern equipment this advantage gained by the P-A-Y-E car outweighs perhaps all others, and the success of the car in Buffalo is largely attributed to the type of fare box approved and used by us in connection with the car.

2. The increase in speed due to cars being able to take on and discharge passengers simultaneously; a clear rear platform to accommodate at least twenty passengers at all times, who, after paying their fares, immediately pass to the interior of car.

3. The decrease in regular cars operated, which necessarily decreases the mileage as well as the number of car hours.

4. The decrease in accidents, due to the presence of conductor on the rear platform at all times to prevent passengers from alighting from a moving car or from starting car while passengers are boarding, while the front exit door is controlled by motorman, who brings the car to a full stop before the exit door is allowed to be opened, and who sees that passenger is clear of step before starting the car upon signal (two bells) from the conductor.

5. The alleviation of conditions leading to the jostling, crowding and other discomforts to passengers formerly caused by conductor pushing through to collect fares, etc.

SIGNALS FOR INTERURBAN AND LOCAL TRAFFIC *

BY F. B. HARRINGTON, ASSISTANT TO SUPERINTENDENT, NEW YORK CENTRAL & HUDSON RIVER RAILROAD

In order that the various terms used may be understood, it is desirable to give a few definitions.

Block.—A length of track of defined limits, the use of which by trains is controlled by block signals.

Absolute Block.—A block in which but a single train is allowed at any time except on instructions from the division superintendent.

Permissive Block.—A block which two or more trains are permitted to occupy at the same time on proper authority from the signalman.

Block System.—A series of blocks.

Telegraph Block System.—A block system in which the signals are operated manually, upon information by telegraph.

Automatic Block System.—A block system in which the signals are operated by electric, pneumatic, or other agency actuated by a train, or by certain conditions affecting the use of a block.

The merit of the "absolute block" is that but a single train is in the block at a time, consequently collisions caused by one train overtaking another are impossible. "Absolute block" may be maintained by the use of the telegraph, telephone, bell and "lock and block" systems; in the latter case the signals are controlled electrically and operated manually.

It has been believed that there was no question as to the desirability of maintaining absolute block, but it will readily be seen that, as it is necessary to station "signalmen" at each set of signals, the wage question is a very serious one. In illustration: With a road 50 miles in length divided into 5-mile blocks, it would be necessary to employ 33 signalmen at a salary of \$60.00 per month each, which would mean a fixed charge of \$23,760 per month for operation of signals, which to most roads would be prohibitory. If the general characteristics of the road were such that the men must be employed, and they could devote sufficient time to the blocking, then the item should not be charged against the signals and it might then be desirable to use this system. It is seldom, however, on electric roads that it is necessary to have men constantly on duty at sufficiently frequent intervals, and the "absolute block," with the exception of the "lock and block," is dependent upon human fallibility.

During the past few years permissive blocking as typified by the automatic block system, has been growing in favor. This change in sentiment of signal engineers is due to a number of things, among which may be mentioned the perfection of the power operated semaphore signal, the im-

*Abstract of paper read at the Niagara Falls convention of the Street Railway Association of the State of New York, June 30, 1908.

proved system of circuits, the desire to reduce the human element to a minimum, and, not least, the demand for a system that would increase the capacity of a road at a reasonable operating cost.

In the case of the "telegraph block" and kindred systems, the blocks range from 1 to 30 miles in length, averaging about 5 miles. With the "automatic block system" the length of blocks range from 1800 ft. to 2 miles, averaging 1 mile. It will be seen from this that the automatic system greatly increases the capacity of a road.

In 1892-3, the New York Central was equipped with the lock and block system. The average length of block was about 1½ miles from New York to Albany, and 3 miles from Albany to Buffalo. It was frequently found, with the slow moving freight trains, that before one train passed through a block another had arrived at the entrance and was delayed. For this reason, on the freight tracks, it was necessary to make the blocks permissive and give the signalmen authority to forward trains past signals indicating stop. This was bad practice and did not materially reduce the detentions. In the spring of 1907 the installation of automatic signals on the freight tracks was commenced. Since then the two freight tracks for a distance of 60 miles have been equipped, and instead of 3-mile blocks we now have blocks that average 1 mile in length, while some of them are but 4200 ft. long. The signals used are typical automatic block signals carrying a distant signal blade on the same mast, and it has been found that the capacity of that part of the road has been trebled.

The only obstacle of any magnitude that is met in signaling electric roads is the track circuit. On account of using the running rails for the return direct propulsion current, it is practically impossible to use low voltage d. c. track circuit; therefore, it is necessary to turn our attention to the use of alternating current for this use. Very little had been done toward perfecting a. c. devices until about ten years ago, when the signal companies began to turn their attention to the needs of the electric roads, with the result that a number of the leading signal companies have a. c. systems that they are ready to install and guarantee.

Most cities have such speed regulations that, when they are observed, accidents are impossible. Yet on those roads where "single" track is in use it would seem necessary that some form of signaling be used. You are all familiar with the type where a car is stopped, the conductor or motorman goes to a small box at the side of the street and throws a handle lever which gives current to a bank of lamps at the next turn out or beginning of double track. Later practice is to have this work done automatically. With one of these systems, when one or more cars enter a block section, the signals at the opposite end automatically give a stop indication and continue to give that indication until all cars have passed through the block and the way is again clear. In case cars attempt to enter opposite ends of a block simultaneously the signals at each end would indicate stop, and in this way protection would be afforded.

It is generally acknowledged that a wise man insures his life and property. This being so, is it not a logical conclusion that railroads should insure themselves? Block signaling is one form of insurance. An accident which takes human life often costs a railroad company more than an up-to-date system. The loss is felt not only in the claim department, but in the loss of prestige. As individuals you believe in insurance for yourselves, as officers of railroads should you not believe in insuring them by the use of an adequate signal system?

Not only has it been found that block signals are desirable from a safety standpoint, but faster time can be safely made, and those delays that are the demoralizing factor in any fast service will be reduced to a minimum.

All interurban and single track railroads should be equipped with some reliable form of block signals.

THE PROPER HEIGHT OF CITY CAR STEPS *

In considering the question of recommending a standard for steps of cars, your committee has held several meet-

ings, and so far as the question might relate to cars now in use has been unable, on account of the greatly varying conditions found on many roads, to come to any decision which would be of practical value, as it is very evident that at least the roads which have been represented at the meetings, and undoubtedly all other roads, have individually given the matter careful consideration from the standpoint of having cars as easy and convenient of entrance and exit as the conditions existing at the times when cars were designed would permit. Your committee, while considering the matter, has taken into consideration also the fact that this question has become one in which the public is taking an interest, and for this reason it may not be out of place to recall to mind some of the factors which have been responsible, to a large extent, for conditions which at first thought may seem to have been merely the result of inattention on the matter of convenience to the public.

In considering many of the pertinent questions of street railroad operation as it exists to-day, it is necessary to go back to the days of the horse car and recall the great evolution which has taken place in the matter of transportation in cities, and the bearing which former conditions had on present conditions. Notwithstanding the fact that greater advancement has been made in transportation facilities within the past 20 years than in most any other public conveniences which can be mentioned, the development has not always been along the line which required and should have had first attention. Prominent among such matters is that of the distance between track centers in streets. If it could have been realized years ago of what enormous importance the question of transportation in the streets of cities would become, and the large bearing on many matters in which the distance between tracks would become practically the controlling influence, undoubtedly the matter would have received the consideration which it deserved. At present, however, probably the majority of roads have their tracks spaced practically the same as in the horse-car days, while nearly every other condition in connection with operation and equipment has been cast aside or developed to suit prevailing conditions, until to-day we find scarcely a resemblance between the original electric cars and those which are now considered as being suitable for present requirements. So long as only single-truck cars were in use, there was no difficulty in so proportioning the dimensions of steps that no passenger was seriously inconvenienced in entering or leaving a car, as it was possible to use such diameter of wheel as might be necessary to give reasonable clearance for motors above the pavement, and still keep the floor of car at practically the same height above the street as formerly by allowing the wheels to project above the floor under the seats and be suitably boxed in. With the advent of the double-truck car in cities, the condition became very different. Even when motors of the same size were used, as had been in use under the single-truck car, permitting the use of the same size of wheel, it was necessary to raise the car body to a point which would allow the wheels in turning curves to swing clear of the car sills. This amounted to several inches in most cases. Again, it sometimes becomes necessary in the construction of such cars to provide truss rods to stiffen the sills, and in such cases it was necessary to again raise the car body sufficiently to prevent the wheels striking the truss rods in turning curves. It is evident that if the distance between truss rods on each side of the car had been greater, allowing wheels to swing without coming in contact with the truss rods, that raising the car body on account of the latter reason would be unnecessary, but this in most cases is impossible because of the limitations on width of cars due entirely to distance between tracks. With the necessary raising of car body came the matter of height of car steps, and designers of cars were forced to adopt such dimensions as seemed most convenient and possible. As the type of truck, size of motors and general design were fast changing, it is easily conceivable how the various arrangements of steps have followed, each designer striving to meet, in the best way possible, the conditions as they were presented in each case.

In the case of closed cars, it has been possible to keep within limits which seem to be reasonably convenient for passengers generally, and we feel warranted in making the recommendation that in the design of cars to be built in the future for use in cities the height and rise of steps be,

*Committee report presented at the Niagara Falls convention of the Street Railway Association of the State of New York, June 30, 1908.

measuring from the top of rail, not more than 17 in., from step of platform 14 in. and from platform to floor of car not more than 10 in. In no case do we consider the use of two steps from street to platform advisable.

In the case of double-truck open cars the conditions become more difficult, for while the height of the car floor would suggest the use of two steps, we are at once met by the earnest protest of managers and claim departments to the adoption of two steps on account of the greatly increased danger of accident to passengers, particularly when leaving such a car, which this committee believes is warranted, and which the greater inconvenience of having one step would not justify. Again, the width of track centers is the controlling condition by limiting the width of car body, making it necessary to so design steps that the truck frame as well as wheels in swinging at curves will have clearance under the step.

In the case of open cars, so much depends upon the size of motors, condition of roadway over which cars run as affecting clearance above rails and maximum allowable width of car, that your committee feels that perhaps the only reasonable recommendation which can be made is that in all cases the distance from rail to step be made as small as possible, and that the height from step to car floor be not more than 17 in.

In selecting trucks for open cars, other conditions being equal, it should be kept in mind that the minimum diameter wheel and shortest wheel base will permit of the least distance from rail to step, but as these are matters which must be controlled according to specific conditions of operation, we do not feel warranted in making a recommendation which obviously could not apply generally.

EXPRESS RATES*

BY ALBERT EASTMAN, GENERAL PASSENGER AND FREIGHT AGENT, UTICA & MOHAWK VALLEY RAILWAY COMPANY.

I find in going over the very complete and instructive data gathered together by the committee on freight and express that practice in rates varies perhaps more than in anything else in the transportation of freight and express matter over electric railways. Possibly no uniform or standard form could be adopted in compiling express and freight tariffs; still I believe it would be to the interest of all electric railway companies engaged in this kind of traffic to adopt a more uniform tariff sheet if for no other purpose than to make the filing with the Public Service Commission more uniform.

In going over the 20 tariffs filed with the committee, I find the following variations in classification:

- Individual classifications naming rates on certain commodities per package or per 100 lb. 4
- Official classification with exceptions thereto. 3
- Modified form of official classification using possibly first and second class rates only. 3
- Classification based on principle of the old line express companies, with a flat merchandise rate per 100 lb., with exceptions and special commodities. 7
- Straight official classification 3

The general system of transacting business also varies considerable. Thus:

Three companies make delivery from car to consignee, provided consignee's place of business is located along line of track.

Eleven companies make no provision for delivery. I assume goods are delivered at warehouse or to draymen, who deliver shipments at consignee's expense.

Six companies provide for pick up and delivery on a graduated scale rate, making a distinction of rate as to service performed, namely: rate covering pick up, transportation and delivery; transportation with wagon service at one end, and transportation without wagon service. I do not think any recommendation could be made on this matter as each company has no doubt adopted the system best adapted to its territory, competition and requirements.

I have been requested to make a comparison of the rates charged by the different companies on a ton-mile basis. In doing this I have compared rates without consideration of

whether a pick up or delivery service is given. If I should submit in figures the result of this comparison; the statement would be very misleading and would show that a company, with a few miles of track, was getting a much higher rate per ton-mile than another company with considerable mileage. This is because a 5-mile haul at a rate of 10 cents per 100 gives a rate of 40 cents per ton-mile, when possibly the same commodity would be hauled 50 miles at a rate of 20 cents per 100, giving a rate per ton-mile of 8 cents. If the 5-mile rate was taken as a basis the 50-mile haul would amount to 10 times as much as a 5-mile haul or \$4 per ton-mile. It can therefore be clearly seen that the length of haul controls the rate per ton-mile. To make a comparison, I have taken five standard commodities that are usually handled by all transportation companies, viz.: beer, fresh meats, oranges, flour and household goods. After having arrived at the rate per ton-mile on each of these commodities I have taken a general average and arranged the companies according to mileage and average rate per ton-mile.

COMPARISON OF AVERAGE RATES IN CENTS PER TON-MILE FOR HAULS OF DIFFERENT LENGTHS.

	Miles.						Average.
	1-5	5-10	10-20	20-30	30-40	40-50	
Oneida Ry.	96	42	37	..	..	17	.. 48
Electric Exp.	56	28	21	..	16	..	.. 30.5
Schenectady, Roch. & Sodus B.	54	31	17	..	10	..	.. 28
Utica & Mohawk Valley.	57	28	17	..	11	..	.. 28
Syracuse R. T.	30	25	..	..	..	..	.. 27.5
Buffalo & Lake Erie. . . . .	..	..	..	..	..	..	.. 23.6
Roch. & Eastern.	54	27	16	..	10	10	.. 23.4
Auburn & Syra.	43	20	14	10	..	..	.. 21.7
International Ry.	37	23	11.2	8.8	..	..	.. 20
Chautauqua Tr. Co.	31	17	17	11	..	..	.. 19
Binghamton Ry. . . . .	..	8	..	..	..	..	.. 16
Hudson Valley.	25.6	25.6	..	9.4	..	8.2	7.8 15.2
Oneonta & Mohawk Valley.	30	..	10	8	8	..	7 12.6
Cortland Co. Tr. Co. . . . .	..	8	..	..	..	..	.. 8

Average rate per ton-mile on steam railroad for the same five commodities for the hauls given below are:

10 miles.	18 cents.
50 "	5.6 "
100 "	3.8 "
200 "	2 "
400 "	1.6 "

A number of the electric railway companies have adopted a minimum charge of 10 cents per shipment, but unless competition absolutely requires it, I do not think the minimum charge should be less than 15 cents per shipment and it should be 25 cents when possible.

As the statement covering the average rate per ton-mile is based on the tariff sheets and not on actual business transacted, it might be well to ask the various companies to supply for at least one month a statement giving particulars of traffic handled per ton-mile. This information could be obtained from abstracts and would enable the committee to make a comparison based on the actual business handled.

BLANKS AND FORMS USED IN THE FREIGHT AND EXPRESS BUSINESS OF ELECTRIC ROADS*

BY J. C. COLLINS, JR., SECRETARY AND AUDITOR ROCHESTER & SODUS BAY RAILWAY.

In analyzing the freight and express business, one thing which has greatly impressed me is the difference in the forms used by the various roads. A considerable amount of standardization should be done to evolve a system that shall be sufficiently elastic to cover all roads and all conditions. With this end in view I sent to all roads in New York State for copies of their blanks, and received samples from the following:

- Auburn & Syracuse Electric Railroad Company.
- Hudson Valley Railway Company.
- International Railway Company.
- Rochester & Eastern Rapid Railway Company.
- Rochester & Sodus Bay Railway Company.
- Schenectady Electric Express.
- Syracuse Rapid Transit Company.
- United Traction Company of Albany.
- Utica & Mohawk Valley Railway Company.

These forms have been assembled and are on exhibition here, arranged according to their use and also according to the issuing company.

*Paper presented at meeting of Street Railway Association of the State of New York, Niagara Falls, Ont., June 30.

*Paper presented at the meeting of the Street Railway Association of the State of New York, at Niagara Falls, Ont., June 30.

It is my intention to give a short description of what I think are the best forms in this collection, not because they cannot be improved, but to bring to your attention the best features of each. An important point to be considered is the difference in operation. For instance, a city company operating with an express messenger on a car would not need so elaborate a system as a large interurban road operating through towns with agents. It is cases like these that we want to harmonize, so that the primary blanks will be the same for all companies.

Shipping Receipt—A question which arises about this form is whether it is best to have separate receipts for freight and also for express, or a combined receipt covering the different classes. If a combined form is to be adopted, those of the Utica & Mohawk Valley Express, the Rochester & Sodus Bay Railway Company and the Rochester & Eastern Rapid Railway Company are good, although some improvement could possibly be made in them. Should a regular bill of lading be adopted for freight, that of the Hudson Valley is a good sample, as it is a steam railroad form. A regular receipt should be adopted in duplicate book form for the express service; for instance, a copy of that used by the American Express Company. This would probably be more satisfactory to the shippers, as each kind of business would have its own proper receipts, for while it is called "express" on account of the quickness of delivery, we are really doing a light freight and express business. The Rochester Railway has a good form of special receipt for customers who want quick wagon service and wish to avoid the trouble of making a separate receipt for each shipment. One blank is used, for instance, if a baker ships to 10 customers each day.

Way Bills—Of these we have 11 samples. None is standard, but all can be made so. I find consignees frequently object to giving a receipt on the way bill because it shows their competitors what goods they have just received. This is a valid objection, although it is easier in a good many cases to take the receipt on the way bill. Not counting this objection, the form of the Rochester & Sodus Bay Railway Company and that of the Fonda, Johnstown & Gloversville Railroad are very good. The way bills should be in impression books and in two sizes, to save paper and work in case of a small number of shipments.

Expense Bills—Of these we have eight samples, all quite similar. The form submitted by the Utica & Mohawk Valley Express is very good and covers all detail. Some of the blanks should have more lines.

Registers of Way Bills—The companies submitting these are: Hudson Valley Railway Company, International Railway Company, Utica & Mohawk Valley Railway Company, Rochester & Sodus Bay Railway Company, Rochester & Eastern Rapid Railway Company. The forms used by the last three companies are the best. These forms are not essential with all companies, but should be used where regular agencies are established.

Abstract of Way Bills—All companies show this kind of form. Personally I favor those used by our companies—the Rochester & Sodus Bay Railway Company and the Rochester & Eastern Rapid Railway Company. They were adopted last January for daily use and are sent in each day to the auditor, together with copies of the way bills to be checked against each other. We have found this both economical and satisfactory, and it keeps us in daily touch with the actual business. Formerly we had a weekly abstract, but there was often trouble in getting it in promptly because our agents were on commission. Our agents prefer doing this work daily, as it takes less time than if allowed to accumulate.

Correction notices have been received from five roads. The Rochester & Eastern Rapid Railway form is the same as that used on the Sodus line, and is exceptionally good. All embody the same ideas, however, and it is simply a matter of arrangement.

Cash books are shown by three roads and all are practically the same. On the Rochester & Sodus Bay and the Rochester & Eastern the receipts and disbursements are on one page, while on the Utica & Mohawk Valley a separate page is used for each. A cash book is important where there are agents. I should like to know how the other roads take care of these accounts unless they have cash books which they have not submitted.

C. O. D. envelopes are submitted by six companies, and in general are the same. This will be one of the easiest forms to standardize, and it should be done at once.

Remittance Envelopes—Some good samples are submitted of these. I do not think it is absolutely necessary, however, to employ a special envelope for express. An envelope like that of the Rochester Railway Company is used for all remittances on our lines, the agents filling in the data necessary. This is a good point, as it saves trouble.

Delivery slips are shown by most companies. That used by Oneida Railway Electric Express is an exceptionally good one, and is the same as that of the Utica & Mohawk Valley Express. The space for articles, however, should be larger, to save confusion and error, and could be made without increasing the size of sheet by taking the space used by in-trip and delivery.

Call Books—The only one submitted is from the Utica & Mohawk Valley Company. It is the standard form used by express companies, and is good if companies wish to use a printed form. I understand that most companies, however, use a plain book.

Balance Sheets and Monthly Reports—Of the balance sheets submitted I like those of the Sodus Railway (which is the same as the Rochester & Eastern) and those of the Utica & Mohawk Valley best. Of the two I prefer those of the Rochester Companies, as they give all detail by days. I also like our Unpaid Bill Statement, which we find very useful in checking up balances, as it shows why settlements are not made. It is also useful in case goods are not delivered. It is kept in agents' report books, a sample of which is submitted. There is too much difference in these forms at the present time. In our companies we have made them all of about 8 in. x 11 in., which is a very convenient size for blanks.

Miscellaneous Forms—Under these headings are shown several good forms, the principal ones of which I will describe. They are:

1. Receipts for way-bills and express.
2. Remittance slips.
3. Conductors' way-bills of milk.
4. Correction notices.
5. Purchasing blanks.

A receipt for way-bills and express is used by the Utica & Mohawk Valley Railway Company. It is put up in duplicate in book form, is filled out by conductors, and is used when the car is employed for express only. Just before arriving at a station the conductor enters all the way-bills for that station on this form. It contains 21 lines, showing where the express is from, way-bill number, destination, weight, net charges and time received. All way-bills are receipted for by the agent. The advantage of this form is that at the end of each day totaling of the form shows the total of the business done by each car each day. The form is sent daily to the general express agent, enabling him to know promptly the day's business without waiting for it to go through the auditing department. At the same time the general express agent can give a summary of the previous day's business to the general manager the first thing in the morning.

The Rochester & Eastern and the Rochester & Sodus Bay lines use simply a way-bill receipt book because express matter is carried on nearly all cars. We find a receipt for way-bills useful in tracing in case of loss or delay.

Remittance slips are an important form, especially for the agent, and should show the details of money sent in. A particularly good form is that of the Utica & Mohawk Valley Company, which is got up in book form with three stubs, one of which remains in the book. The other two are sent to the cashier, who receipts. The cashier keeps one for his files and returns the other to the agent, who files it opposite the original stub. In connection with this form I suggest that an advice slip to the auditor be attached, making four stubs in all. This would enable the auditor to have a proper check on agents' remittances, and would be useful in auditing accounts and reports. Utica & Mohawk Valley Form E-557 embodies this idea, and we shall probably adopt this form. Being in book form, it is safer than if the sheets were loose. I might say that this form was very useful a few years ago in checking up an agent's error in regard to the amount of a certain draft said to have been deposited in the bank.

Conductors' Way-bills of Milk—This form is in use by our companies, and is very serviceable. The conductors of most trains pick up milk and make out two of these reports, sending in one to the agent and the other to the auditor, with tickets to check the report.

Correction notices are necessary on large systems. In the exhibit are forms which speak for themselves.

Purchasing Blanks—This form is one of the methods used to secure business for the express company, and Utica shows a good form and envelope. It is in book form. One side of the book is stamped, say, "Utica;" the reverse side, say, "Clinton." The book is placed in an envelope with a slit which shows the station or town it is from and is given to a passenger conductor, who places it in a receptacle provided by the company. The driver picks up the book, delivers the order to the different firms, and if the order is not filled at once the driver calls later. Each order is signed by the firm receiving the order, and the time of its receipt is entered.

Syracuse Rapid Transit Company—Only three forms are used in the transaction of this company's business, viz:

Receipt given for shippers, known as shipper's receipt, or bill of lading, and

Billing is done on car, on duplicate register.

Delivery is made from the car, and collections are made by the conductor, who also obtains a receipt from the consignee of the goods delivered. Settlement is made daily by the conductor, who remits for all money collected. The territory served and the amount of business transacted would not warrant any more complicated reports. The adoption of this method saves having a regularly appointed agent at stated places on the line of the road, thus making a considerable saving in operating expenses.

THE COST OF OPERATION OF THE FREIGHT AND EXPRESS DEPARTMENTS*

BY F. J. WALSH, GENERAL FREIGHT AND EXPRESS AGENT, SCHENECTADY RAILWAY COMPANY

The cost of operation depends largely on the manner in which the business is conducted, and as the companies are using different methods, it is hard to make comparisons. For instance, one company may handle nothing but freight, thereby doing away with drivers and other stable expenses. Another company will handle both freight and express and have a complete stable outfit picking up and delivering freight. Still another will do the same thing, but instead of maintaining horses and wagons will let out its team work or delivery on a contract, either by the day or by the ton, or on a percentage basis.

The figures given in the table¹ are for the 10 months ended Oct. 31, 1907, and are for nine companies.

The total operating expenses per car-mile vary from 20 cents per car-mile to \$1.02½ per car-mile. The company that operated for 20 cents per car-mile earned gross 44¼ cents per car-mile, while the company that operated for \$1.02½ per car-mile earned gross a fraction over \$1.28 per car-mile. The company with the operating expense of \$1.02½ per car-mile earned 1½ cents net more per car-mile than the company which operated for 20 cents per car-mile. There was also a large variation in the mileage—196,602 miles for one company against 30,515 miles for the other. As the tonnage is not given in both cases I can make no comparisons.

Another company operated for 33 cents per car-mile and earned net about 17¼ cents per car-mile. Still another operated for 74¾ cents per car-mile and earned gross 81 cents per car-mile, but net only about 6½ cents per car-mile. Neither of these two companies delivered by wagon, and both of them handling nothing but freight.

The greatest difference in the operating accounts seems to be in Account No. 4 (Cars and Equipment), one making no charge and the other a charge of \$2,125.14. Accounts Nos. 11, 12 and 13 (Power Equipment and Rent of Tracks) show a difference of about \$4,500, and Accounts Nos. 14, 15 and 16 (Salaries) show a difference of about \$18,000. I

presume this comes from different methods of accounting, as no two companies seem to make the same charge against their freight and express service.

In the cases of a number of other companies where the accounts seem to be kept in practically the same way, the expenses vary from 77 cents to about 87 cents per car-mile. This difference is made up largely by the difference of charges for power, equipment and rent of tracks and terminals, some companies charging a flat rate per car-mile to include everything, while others make additional charges in rental, etc. To make a correct and intelligent comparison, a uniform method of charges should be made against freight or express. At the present time charges vary from 10 cents to 50 cents per mile, and in some instances other practice prevails.

Some companies will not maintain horses and wagons, claiming it does not pay and that the operation of wagons adds largely to the expense. It certainly does add to the cost, but in most cases it is a large source of revenue. In almost any city, trucking is done for 50 cents or 60 cents per ton, and in some cases for as low as 40 cents per ton. Truckmen make a good living at those figures and generally have a little surplus. With our horses we figure on earning from 75 cents to \$2 per ton on all business handled by our wagons.

Again, there is business to be had that we would not get if we did not operate wagons, and as a rule the class of business offered to us, which calls for wagon service, is usually good paying freight.

Some managers look kindly on the freight business, while others claim they only do it because they are compelled to do it. There is no doubt that the service is a great convenience to the merchants on account of quick delivery. This enables a storekeeper to carry a smaller stock, and the result is that the electric roads get a large number of shipments which would come under the minimum rate, and these minimums, while small as a unit, run into money when there are many of them. When the merchant finds that he can get good service for his freight and express, he generally has a good word to say for the road, and as we are brought into such close contact with the general public, it is much better to have their good will than their enmity. Another thing to consider is, that if the merchant finds he is getting good freight service he will patronize the road when he wants to travel.

Since Jan. 1, 1908, charges have been made by the Schenectady Railway Company against the freight department of about 25 cents per car-mile more than was charged last year. That, of course, will materially increase our operating expenses for this service and the department will show a deficit, but it will be a source of revenue for the company. In my opinion these high charges against the freight departments are not right. The consumption of power by a freight car will be somewhat less than that of the passenger car of equal weight and equipment, because the latter will probably make 20 or 30 more stops in a run of 20 miles than the freight car.

It has been said that an arbitrary charge per mile should be assessed against freight and express cars. This might be right if the freight and express privileges were leased to a foreign company, but where a railway company does this work itself it would seem that a proportion of the operating expenses should be charged. This proportion would include all maintenance, supplies, cleaning and sanding track, removal of snow and ice. In addition the freight department would pay its own motormen and conductors. It would also pay other salaries, rents and damage accounts and any other items that could consistently be charged against it. It would also pay its own stable expenses, provided it owned and operated horses and wagons.

Some roads are carrying express in combination cars, which of course decreases the cost of operation. Others use trailers and run two cars with only one crew, or at the most one additional man, while others run a freight car with two or three men on it as the business may demand. All these conditions change the cost of operation.

Proper terminal facilities also have a bearing on cost of operation. A terminal that is not large enough means extra warehouse men and porters, and I have known cases where congested terminals have resulted in loss and damage claims.

¹This table will be published next week. [Eds.]

*Paper presented at meeting of Street Railway Association of the State of New York, Niagara Falls, Ont., June 30.

CONVENTION OF THE NEW YORK STATE STREET RAILWAY ASSOCIATION

The twenty-sixth annual convention of the Street Railway Association of the State of New York was held on June 30 and July 1 at the Clifton Hotel, Niagara Falls, Ontario. It was very largely attended and was one of the most successful in the history of the association. An especially large number of ladies were present and this fact, with the scenic attractions and pleasant weather, combined to make the meeting a most enjoyable occasion. As usual with the New York state conventions no attempt was made by the manufacturers to provide elaborate exhibits. A few articles of street railway interest were shown, however, in the billiard room of the hotel. An article describing the apparatus on exhibition is published elsewhere.

The meetings were held in the Assembly Room of the hotel and consisted of three sessions, two on Tuesday and one on Wednesday.

TUESDAY MORNING SESSION

The meeting on Tuesday morning was called to order at 10:30 by President T. W. Wilson, general manager of the International Railway Company of Buffalo. After the roll call the delegates were welcomed to the city by Hon. R. F. Carter, mayor of Niagara Falls.

The secretary then announced that the International Railway Company and the Buffalo & Lake Erie Traction Company had extended free transportation on the days of the convention to those in attendance.

The president then presented his annual address. An abstract follows:

PRESIDENT'S ADDRESS

The electric railway companies have not felt the prevailing business depression nearly as much as the steam railroad companies. The reason is that 98 per cent of the total earnings of electric railways are derived from receipts from passengers, while the steam railroads depend for their business mainly upon freight, which constitutes 66 per cent of their total earnings. Passenger business is affected very slightly by business depression, and while the steam roads in New York State are showing from 15 to 25 per cent decrease in gross, the electric roads are about holding their own with last year. Your president believes that the fiscal year just starting will show a marked improvement over that just passed, and looks forward with confidence to the future.

The most important question which arose during the past year, and one which vitally affected our interests, was that of standard classification accounts. Commencing with the conference of auditors, called by the statistician of the Public Service Commission, Second District, at Albany on Oct. 22, your executive committee has been in touch with the situation at all times. Numerous meetings have been held and conferences had in Albany, Buffalo and Washington, with the representatives of both the Interstate Commerce Commission and the Public Service Commission, and at the second quarterly meeting held in Albany March 18 the association in no uncertain language denounced the classification of accounts, known as Circular No. 20, and authorized the preparation of a brief in opposition thereto. This brief, as you all know, was published May 4, 1908, and copies were mailed to every separate member of the Interstate Commerce Commission, the Public Service Commission of both the First and Second districts, and to every State railroad commissioner in the country, as well as to every electric railway company—no matter how small—in New York State, and all the principal companies in the United States. This brief was an admirable discussion of the question, and great credit is due to the able committee and to its counsel, Morris Cohn, Jr., who prepared it. Your president believes its publication assisted very materially in the settlement which was effected in Washington by the general committee. The matter now seems to be in statu

quo with the indications that the new classification will not be effective until Jan. 1, 1909.

REPORT OF SECRETARY AND TREASURER

Secretary Pardee in reading the report of the secretary said that the number of active members was the same as a year ago. The associate members have also remained the same. Of the allied members, three have resigned, from a total of 73, and approximately 22 have joined the association, so that the association has now nearly 100 allied members. The minutes of the executive committee showed that William Darbee and J. C. Calisch, who were elected at the last convention as members of the executive committee, were compelled to resign as members on account of business engagements. E. J. Cook, of Rochester, and R. J. Dyer, Jr., of Auburn, were elected to fill the vacancies.

Treasurer H. M. Beardsley, secretary and treasurer of the Elmira Water, Light & Railroad Company, presented his report. It showed total receipts for the year, including balance from 1907, \$10,875.23; expenses, \$6,897.05; balance, \$3,978.18.

REPORT OF COMMITTEE ON CLASSIFICATION OF ACCOUNTS

President Wilson then called for the report of the Committee on the Classification of Accounts. In the absence of the chairman of that committee C. Loomis Allen presented the report.

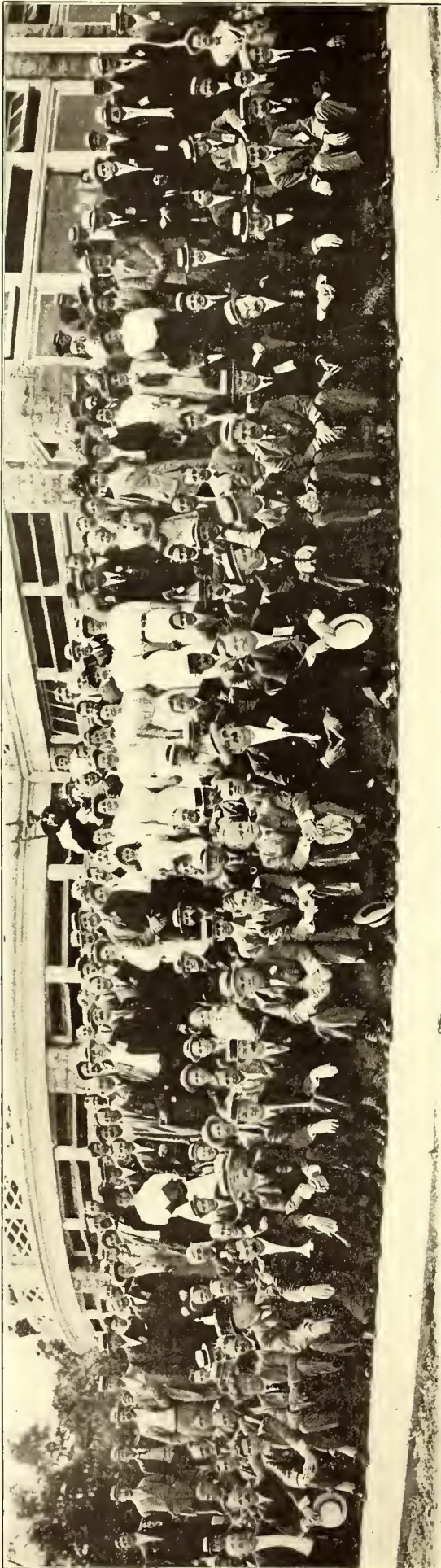
Mr. Allen briefly reviewed the proposals of the Interstate Commerce Commission and the Public Service Commission to establish a standard classification of accounts and the various hearings which had been held on the subject. He also mentioned the brief which the committee had prepared. Upon motion it was decided to include this brief in the printed report of the year.

REPORT OF COMMITTEE ON FREIGHT AND EXPRESS.

President Wilson then called upon Mr. Allen for the report of the Committee on Electric Express and Freight Service. Mr. Allen, chairman of the committee, said that the work of the committee had been carried on largely by Mr. Collins, who was secretary of the committee. It had been divided into three sections and a paper had been prepared on each. One was the question of rates; the second was that of forms and blanks; the third was that of operating expenses. These three topics were treated respectively by Albert Eastman, of Syracuse; W. C. Collins, of Rochester, and F. J. Walsh, of Schenectady. These papers will be found elsewhere in this issue.

In opening the discussion Edgar S. Fassett, general manager of the United Traction Company of Albany, brought up the question of what constituted interstate commerce. His counsel has recently advised that if the company accepts any freight and express which is consigned to points outside of the State, or which comes from points outside of the State, it comes under the Interstate Commerce Act. The speaker has consequently recently issued an order to his freight and express department not to take any freight or express matter consigned to points outside of the State, even though it is simply to make delivery to a steam railroad, and not to receive from any steam railroad any freight or express packages coming from outside of the State.

W. W. Cole, vice-president and general manager of the Elmira Water, Light & Railroad Company, said that from recent correspondence with the Interstate Commerce Commission he understood that the rule went further even than Mr. Fassett had stated; that is, if a company receives freight from any road that does a freight business outside of the State, it comes under the Interstate Commerce Act. In other words any freight, baggage or passenger on an



Group of Delegates at the Niagara Falls Meeting of the Street Railway Association of the State of New York

excursion, received from an interstate road, even though going to a different part of the State, will bring an electric railway under Interstate Commerce jurisdiction.

W. R. W. Griffin, general superintendent Rochester Railroad Company, asked Mr. Cole whether his remark would apply if an electric railway company accepted a car consigned to a station on a steam road with which the electric road had a connection?

Mr. Cole considered that it would and Mr. Fassett concurred in this understanding.

J. N. Shannahan, general manager Washington, Baltimore & Annapolis Railroad Company, asked how the electric railways could refuse to accept any shipment that is offered them for transportation if they are common carriers.

Mr. Fassett replied that the legality of the order issued by him had not been tried in the courts, but he had been advised by counsel that it was absolutely legal. He added that the same decision would cover passengers if a through rate was made with interchange of tickets.

The Committee on Freight and Express was then tendered the thanks of the association for their reports and was discharged.

REPORT OF COMMITTEE ON HEIGHT OF CAR STEPS

President Wilson then called for the report of the Committee on Height of Car Steps. Mr. Peck, chairman of the committee, read the report which is published on page 225 of this issue.

Mr. Cole asked the committee what it considered the proper width of the running board on an open car.

H. A. Benedict, chief electrical engineer United Traction Company, Albany, thought that 8 in. would be a sufficient width from the riser to the outer edge of the step.

Mr. Cole said that the question of proper width of running board frequently comes up in negligence cases.

REPORT OF COMMITTEE ON MODEL REPAIR SHOP

President Wilson then called for the report of the Committee on Repair Shops, which had been asked to present plans of a model shop for 100 cars. Mr. Benedict, the chairman of the committee, read the report, which is found on page 216 of this issue.

Mr. Cole, in the discussion, referred to location as a very important subject in connection with shops. Sometimes the site for a shop is chosen considerably out of town where the shop is not easy of access. This creates a very large non-revenue mileage in shifting cars to the shop, and a corresponding tendency to hold cars too long before sending them to the repair shop, or a tendency to increase the amount of repairs done at the car houses. The latter plan caused the force at the car house to be made up of higher-priced men, and repairs to be made under the oversight of some foreman, instead of under a master mechanic. Mr. Cole thought that the repairs of cars would be found to be materially higher, and the work not as well handled under these circumstances.

W. H. Collins, general superintendent Fonda, Johnstown & Gloversville Railroad, referred as an admirable feature of the report to the plan of having the entire plant enclosed, so that everything passing the entrance can be checked. As regards the list of machine shop tools, he thought the capacity of the wheel press was small, and there seemed to be no shaper or planer. A few other machine tools might be added to advantage. Again, there was no provision for making coils or doing work of that character, and he thought it a question whether in a shop designed to take care of 100 cars, it was not good practice for a company to manufacture its own coils.

J. C. Calisch, of the Buffalo & Lake Erie Traction Company, asked why transfer tables were omitted.

Mr. Benedict said that this was on account of the expense.

D. McDonald, manager Montreal Street Railway Company, said that the large companies were confronted with the question of a large shop or several smaller shops. He was inclined to prefer the latter plan.

R. E. Danforth, general manager railway department Public Service Corporation, Newark, N. J., thought each system would have to be treated separately. As regards connecting tracks or transfer tables he believed that the weather conditions should largely determine this question. On large systems there are some advantages in making light repairs at car houses or divisional shops rather than at the main shop, as each division master mechanic is incited to keep down the expenses on his particular cars. On the New Jersey system, operating 500 cars, there are two repair shops, each under a division master mechanic. These shops do all minor work except painting and varnishing. On another division in which the car houses are within 40 minutes run from the general repair shops, there are two small division repair shops. It has been noticed that on the division farthest away from the general shops the operating expenses for maintenance and equipment are less, in spite of the fact that the cars are subjected to severer service and also although the superintendent of rolling equipment, division master mechanics and inspectors have been endeavoring to reduce the cost of maintenance in the home division. He believed that systems operating 100 to 150 cars could well afford to follow generally the plans outlined by the committee, and where the property is well scattered should take into consideration the cost of deadhead mileage in locating their car house or car repair shop.

W. H. Evans, master mechanic International Railway Company, called attention to the ease with which the shops could be extended, either lengthwise or in width.

After the close of the discussion on repair shops H. A. Correll, of Buffalo, called attention to a section 200 ft. long on the Lockport division of the International Traction Company, which is equipped with concrete ties, known as the Correll tie.

The meeting then adjourned.

TUESDAY AFTERNOON SESSION

Edgar S. Fassett, vice-president of the association, occupied the chair on Tuesday afternoon and after calling the meeting to order, requested Edward H. Anderson, of the railway engineering department of the General Electric Company, to read a paper which he had prepared on "Commutating Pole Direct Current Railway Motors." Mr. Anderson reviewed the progress which had been made in motor design and construction and explained that as the working trolley voltage was raised the fundamentals of motor design were satisfactory with the exception of the commutation trouble. Commutating poles were introduced to overcome this difficulty. Mr. Anderson described and illustrated by diagrams the effect of the use of commutating poles and discussed the possibility of using high potential with commutating pole direct current motors. A 40-hp motor could be built for 850 volts, one of 100 hp for 1250 volts and one of 250 hp for 1750 volts. By operating two or more of these motors in series a high line potential could be obtained. Mr. Anderson said in continuation that the over-load capacity of the old motors was limited by the brushes and the commutators, and that if the line of commutation

was kept constant by auxiliary poles the over-load capacity would be greater.

Mr. Allen asked how much more expensive were the new motors than the old.

Mr. Anderson replied that he could not answer definitely, but that the manufacturing cost would be more on account of the additional poles and larger amount of copper. He thought that the extra cost of manufacturing would eventually be not more than 25 per cent.

Mr. Evans asked if it was possible to rebuild old motors so as to introduce the commutating pole feature.

Mr. Anderson replied that this subject had been given very careful consideration, but it would be very difficult if not impossible to make the change on account of the lack of room in the motor casing.

As there was no further discussion on the paper, President Wilson announced the appointment of the nominating committee as follows: C. Loomis Allen, W. W. Cole, B. B. Nostrand, Jr., W. N. Collins and R. H. Smith. The meeting then adjourned.

WEDNESDAY MORNING SESSION

The Wednesday morning session was called to order by President Wilson, and the first order of business was the reading by W. H. Evans, master mechanic of the International Railway Company, of his paper entitled "Observations on Pay-as-You-Enter Cars by the Mechanical Man." This paper is printed on page 222 of this issue.

Acton Burrowes, secretary of the Canadian Street Railway Association, was then introduced and extended an invitation to the New York Street Railway Association to meet in Toronto, Canada, in 1910.

Following Mr. Burrowes' address, C. A. Coons, superintendent of transportation, International Railway Company, read a paper on "The Pay-as-You-Enter Car from an Operating Standpoint." Mr. Coons' paper will be found on page 223 of this issue.

Duncan McDonald, manager of the Montreal Street Railway Company, was then happily introduced as "The father of the pay-as-you-enter car." He gave some interesting reminiscences of the operation of the first car in Montreal and complimented the street railway managers of the United States—particularly those of Chicago, Buffalo, New York and Newark (N. J.)—for their courage in introducing the pay-as-you-enter idea under American conditions.

R. E. Danforth, manager of the Public Service Railway Company, told of his preliminary observations of the prepayment car in Montreal and discussed the success his company has had with it in Newark. He stated that 450 pay-as-you-enter cars would be in use on the New Jersey system by Christmas.

C. Loomis Allen, general manager of the Utica & Mohawk Valley Railway, asked for operating figures on this type of car and was told by T. W. Wilson, general manager of the International Railway Company, that the latter was willing to give such figures to anyone particularly interested.

TOPICAL DISCUSSION

Charles R. Barnes, electrical engineer to the Public Service Commission of the Second District, asked for a discussion of the topics suggested by him and which appeared in the printed program. The first of these subjects was the use of curtains on the front end of suburban cars during the daytime.

The discussion was opened by W. R. W. Griffin, superintendent of the Rochester Railway Company, who said that

his company's interurban combination cars had curtains on the front end of the passenger compartment so that passengers would not be obliged to stare into the freight and express compartment. He considered curtains necessary on all high-speed roads to cut off the view ahead so that passengers would not get unnecessarily frightened.

J. H. Pardee, secretary of the association, agreed with Mr. Griffin and told how on the Rochester & Eastern Rapid Railway, public sentiment had been created against high speed because the passengers could look ahead.

Mr. Sheehan, of the International Railway Company, said that passengers on the Lockport line of that company had no objections to the curtains being up in the daytime. E. F. Peck, general manager of the Schenectady Railway Company, said his cars also ran without curtains in the daytime, and he thought it a good plan for passengers to see the motorman all the time. Mr. Allen said that the Utica & Mohawk Valley Railway Company did not use curtains day or night as the motorman is in a compartment in which the glass is so arranged that there is no reflection.

The next subject suggested by Mr. Barnes was "On some practical means to enable passengers desiring to board trains to stop them at flag stations at night."

Mr. Williams, of the Utica & Mohawk Valley Railway, described his company's lamp post for this purpose. This costs \$3 to build and only 25 cents a year to maintain. The company has about 100 in use.

W. H. Evans, of Buffalo, described an Indiana signal which required the holding up of a switch handle to light the lamps; when a person let go the handle the lamp circuit was broken. The Utica & Mohawk Valley Railway uses a rope handle for lamp lighting and it is easy for boys to tie the rope down to make the lamps burn all the time. The handle scheme mentioned by Mr. Evans would eliminate such tampering.

Mr. Sheehan, of the International Railway, believed no form of lamp signal satisfactory as the lamps get broken or otherwise damaged.

The result of this discussion was the passage of a motion that the incoming president appoint a committee of five to pursue the subject to a conclusion.

J. E. Duffy, superintendent of the Syracuse Rapid Transit Company, opened the discussion on the next topic, entitled "The equipping of city cars with red flags and lanterns on lines which cross steam tracks at grade." Mr. Duffy operates over 13 grade crossings and does not consider it necessary to equip cars with flags, although there are arguments for the opposite practice.

Mr. Coons, of Buffalo, did not favor lanterns or flags because they would be stolen or lost from city cars.

Mr. Barnes, of the Public Service Commission, did not consider that a crossing flagman employed by the steam railroad could be considered as affording adequate protection to electric railway passengers.

E. S. Fassett, general manager of the United Traction Company, Albany, opposed any condition requiring the conductor to leave his car to flag ahead. His company has 25 crossings at which it employs a night and day flagman and has derrails at the other crossings. These flagman positions he considers a good refuge for retired motormen and conductors.

Mr. Allen considered that every steam railroad grade crossing costs the electric railway for accidents about \$1,000 a year because the conductor has to go ahead and flag over, meanwhile leaving the rear end of the car unprotected.

A motion was passed to refer this subject to the rules committee.

The last topic was on "The practice of carrying musical instruments on city cars." Mr. Barnes, in answer to a question, said that he had suggested this subject in consequence of complaints received from the musicians' unions that certain instruments were excluded from cars.

Mr. Fassett, of Albany, said he issued a book of permits to the owners of musical instruments and secures an agreement from them that they will not enter crowded cars with such instruments. One permit is given to the conductor for every ride.

E. J. Ryon, superintendent of transportation of the Schenectady Railway Company, has the same scheme, but issues a card permit and makes the musicians stay on the platform.

At the close of the discussion a motion was passed requesting the incoming president to appoint a committee of three to discuss the classification of operating accounts.

A report was then requested from the committee on nominations. The committee suggested the following names and these gentlemen were unanimously elected for the ensuing year:

President, Edgar S. Fassett, Albany;

First vice-president, E. F. Peck, Schenectady;

Second vice-president, C. Gordon Reel, Kingston;

Secretary, J. H. Pardee, New York;

Treasurer, H. M. Beardsley, Elmira.

Executive committee: E. J. Cook, Rochester; R. A. Dyer, Jr., Auburn; J. W. Hinkley, Jr., Poughkeepsie; T. W. Wilson, Buffalo.

The usual vote of thanks was rendered to the retiring officers and those who had presented papers or served on committees. W. W. Cole was elected an honorary member of the association in consequence of his retirement from active railway management in Elmira, N. Y., to accept a position with Dodge & Day, as mentioned in the *ELECTRIC RAILWAY JOURNAL* of June 20, 1908.

The convention then adjourned.

SOCIAL FEATURES OF THE CONVENTION

The Clifton Hotel, which was the headquarters of the Street Railway Association of the State of New York during its convention this week, is located on the Canadian side of the Niagara River in full view of the Falls and adjoining Victoria Park. The scenic attractions and the electrical development at Niagara Falls make the city an extremely interesting one to visit for electrical engineers, and there was adequate opportunity to visit the points of both scenic and scientific interest. On Tuesday morning, while the convention was in session, carriages were provided to give the ladies in attendance at the convention a drive through the parks on both sides of the river. The second trip, in which the delegates as well as the ladies took part, was made through the Niagara gorge, Tuesday afternoon. Through the courtesy of the International Traction Company a number of special cars were provided at 4 o'clock. The trip north was on the Canadian side and return trip on the American side.

Wednesday morning there was a bridge tournament for the ladies, and Wednesday afternoon, through the courtesy of the International Railway Company, cars were provided for a trip through the power houses on the Canadian side.

The banquet, which is always a feature of the New York State convention, was held at the Clifton Hotel Tuesday evening. About 250 were present. Henry J. Pierce, president of the International Railway Company, acted as toastmaster, and was introduced by T. W. Wilson, general manager of the International Railway Company and retiring

president of the State Railway Association of the State of New York. Mr. Pierce, after a felicitous introduction, called upon Hon. Frank W. Stevens, chairman of the Public Service Commission of the Second District of New York, who answered to the toast of the "Wonderful Development of the Trolley Car." Mr. Stevens' remarks are always interesting, and his speech on this occasion showed he was fully conversant with the various steps taken during the past 20 years, which have resulted in the evolution of the modern electric transportation. Mr. Stevens was followed by A. Monroe Grier, who spoke for Canada, and whose remarks were listened to with interest. The concluding speech was on the subject of "Fraternal Associations" and was given by Herbert P. Bissell, vice-president of the Niagara Gorge Road.

THE EXHIBITS AT NIAGARA FALLS

The exhibits at the Niagara Falls convention consisted principally of car couplers as this subject was considered by the Committee on Standardization of the Engineering Association.

Among the coupler exhibits the W. T. Van Dorn Company, of Chicago, showed a new type of M. C. B. coupler adapted to electric roads. The head and knuckle are the same as in the M. C. B. coupler, but in addition the knuckle is provided with an unlocking device operated by a lever on the side of the head. This lever is protected by projections on the head so it cannot be broken off. The chief feature of the coupler, however, is the use of a fork-shaped bar just below each head, and these bars fit into each other as the cars are being coupled. If the couplers are not exactly in alignment they are brought into the correct position for coupling by the bars which also keep the couplers from spreading or buckling out when the coupler is under compression. The bars are 1 in. x 6 in. drop forgings, riveted together and also riveted to the head. Their spread is such as to bring the heads into engagement if the latter are 3 in. out of line. As the bars are flat they allow any necessary vertical movement in the coupler. They can be set any distance below the head. In addition to his new M. C. B. coupler Mr. Van Dorn showed samples of his New York subway coupler, two No. 21 couplers, two No. 27 couplers and two No. 5 couplers.

The Ohio Brass Company, of Mansfield, Ohio, showed several samples of Tomlinson couplers and illustrated its principle of operation by a full-sized model supported on a skeleton platform, also a compromise head by which this coupler can be used to couple with an M. C. B. head. Mr. Tomlinson, who was present, also referred, in the discussion before the Standardization Committee, to a new type of coupler on whose development he was engaged. He did not announce the details of its construction, but stated that it was along M. C. B. lines, and could be used interchangeably with any type of coupler on the market.

The Ohio Railway Equipment Company was represented at the convention by A. J. Allen, of Columbus, master mechanic of the Ohio Electric Railway Company. Mr. Allen exhibited models of the Gibbs automatic coupler, which has the M. C. B. contour, but each coupler head also has a lug which fits into a corresponding pocket on the opposite coupler head. This keeps the heads in line on curves and on changes in grade. Mr. Allen had on exhibition a model track and cars built to scale and equipped with his coupler to indicate that the coupler would operate satisfactorily while the cars were passing around a curve of 45 ft. radius.

The McConway & Torley Company, of Pittsburg, Pa., showed a model of the Jamney radial drawbar with self-centering device for electric street and interurban cars.

The Washburn Steel Castings & Coupler Company, of Minneapolis, showed blue prints of a new type of M. C. B. coupler designed for electric service.

The Felt & Tarrant Manufacturing Company, of Chicago, exhibited its model B comptometer. With this office appliance not only addition but other operations involving multiplication, division and subtraction are performed equally well and the simplicity of the key arrangement, as well as the light, quick action of the keys permits great speed.

The O. M. Edwards Company, of Syracuse, had an exhibit window mounted in a frame and fitted with this company's fixtures. The window was built to fit the front vestibule for motorman's use. This design of fastening is provided with an adjustable lock so that the sash can be fastened at any height desired. The fastening is controlled by two finger latches and cannot accidentally be dropped. The variable height is a desirable feature in stormy weather and the positive latch prevents dropping the sash and breaking glass.

An automatic fare box or safe for platform use with pay-as-you-enter cars was exhibited by the Toronto Railway Company. Their fare safe is built after the patents of William Cox and though adopted for the Toronto cars has not yet been put on the market. Manufacturing arrangements are, however, now being made.

The Curtain Supply Company, of Chicago, exhibited a frame containing several window curtains fitted with this company's various curtain fixtures.

The Utica & Mohawk Valley Railway Company exhibited a signal post for signaling interurban cars to stop at night. The post had mounted on it an old lamp frame which had been in service and a new lamp frame just from the shop. The signal light consists of five 16-cp incandescent lamps in series on the trolley line, mounted in a circle behind and around a glass spectacle which is held in a wooden frame. In the new signal shown the spectacle glass is half green and half clear white.

The General Compressed Air & Vacuum Machinery Company, of St. Louis, Mo., exhibited photographs of compressed air and vacuum cleaning outfits for steam and electric railway coaches, office cleaning plants and portable cleaning plants.

The Egry Register Company, of Dayton, Ohio, exhibited two forms of its well-known multigraph train order registers.

The National Brake Company, of Buffalo, N. Y., exhibited an aluminum model of the Peacock brake. It was represented in large force at the convention.

Atlas Railway Supply Company, of Chicago, had on exhibit a number of samples of Atlas rail joints for T and girder rail and compromise joints.

Vaile & Kimes, Dayton, Ohio, exhibited samples of their V. & K. trolley harp, which contains an ingenious device for holding pins in the harp and is adapted to any make of wheel. The manufacturers also showed a number of their wheels for electric city and interurban service.

The J. G. Brill Company, of Philadelphia, exhibited a new fare box for use on pay-as-you-enter cars. The box contains the usual hopper with glass baffle plates at the top through which the fares or tickets pass into the box below. They are then directed into one of four compartments in a drawer contained in the casing. Each compartment is designed to hold the fares collected by one conductor. When

one conductor relieves another, he sets a lever on the front of the box in one of four positions so that the fares fall into the proper compartment in the drawer. The drawer is removed from the casing by an inspector who unlocks a door. The act of unlocking the door, however, locks the cover of the drawer so that no money or tickets can be removed from the box except by the auditor or some one directly appointed by him. A number of these boxes are in use on the pay-as-you-enter cars in Newark, N. J.

The Taylor Electric Truck Company, of Troy, N. Y., had on exhibition one of its steel-tired wheels with malleable iron centers. The wheels go under the trade name of T. M. C.

The Coleman Fare Box Company, of Buffalo, made an exhibit which attracted a great deal of attention at Niagara Falls. It consisted of the fare box and safe which has been adopted by the International Railway Company and is now in use on its pay-as-you-enter cars. A box was also shown in actual use on one of these cars which the International Railway Company had on exhibition at Niagara Falls. The box was also described in the paper read by W. H. Evans, master mechanic of the International Railway Company, and printed in this issue. After the fares pass through the baffle plates they fall into an inner cash box in the casing, but this cash box cannot be removed from the casing until the cover has been automatically locked. In this way, the fares collected go directly from the passenger to the treasurer's office.

MEETING OF THE STANDARDIZATION COMMITTEE

The standardization committee of the American Street & Interurban Railway Engineering Association met at Niagara Falls, Ont., on Monday of this week, one day previous to the annual meeting of the Street Railway Association of the State of New York. There were present: W. H. Evans, Buffalo, chairman; H. A. Benedict, Albany; Henry W. Blake, New York; C. B. Fairchild, Jr., and L. E. Gould, Chicago; also J. W. Corning, Boston, secretary American Street & Interurban Railway Engineering Association; F. W. Sargent, American Brake Shoe & Foundry Company; C. R. Ellicott, Westinghouse Traction Brake Company; C. N. Leet, National Brake & Electric Company; W. T. Van Dorn, W. T. Van Dorn Company; C. H. Tomlinson, Ohio Brass Company; A. J. Allen, Ohio Railway Supply Company; J. L. Hopper, E. C. Washburn Steel Castings & Coupler Company; I. H. Milliken, McConway & Torley Manufacturing Company; R. E. Janney, American Steel Foundries. The subjects discussed were couplers and coupler heights, draft rigging and the heights of bumpers, steps and platforms. As a result of the Pittsburg meeting a data sheet had been forwarded to each member company, asking for dimensions of existing cars and also requesting other information. This data sheet was published in the STREET RAILWAY JOURNAL and ELECTRIC RAILWAY JOURNAL for May 30. The replies received had been tabulated by Chairman Evans and were available for reference at the Niagara Falls meeting.

Mr. Evans opened the meeting by reading the minutes of the Pittsburg meeting of the committee, at which several of the dimensions in question were tentatively accepted. With these available as a basis for discussion the committee first considered the choice of standard heights for couplers on interurban and city cars. Some of the conditions to be observed in the choice of these heights were the growing necessity for interchange of equipment with steam roads,

clearance between top of coupler and bottom of bumper on rough track, desirability for a small offset in the line of pull between coupler head and anchorage and provision for an emergency coupling between city and interurban cars. In the case of the interurban cars it was thought that the desirability for interchange was a most important factor. A height from top of rail to center of coupler of 35 in. was therefore adopted pending further consideration. With this dimension as a basis it became possible to consider the height from top of rail to top of bumper. Making allowance for a suitable clearance between the top of a coupler or its shank and the bottom of the bumper and fixing the height of the bumper as 8 in., the distance from the top of the rail to the top of the bumper was chosen tentatively as 51 in. This dimension, which also is the height of the floor above the rail, was divided into the following steps; from ground to top of tread on lower step 17 in., rise to tread of second step 12 in., rise to tread of third step 11 in. and rise of third step 11 in.

Similar dimensions for city cars were considered in the same way, the height of platform floor being taken as 31 in. The following table gives the various dimensions chosen pending further discussion by the members of the committee. All dimensions are in inches.

	Interurban	City
Height from top of rail to center of coupler..	35	20
Height from top of rail to bottom of bumper.	43	25
Height from top of rail to top of bumper....	51	31
Width of bumper.....	8	6
Height from top of rail to floor of car.....	51	41
Height to center of bumper pocket casting...	*	35
Length of radial coupler from pocket pin to pulling face of coupler.....	54	54
Height from top of rail to top of platform floor ..	51	31
Height from top of rail to top of tread on first step.....	17	17
Height from top of rail to top of tread on second step.....	29	31
Height from top of rail to top of tread on third step (interurban).....	40	
Rise from top of vestibule platform to floor of (city) car.....		10

*Bumper pocket casting on city car would be on level with interurban coupler, so straight emergency coupling bar could be used and no pocket would be needed on interurban car.

NEW EDITION OF AMERICAN STREET RAILWAY INVESTMENTS

The 1908 edition of American Street Railway Investments has been issued and is now in process of distribution. The new issue of the "Red Book" contains more information than any previous edition, reflecting the great increase in importance of electric railways. Statistics relating to more than 1500 operating and controlled companies in the United States and Canada are presented, making the book invaluable for reference to all who are interested in traction financial reports. An introduction in the new issue discusses the tendency of the times toward public control of utility corporations and outlines briefly the principal recent developments affecting companies in the largest cities of this country. The "Red Book" is published by the McGraw Publishing Company. Of the companies reporting for their last fiscal year 78 show gross earnings of more than \$1,000,000; 45 of between \$500,000 and \$1,000,000; 199 between \$100,000 and \$600,000; 120 between \$50,000 and \$100,000; and 95 between \$25,000 and \$50,000.

The Danish Folketing has passed a bill authorizing the building of a number of electric lines. The electric railways, unlike the steam roads, will receive no State assistance.

REPAIRING A COMMUTATOR

BY C. L. GREER

Commutators, if properly cared for, are not usually troublesome, but occasionally difficulties arise that bring grave concern to the man in charge. If not arrested, they will continue to increase, finally causing much damage and sometimes completely ruining the commutator. The writer has reference to the eating away or burning out of the mica between the commutator bars.

This trouble probably occurs more frequently in rotary converters than in d.c. generators, resulting perhaps from the fact that rotaries are more subject to "bucking" or flashing over than are d.c. generators. It is no doubt due to several causes, but probably the most prolific is the "bucking" or flashing-over mentioned. This usually begins on the corner on the outer end of the commutator. It is only a speck at first, but gradually grows larger.

It will be noticed that a ring of fire goes around the commutator at frequent intervals, due to a momentary short circuit between the bars caused by the place becoming filled with the dust of carbon, copper or other conducting material. This is especially noticeable in rotaries when syn-

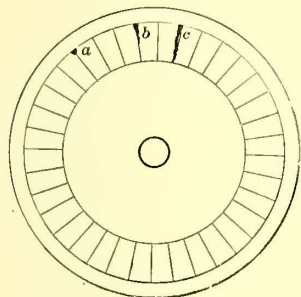


Fig. 1

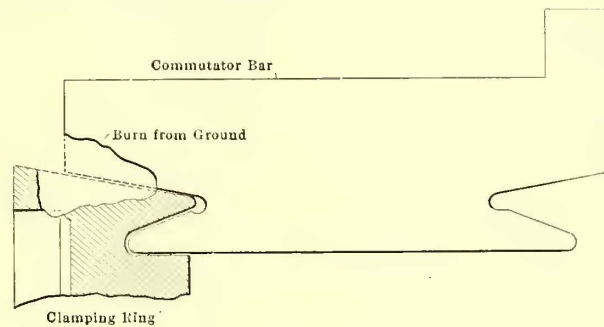


Fig. 2

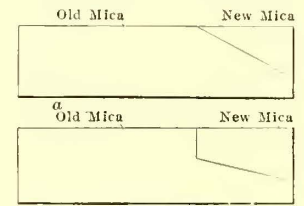


Fig. 3

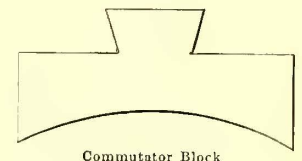


Fig. 4

chronizing. Every time this flashing or burning occurs the hole becomes deeper.

A glance at Fig. 1 will show the origin and progress of the trouble. Fig. 2 shows how it will end if not arrested. In Fig. 1 *a* is the beginning. Here the trouble is but a slight burn with a small bit of charred mica in the center. At *b* is shown a further development which extends down the end of the commutator toward the clamping ring. At *c* the burn has gone to the clamping ring and the real trouble begins. The mica ring is soon punctured and a ground results which may ruin the commutator.

Fig. 2 is a typical case, the irregular outline illustrating the burn and the dotted lines the original form of the commutator bar and the clamping ring. The mica ring (not shown) is between the clamping ring and the commutator bars.

The best remedy for this disease of course is prevention, but if the trouble has already developed the cure here given may be used. It is not offered as an absolute panacea, but the repairs made two years ago in a case of this kind still hold good, and in the absence of a better remedy the writer feels justified in giving his experience with this one.

In any stage of the trouble before a ground occurs the crevice should be carefully cleaned out. An old hacksaw blade with the end ground down to a point will do for removing every particle of the charred mica. The good mica should show firm and white at the bottom. The place may then be filled with a mixture of waterglass (solution of silicate of soda) and plaster of paris. This combination must

be mixed and applied at once, as it hardens very rapidly. The crevice should be filled tightly with the mixture and allowed to stand a while to dry. Powdered glass may be used instead of plaster of paris if the crevice is small, but if large it will require more time to dry. When dry, however, it becomes as hard as flint.

If a ground has occurred there will usually be a large hole burned out, as in Fig. 2. Should the brush-bearing surface of the commutator be uninjured the hole may be cleaned out as before described and plugged with the waterglass mixture. Unless the machine can stand idle long enough to dry thoroughly it is best to use the plaster of paris filler. If the hole is very deep it is probably better to make three or four mixings, putting in the first and allowing it to stand a while to harden before putting in the second, and so on to the last. If the waterglass is very fresh the mixture will harden almost before it can be used, but by exposing this waterglass for a time to the air before mixing it will not harden so rapidly. Of course, the

more time the mixture has for drying before using the machine the better will be the repair.

Efforts are sometimes made to remedy this trouble in its early stages by cleaning out the burnt mica, putting in a new piece of mica and calking the bars on each side to hold it in place. This method as usually used is shown at *a* in Fig. 3. It will be noticed that the new piece comes to a point or feather edge at the surface of the commutator and furnishes an excellent place for another beginning of the trouble. If a square fit could be obtained, as at *b*, Fig. 3, the method would be excellent, but such a fit can rarely be had.

The intelligent use of sandpaper and a block, as shown in Fig. 4, will do much toward keeping the commutator in good condition and preventing the difficulty, but sandpaper must be used intelligently. Rounding off the corner of the commutator with a file seems to have a tendency to prevent the eating away or burning out of the mica.

The Locarno-Pontebrolla-Bignasco is the second single-phase railway to be constructed in Switzerland. It is 169 miles long and runs through tunnels the total length of which is 939 ft. There are 12 stations and stopping places. The gage is 39.37 in. and the track is laid with 50-lb. rails. A 5000-volt single-phase current is furnished by the power house at Pontebrolla. The cars are equipped with 40-hp single-phase series motors capable of hauling a 55-ton train over the heaviest grade on the line at 11.2 m.p.h. and on a level at 18.7 miles.

HEARING ON DEPRECIATION OF EQUIPMENT ACCOUNTS BY INTERSTATE COMMERCE COMMISSION

A committee of the American Railway Association, composed of executive officials of steam railways, was given a hearing by the Interstate Commerce Commission on May 22 on the subject of the depreciation of equipment accounts prescribed by the commission and the large number of primary accounts in the classification of operating expenses. The hearing was requested by the representatives of the steam railways in order that they might submit arguments against the treatment of depreciation as an operating expense and that they might show the difficulty and expense of application of the classification of operating expenses.

Statements were made on these subjects by each member of the committee present or represented, and on behalf of the Interstate Commerce Commission. At the conclusion of the hearing the subjects were taken under consideration by the commission.

It was stated on behalf of the railways that it is believed that the apportionment of the revenues of the companies is one of the most important functions of management and something for which the directors are morally, and in many states legally, responsible. It was the desire to express to the commission the principles which have been adopted by various roads and have stood the test of time in this country and abroad, and it was hoped to convince the commission of the fairness and correctness of the position of the railways on this subject. One of the railway representatives said:

"I think there is a misunderstanding as to just what is meant by depreciation. It is a new term so far as railways are concerned. We have never had depreciation in our accounts, although we have all taken care of what you call depreciation. Diminution in value by reason of wear and tear or decay of a car, locomotive, piece of track or building is what some might call depreciation. We have never considered that depreciation. We have considered that when a locomotive, a car or a piece of track needed renewal in respect of any of its constituent parts we should make the renewal and charge the entire expense to maintenance. A railway as a whole is an immense composite structure and almost every individual item of equipment enters into that structure. So long as we maintain the integrity of the original tool, equipment or structure, etc., we have never called the expense an expenditure for depreciation; we have called it maintenance.

"We recognize that something else is taking place all the time, and that especially in a country which is developing as this is there is a depreciation due to the fact that the equipment or structures become obsolete and not as economical as they should be; but we all agree that that depreciation is something that we cannot foresee. That which is due to wear and tear, age or decay we always have provided for out of maintenance. It seems to us that the setting up of arbitrary charges every month or every year is not the natural way of providing for expense of that character. To provide for depreciation due to obsolescence would be trying to enter on our books something that is to be anticipated in the future, but that is hardly a function of accounting. Several methods of providing for the depreciation due to obsolescence are in use. The most common, I suppose, is what might be called the numerical method, whereby a company maintains the number of cars with which it started. Under another method the original valuation is preserved intact."

Other representatives of railways presented statements,

showing what the practice of certain companies had been in the past. The following statement was presented on behalf of one large company:

The company provides for depreciation that would otherwise occur in value of equipment by charging operating expenses adequately each year with an amount that would cover not only the necessary replacement of equipment actually worn out or destroyed, but also the repairs of equipment no longer available for the most efficient and economical service, by equipment of a higher standard. The traffic necessities of the company dictate the type of replacement and the charge to expense in each case is the amount necessary to purchase new equipment of the same character as that disposed of, the balance being provided out of income.

In this way the charge to operating expense is an actual charge and the present stockholder gets a direct corresponding benefit through a better class of equipment, whereas a theoretical bookkeeping charge into a fund would take from the stockholder current revenue and give the benefit of its expenditure to a future stockholder. The sums so charged off would not represent actual expenditures, but would merely be transfers from one account to another. Under our practice the amounts that we believe properly chargeable to operating expenses are those covering actual expenditures, and the amount of money to be spent is decided according to the best judgment of parties entrusted by the stockholders with the management of their property, based on actual experience and knowledge.

We have also charged against the income account from time to time large sums on account of the purchase of equipment, and as a result of the company's practice the equipment and its value on the books have been thus more than maintained. In the judgment of this company it must be apparent that with the change in the volume of business and the reduced service made by the equipment any fixed or arbitrary percentage such as that adopted by certain companies in 1907 must now be changed, if such action has not already been taken.

Therefore, in view of the fact that our accounts are kept on the basis of facts and not on any hypothetical basis, it will be apparent why we have no data applicable to the question as to the depreciation and the life of equipment.

After these statements had been made on behalf of the companies, a response to some of the points raised was presented by a representative of the commission. The misunderstanding between the commission and the railways, it was stated, really seemed to be on the point when the liability due to depreciation should be entered into the accounts. Depreciation was declared to be a decrease of capital assets and the position which the accountants of the commission take is that the accounts ought to recognize this decrease of capital assets at a time when the decrease takes place. The depreciation accounts, it was declared, are primarily for the purpose of securing a uniformity of method between carriers, and are designed to have the financial facts and the official facts, so far as obsolescence are concerned, taken care of in uniform manner. A secondary consideration is the maintenance of the capital assets for the stockholders and a corollary is the protection of the public against over capitalization.

It was stated on behalf of the commission that the accounts might perhaps be brought into better shape and be made more satisfactory if the renewals of important parts should be charged against the replacement liability and not as at present covered into repair accounts. Some have felt that the replacement liability accounts or replacement reserves ought to cover repairs, reserves and replacements of units when they are abandoned. The statement was made that if this could be worked out it was thought that the commission would be in accord with it.

It was objected by one of the representatives of the companies that the statements made on behalf of the com-

mission indicated that the real purpose of the depreciation charges is to obtain for the commission a control and determination of the manner of application of the operating funds; in other words, that the intent of the commission was to prescribe not so much a uniform system of accounting as a uniform system of spending.

It was stated as the method of another railway that the practice has been to maintain the efficiency of equipment by repairs and renewals as occasion required. This policy has been pursued for many years, and as a result the equipment instead of deteriorating in value cost more than the amount at which it stands on the books. This is the result largely of replacement of the retired units by better and more costly equipment. This company admitted that theoretically, and indeed practically, there is depreciation of equipment, but submitted that there is and can be no uniformity in expenditures because in practice those must vary in accordance with financial and business conditions. As there can be no uniformity among the years so there can be none in the months. This company stated that it was willing to maintain the efficiency of its equipment, but that it had a most decided objection to accumulating funds of idle money to represent a depreciation that does not affect the usefulness of the cars or locomotives. To undertake to set up accounts or funds representing depreciation would be to inject an element of speculation and uncertainty, the actual result of which would be little short of chaotic.

The position of the railways represented was summed up substantially as follows:

"We desire and think it is proper to treat as an operating expense actual expenditures of money only. We think we take care of the liability by the replacement of each part as it wears out and that replacement in this manner provides for everything except depreciation due to obsolescence. The latter cannot be foreseen."

At the beginning of the hearing, before the subject of depreciation was considered, the question of the number of primary accounts was discussed. In introducing the subject of changes in the system it was stated to be the feeling of the railways that the problem is somewhat broader than a mere accounting problem. There was no desire on the part of the committee to depreciate the work that has been done or to criticize the action of the accounting officers of the companies or of the expert of the commission. It was thought that the readiness with which most of the railways introduced depreciation accounts last year was evidence of the good faith and willingness of the companies to work with the commission in order to establish a ground on which the accounting for depreciation could stand. But conditions existing at that time, and in the light of which that willingness was displayed by the railways, have changed materially and have practically shown that an arbitrary charge for depreciation that looked safe at that time is not only unsatisfactory but positively dangerous.

The chief executive official of one company said that there is a great desire on the part of the railways to have the number of accounts simplified as much as possible. In the first nine months of the fiscal year beginning July 1, 1907, the experience of four roads showed that the charges of from 23 to 26 of the primary operating expense accounts represented less than one-tenth of 1 per cent of the operating expenses. From 23 to 25 accounts represented about 80 per cent of the total. The committee therefore submitted that the primary accounts might properly be divided

into as low as 40 or 50, and certainly not over 75. It takes as much time to divide the expenditure of \$1 as to divide the expenditure of \$1,000, if charges to a number of primary accounts are involved.

A representative of the commission said he thought that there was a great deal of truth in what the committee submitted as to the large number of accounts for very small lines. The situation was very much more exaggerated in the case of the electric roads. It is proposed to adopt the same method of procedure with the steam as with the electric lines, and in the tentative classification of operating expenses to which this scheme of division of accounts has been applied there will be not more than 80 or 90 roads for which the extended classification will be required. The classification for small carriers, of which there are 1100, will be very much reduced. The two bases of division of companies under consideration are gross revenue and length of line operated. It was stated that the one which will probably be accepted is that of the length of line operated. Between 80 and 90 operating expense accounts would be the largest number that would be required for the middle class of roads. The number of primary accounts for large roads would be 121.

An instance was cited by one railway official showing that a charge for a ruler purchased by the engineering department at a cost of \$1.38 had to be divided among 15 or 18 accounts in order to follow the classification correctly.

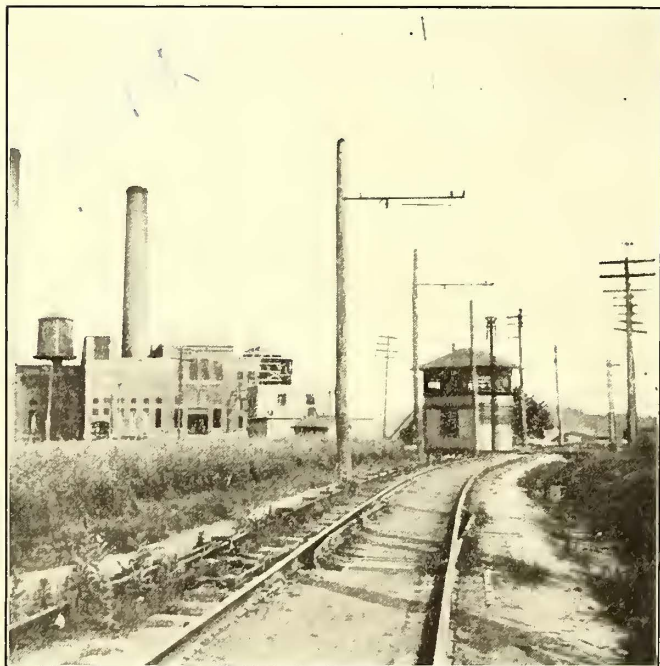
The suggestion made on the part of the commission that the companies be divided so that the large lines would still be obliged to use 121 primary expense accounts did not meet with the approval of the members of the committee, who stated that this plan would afford no relief whatever. The railways thought that a material reduction should be made in the number of primary accounts and that rules might properly be laid down for a number of subdivisions which should be left optional with the carriers. It was suggested that the accounts for stationery and printing, insurance and injuries to persons should be combined and that the maintenance of equipment used by the maintenance of way department should be charged to the maintenance of equipment accounts.

In response to a question from a member of the commission it was stated that in nine months the charges for equipment used in maintenance of way were the following percentages of the maintenance of equipment charges on four roads: .11 of 1 per cent, .09 of 1 per cent, .42 of 1 per cent, .40 of 1 per cent. The repairs of freight cars, for instance, chargeable to maintenance of equipment, were from 6 to 10 per cent. These instances were cited to show that the motive power department is responsible and is chargeable with perhaps 95 per cent of the expenditure. It was also argued that the hire of equipment accounts should be treated through conducting transportation.

A representative of the commission said that in some cases the assignment of accounts was due to an extreme application of the cost theory of accounting. He said that all the accounts that are lower than 1 per cent in the classification of operating expenses are accounts that touch expenditures which are peculiar and significant in themselves. He thought personally that it was best that the service equipment should be transferred from maintenance of way to maintenance of equipment, and would not object to the consolidation of the insurance accounts, but would want to think over the subject a long while before agreeing to anything like a radical modification of the present classification.

THE ANNAPOLIS SHORT LINE

The territory between Baltimore and Annapolis is now the scene of a most interesting trial of single-phase operation. On the one hand is the Washington, Baltimore & Annapolis Electric Railway, whose system was described in the *STREET RAILWAY JOURNAL* and *ELECTRIC RAILWAY REVIEW* for Feb. 15, 1908. On the other hand is the Annapolis Short Line, which is owned by the Maryland Electric Rail-



Annapolis Short Line—Single Track Construction

ways Company, and which has recently been converted from steam to electric power. The fact that a paper on certain electrical problems connected with the latter line was presented this week at the meeting of the American Institute of Electrical Engineers by Prof. J. B. Whitehead makes a description of its main features of especial interest.

ROUTE

The Annapolis Short Line is a single track, standard gage road, between Baltimore and Annapolis, and has for many years been operated by steam. Its length is $25\frac{1}{4}$ miles, and in addition there is a branch 4 miles long, extending south of Annapolis to Bay Ridge, a summer resort on Chesapeake Bay. The Baltimore terminal is at Camden Station, the main terminal of the Baltimore & Ohio Railroad. The demands of a constant high class patronage between the two cities and the conditions imposed by operation over more than a mile of the crowded B. & O. R. R. tracks and into its terminal have resulted in excellent operating efficiency and schedule maintenance. A chief matter of interest in connection with the change to electrical operation is the aim to maintain the same conditions of operation as have held in the past, these conditions being imposed by steam railroad standards of the highest degree.

Among the improvements which have been carried out in connection with the installation of electricity have been the acquiring of new rights of way, enabling many curves to be eased, and the laying of 5 miles of double track; $3\frac{1}{2}$ miles of this double track is at the Baltimore end, there being a $1\frac{1}{2}$ -mile stretch in the center of the road. The maximum gradient is $1\frac{1}{2}$ per cent, the longest stretch at this figure being $1\frac{1}{2}$ miles. There is one curve of 8 deg., one of 6 deg., and many of easier figure. There are three bridges,

one of them at Severn River being 3700 ft. long. Two of these bridges have draws. The rail is 80 lb., the ballast gravel and cinder.

SERVICE

The recent normal service under steam comprised seven trains per day, averaging three coaches each, in each direction. The approximate monthly car mileage was 30,000. The fastest time was 45 minutes between terminals, with five intermediate stops, a schedule speed of 33.7 m.p.h. The local running time was one hour, with an average of 15 stops. There is one freight train each way daily, and there are occasional large excursion loads.

Under electricity trains are run in each direction under hourly headway. These trains consist of either one or two cars. The express trains for the present make the run in 45 minutes. It is probable that this time will be shortened. The local running time, with the full number of stops, has been reduced to 55 minutes.

POWER

The Consolidated Gas, Electric Light & Power Company's principal plant is located at Westport, which is on the Annapolis Short Line, about 1.5 miles from Baltimore. This plant has 13,000 kw installed and an extension is in process of construction. Power being offered by this company at a fairly satisfactory figure, it was decided to begin electrical operation of the road before considering the building of its own power house. The plant generates at 13,000 volts, three-phase, 25 cycles.

The necessity of equalizing the railway company's load for the power company's system made necessary the installation of motor generator sets. Three such sets, with their attendant control apparatus, are installed in the Westport power house. Each set consists of a 600-kw, 6600-volt,



Annapolis Short Line—Double Track Construction

single-phase, 25-cycle generator, direct connected to an 875-hp, 13,000-volt, three-phase, 25-cycle synchronous motor. On the same shaft is also mounted a 100-hp, direct current, compound wound, 125-volt motor. After the set is synchronized, the compound winding of the starting motor is reversed and the machine is used as a generator for supplying one set of d.c. bus-bars, from which the 600 kw generators are excited. A Tirrill regulator is used in connection with this bus. A second set of d.c. bus-bars is fed

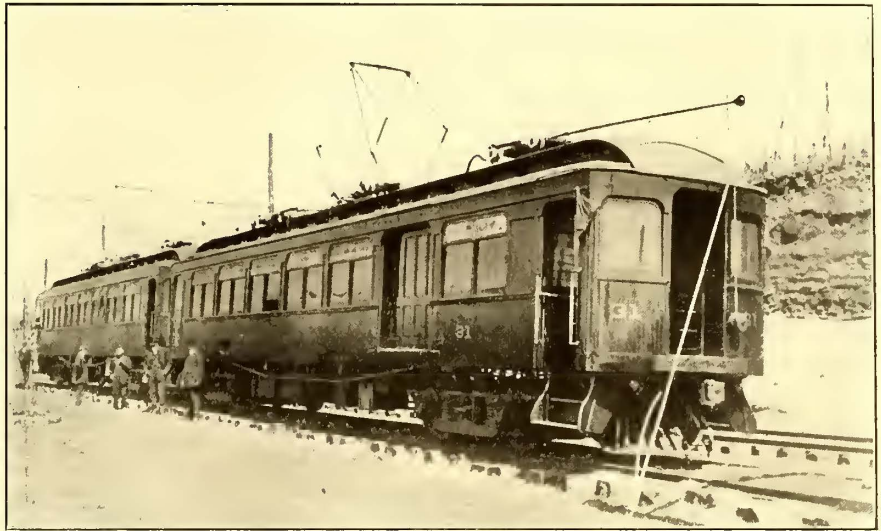
from a 120-kw, 125-volt, compound wound generator, direct connected with an induction motor. This set of bus-bars is used for starting the main motor generator sets and for exciting the synchronous motors. The two sets of bus-bars are interchangeable, and any of the four direct current machines may be connected to either bus. The synchronous motors are connected to the railway company's 13,000-volt bus-bars by means of Westinghouse Type E oil circuit breakers. This 13,000-volt bus is fed from the power company's system through a Westinghouse Type C electrically operated automatic overload release circuit breaker.

The 6600-volt bus-bars supply six circuits. Two of these are carried direct to two sections of the trolley, feeding north and south respectively. The remaining four circuits supply four 300-kw, oil insulated, self-cooling transformers, whose secondary voltage is 22,000. Only three of these transformers have as yet been installed. These six circuits are all protected by automatic, overload release, oil circuit breakers.

SUBSTATIONS

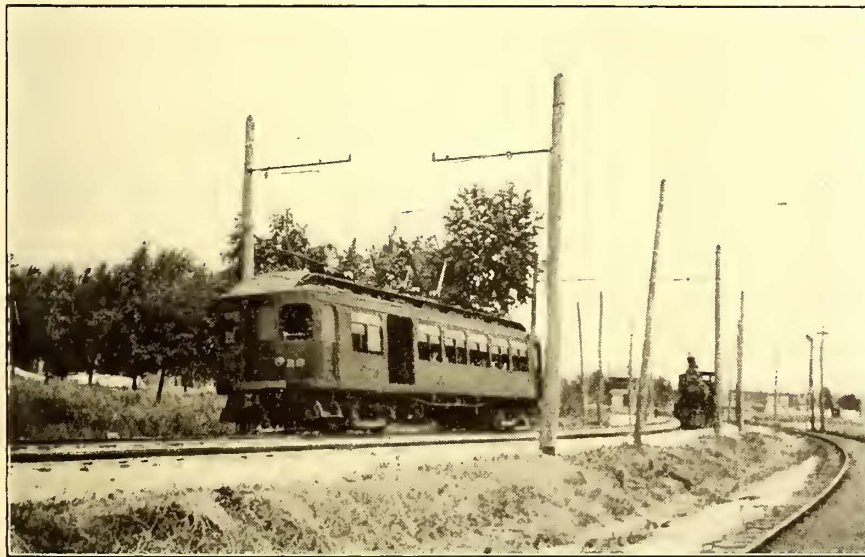
Power is transmitted to a single sub-station, 18 miles from Westport, and approximately 6½ miles from Annapolis. This substation contains at present three 300-kw oil insulated transformers, stepping down from 22,000 to 6600 volts. Space and switchboard equipment are provided for a fourth unit. Two trolley circuits leave this substation, feeding north and south. No attendance is required at this point, the apparatus being protected by automatic overload release circuit breakers in the transmission

lines has been necessary to use a cross span method of suspension. The pole spacing is 120 ft., and the trolley hangers are approximately 10 ft. apart. On curves the pole spacing is reduced to 100 ft. and to 80 ft. The average pole is 35 ft. long and is set from 6 ft. to 7 ft. in the earth, at a distance of 7 ft. 2 in. from the center line of track. The trolley is 22 ft. above the head of the rail. The transmission



Annapolis Short Line—Combination Motor and Straight Passenger Motor Car

lines are carried on the same pole as the trolley bracket. The trolley wire is No. 000. The entire length of the line is divided into six sections, separated by disconnecting switches, all of which, under normal conditions, are closed. The trolley insulators and strain insulators are of the Westinghouse standard for 6600 volt service. There are two single-phase transmission lines of No. 2 hard drawn copper. Both lines are carried on the same cross arm, the individual wires being separated by 30 in. The high tension insulators were furnished by the Lima Insulator Company, Lima, Ohio. On the crest of the pole a 5/16-in. steel strand ground wire is installed throughout the entire length of the transmission line. This wire is connected to the track at frequent intervals, and at every pole which is stayed by a guy the bracket arm and guy wire are also grounded. The two transmission lines are independently controlled at each end. Either is sufficient to carry the maximum normal service demand. One line is transposed twice, the other three times, the transpositions being staggered.



Annapolis Short Line—Combination Car Running on Double Track Section

circuits at Westport power house. A photograph of this substation is shown in one of the engravings.

The entire equipment of power apparatus was furnished and installed by the Westinghouse Electric & Manufacturing Company.

TROLLEY AND TRANSMISSION LINES

The trolley voltage is 6600. The Westinghouse system of single catenary suspension is used. In several places it

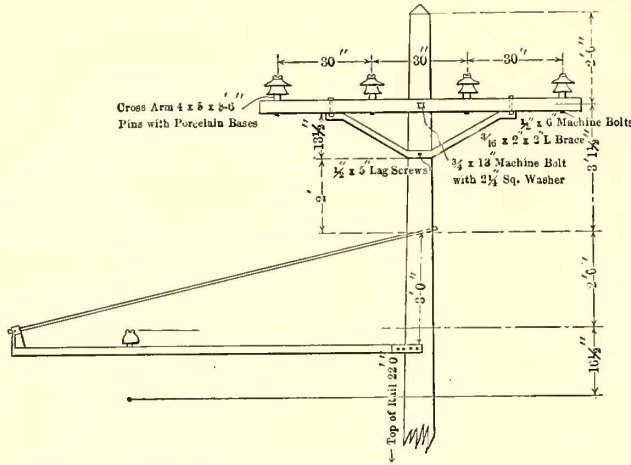
The track is bonded throughout with No. 0000 bonds of flexible copper strap, soldered to the base of the rail. The rails are cross bonded every 500 ft. The track is grounded by means of copper plates, 9 sq. ft. in area, at five points. Two of these plates are on salt water bottom and the remainder are imbedded in coke in damp earth.

The draw bridge over Severn River required special work, both overhead and in the track return; as the transmission line did not extend across this river, the problem was limited to the trolley. Catenary trolley suspension was employed on the draw, terminating on each end in a

rigid tee iron. On the two ends of the bridge, corresponding pieces of tee iron were installed, and a spring jumper was provided at each end for the purpose of leading the pantograph over the break. On opening the draw, this jumper swings to one side, returning to its normal position under the action of this spring. Under normal conditions the trolley would not be alive on the draw. In case, how-

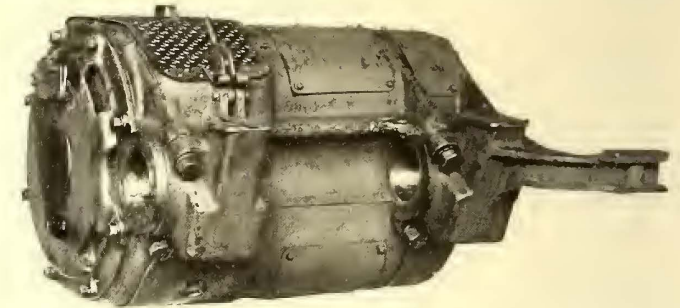
intermediate sills are of 6-in. I beam, and the side sills are reinforced with a 12-in. steel plate, set on edge. The length is 55 ft. over all, and the express car seats 60 passengers. The body alone weighs about 32,000 lb. When completely equipped the total weight is somewhat under 50 tons. The electric control is on one side of the vestibule and is enclosed at the rear end by a door, which, when operating in the forward direction, serves to seclude the motorman. The interior finish is of inlaid mahogany. The cars were made by the Southern Car Company, High Point, N. C.

The trucks are of M. C. B. standard throughout and were constructed by the American Locomotive Company. They



Annapolis Short Line—Line Construction Details

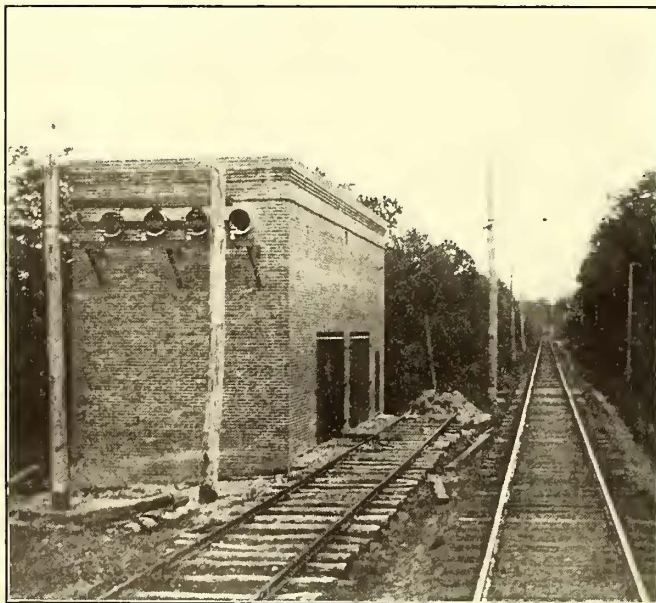
ever, of its being necessary to start a car while on the draw, a disconnecting switch is provided at each end between the two sections of the tee iron already mentioned. Power is carried around the draw by means of three No. 0, single conductor, lead covered, armored, submarine cables. Each of these cables is brought at each end to the center of a single pole, double throw disconnecting switch. The upper points of these switches are connected to the trolley circuit, and the lower points to the track. This permits the use of any cable, either as overhead or return conductor.



Annapolis Short Line—Single-phase Motor Complete

were designed for a maximum load of 32,500 lb. at the center bearings. The distance between truck centers is 33 ft. The axles are 6 in. in diameter, with 7 1/4-in. gear seat and 5-in. x 9-in. journals. The rolled steel wheels are 36 in. in diameter and have M. C. B. standard tread and flange. The brakes are of Westinghouse A. M. T. automatic type.

The motors are of the Westinghouse 132A type and rated at 100 hp each. There are four on each car and they are adapted for both a.c. and d.c. operation. The multiple unit system of train control enables a train of more than one car to be operated by one motorman. The present plans of the railway company will permit it to use alternating current throughout the entire length of its line. The comparatively slight additions necessary to make the cars operable on direct current were installed with a view to a future pos-

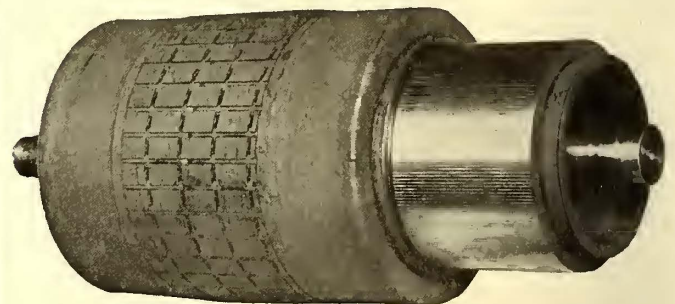


Annapolis Short Line—Transformer Substation

A low equivalent lightning arrester is installed in each of the cable terminal houses. The trolley circuit is protected throughout its length by means of Westinghouse fuse type, line arresters, installed on every eighth pole.

CARS

The cars are of a type and design specially chosen to meet the demands of the required high speed service, and are of the Pullman enclosed vestibule type. The center and



Annapolis Short Line—Armature and Commutator of 100-hp, d.c.-a.c. Motor

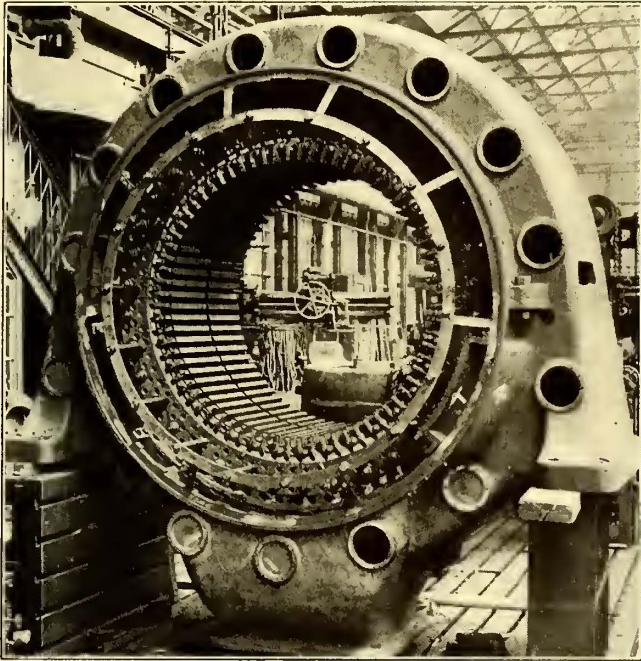
sible operation on city streets. Each car is equipped with one pantograph trolley, controlled by air, and two wheel trolleys, which would be used on direct current operation, but which may also be used on alternating current in case of emergency.

ENGINEERING

The electrical equipment was designed by and installed under the direction of Dr. J. B. Whitehead, of Johns Hopkins University, electrical engineer for the Annapolis Short Line. The construction work and various physical improvements were carried out by J. G. White & Company, New York. This firm also served the railroad in the capacity of consulting engineers.

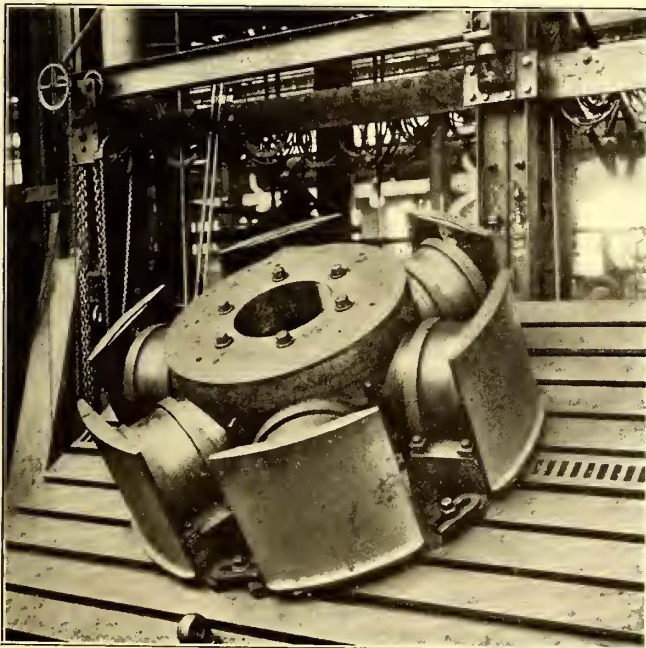
A 6000-KW TURBO-ALTERNATOR FOR MANCHESTER, ENGLAND

On May 5 the Manchester Corporation Electricity Works started a 6000-kw Willans-Siemens turbo-alternator, the largest thus far installed in England. This unit is



Electric Stator of 6000-kw Turbo-alternator

placed in engine room No. 2 of the Stuart Street station, which room originally was laid out for 8000 kw in reciprocating engine sets, but instead will accommodate 30,000 kw in turbines eventually.



Electric Rotor of 6000-kw Turbo-alternator

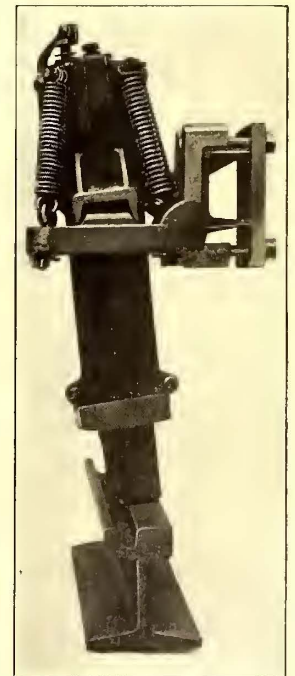
The new turbo-alternator consists of a Willans-Robinson steam turbine and a Siemens three-phase generator. The auxiliaries embrace a "Contraflo" surface condenser with De Laval electrically driven circulating pumps and Edwards air pumps. The steam pressure at the stop valve

is 190 lb., and the guaranteed steam consumption of the turbine 15.85 lb. per kw-hour on full load. The normal full-load output of the alternator at 1000 r.p.m. is 7060 kva or 6000 amp at 6500 volts, 50 cycles, with an 85 per cent power factor. The total weight of the turbine and generator is 158.5 tons. The principal dimensions are the following: Total length over all, 46 ft. 3 in.; diameter of high-pressure section, 34 in.; diameter of intermediate section, 51 in.; diameter of low-pressure section, 77½ in.; length of low-pressure blading, 8 in.; and diameter of shaft, 11 in.

A feature of the alternator is the system of forced ventilation. The machine is totally enclosed and air is forced into the stator at a pressure of 3 in. of water, passes through the stator and rotor, and out again through the hollow feet of the stator to an exhaust duct which leads outside the engine room. The blower, which is driven by a 23-hp, d.c. motor, can force 21,000 cu. ft. of air per minute through the alternator. Air is drawn into the fan room through a dust filter consisting of zig-zag screens of wool cloth mounted on a bamboo frame.

TWO-BLADED RAIL CLEANER

A two-bladed rail cleaner which gives a direct cutting action has been installed by the Consolidated Accessories Company, of London, on a number of English, continental and foreign tramways. The device is the invention of Mr. Pringle, by whom and C. W. Green, of C. W. Green & Company, it was worked out in all its details. Both cleaning blades are vertical to the track and therefore at right angles to their work, and as the edges of each cleaner always retain during their life a sharp cutting edge, it is obvious the work is carried out most effectively and with the least consumption of power. Experiments show that even on a dirty rail the cleaner hardly affects the running of the car. Tests to see how far the car would drift at a given speed with the cleaner out of operation and in operation showed such a small difference that the additional current consumption can almost be considered negligible. The sleeve of the cleaner is supported on two trunnions, being held tightly down to them by four springs. The trunnions permit also of considerable side canting, so that while the sleeve and cleaners are vertically supported they are free to move in any direction. As soon as any work is thrown on the cleaner which is in excess of the power of the springs, the sleeve departs from the vertical and trails to the rear of the car, fulcruming on the front trunnion. A similar action occurs when the car is traveling in the reverse direction. The groove blade is made



Rail Cleaner

of a special steel, retaining toughness and hardness. The tread blade is of a softer material, but retains a sharp cutting edge when in operation. The blades are of sufficient length to give a considerable life, being gradually fed them.

It is recommended that the cleaners be attached to a car which is put into service the first thing in the morning and brought in the last thing at night, and so be continually in operation and permit no serious accumulation of dirt to take place in the groove. By this means the dirt is removed in such small quantities that it never becomes objectionable to the road authorities. Either blade may be used if desired, but there is nothing to prevent the groove blade remaining in action when the cleaner is transferred from grooved rails to T-rails. Should a system be operated entirely with the latter rail the cleaner can be modified so as only to have a tread blade.

SIGNAL AND DISPATCHING SYSTEM FOR INTERURBAN RAILWAYS

The Simmen Automatic Railway Signal Company, of Los Angeles, Cal., has recently developed for both interurban electric and steam railroads a signal and dispatching system which provides the following important features: An automatic record in the dispatcher's office of the progress of all trains over the road; means for the dispatcher to give the stop or proceed signal to any train on the road; telephone communication between dispatcher and motorman or engineer in his cab; interlocking arrangements in dispatcher's switchboard to prevent the giving of wrong signals; and an accurate automatic check of the ability of every motorman to keep schedule time without excessive speeds. The system is now in daily operation on 18 miles of the Santa Fé Railroad in Southern California, where it is said to be giving excellent results.

The dispatcher's record sheet as shown in Fig. 1 is a blue or white print, divided into time lines in one direction, and station lines or blocks in the other. A graphical record of the movement of trains is obtained by placing this sheet in the recording device shown in Fig. 2. The latter moves the record sheet uniformly by clock-work, so that the exact hour and minute of the day, as marked on the sheet, is always under the marking instruments, consisting in this case of vibrating pencils.

A separate marking device is used for each block, the record being made in the following manner: As a train enters block No. 1, marking instrument No. 1 is electrically vibrated, thus making a mark on the sheet, as shown by the heavy, short vertical line in Fig. 1. As the train enters block No. 2, marking instrument No. 1 stops and No. 2 takes up the record. Since the exact time constantly is under the marking instrument, the dispatcher is informed where his trains are at any moment, and a record is made of the time a train entered any block and its running time in the block. The light short vertical lines in Fig. 1 adjacent to the record lines are schedule lines. The latter are put on the tracing before the daily record prints are made, and show the schedule running time in each block for each train. This enables an immediate comparison between schedule time and actual running time.

Schedule lines for extra trains can be put prominently on the sheet in a few seconds by placing one end of a ruler on the leaving time, the other end on the arriving time, and drawing a diagonal line along the ruler with a red pencil. The marking instruments for making a record of the actual running time of a train may be a perforating or inking device. On the Santa Fé installation, a perforating steel needle is preferred.

To operate the corresponding marking instrument when a train enters any particular block, two distinct methods

may be employed, one by using a track circuit, the other as shown by Fig. 3. The latter method is particularly advantageous on electric and steam roads of average traffic where the cost and maintenance of a track circuit is prohibitive.

In Fig. 3 the length of a block runs from passing siding to passing siding. A single wire runs from the dispatcher's office to each block, connecting at the passing siding with

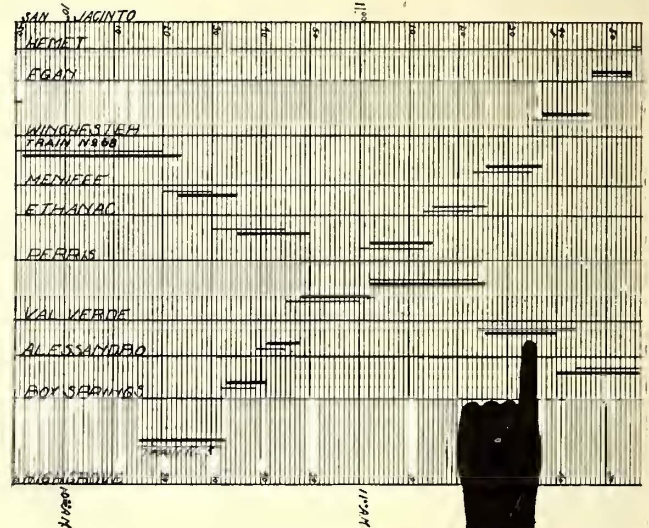


Fig. 1.—Dispatcher's Record Sheet

home and distant third-rails 40 ft. long. Each car or locomotive has a contact shoe, a relay, two lamps (one red and one green), a bell, a storage battery and a telephone.

The record of train movements in the dispatcher's office is made as follows: As a train is passing a third-rail, an electrical circuit is established from a storage battery in

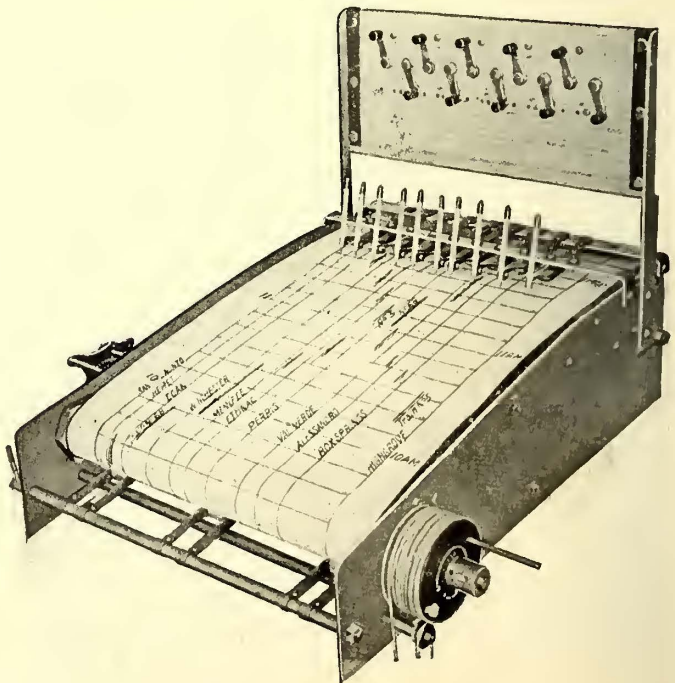


Fig. 2.—Dispatcher's Recording Instrument

the dispatcher's office in order through the line wire, third-rail, contact shoe, signal circuit in cab to wheels of truck, return circuit (track rails) back to the dispatcher's office through relay in the office to the opposite side of the battery. The closing of this circuit energizes the main relay

in the office, which in turn closes a local circuit, in which the perforating magnet is located, thus making a record on the sheet. By the method shown in Fig. 3 only a momentary record is obtained, while the contact shoe makes contact with the third-rail, thus giving a series of short perforations.

A continuous perforation may be obtained by means of polarized relays as long as the train is in any one block, as shown on the record sheet, Fig. 1. The circuit breaker in the local office circuit may be operated by clock-work or a make and break relay, and its purpose is to vibrate the marking magnet, thus preventing friction on the record sheet.

The dispatcher signals to the motorman or engineer in the following manner:

The local cab circuit consists of a main circuit through the cab relay and knife switch operated by the contact shoe. Two auxiliary circuits in which the signal lamps are located are controlled by the relay. When the relay is energized a clear signal is given, and when de-energized a danger signal. When the contact shoe is not on a third-rail the knife switch is closed, thus energizing the relay from the storage battery on the car and giving a clear signal. However, as soon as the contact shoe makes contact with the third-rail, the knife switch is opened, and the battery on car has no further influence on the cab relay. If, then, the third-rail is energized from the battery in dispatcher's office, a clear signal is retained, but if the dispatcher opens the circuit in his office by the switches shown, the cab relay will be deprived of all energy, and a danger signal results. Signal changes are obtained with train running at full speed, and a danger signal is inevitable, unless the third-rails are energized from the dispatcher's office.

It will be noted that the main cab circuit passes through the front contact of the cab relay; thus, once the danger signal is given, and the relay de-energized, the only possible way to clear the signal is by the dispatcher closing the switch in his office. By using condensers, telephone communication can be established in the cab over the signal circuit without the least interference. As the switches

from 30 to 60 miles an hour, the alternate energizing and de-energizing is secured by touching the contact shoe attached to a post in the floor. This contact shoe receives current from the third-rail to represent a signal current from the dispatcher's office so that the indications secured through the shoe are the same as would appear in the motorman's cab in practice.

The essence of the new system is the automatic record and the control of signals from the dispatcher's office.

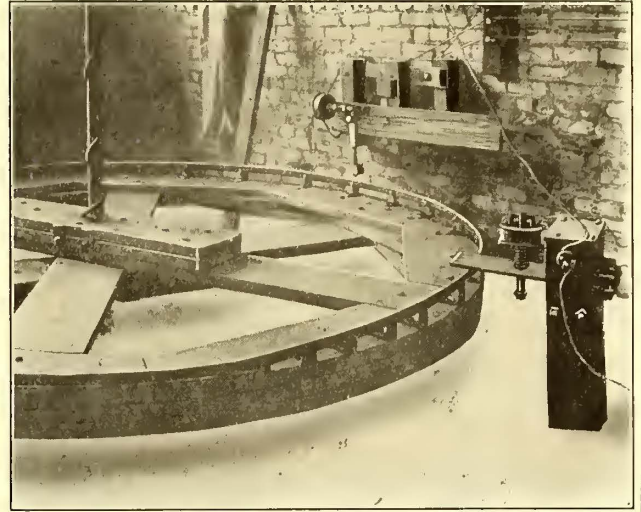


Fig. 4.—Test Apparatus for Signal

Either cab, semaphore or light signals may be used, and normally closed circuits are possible throughout, thus conforming to the most advanced signal methods.

Work on the third section of the power plant of the Public Service Corporation of New Jersey, in the Marion section of Jersey City, has been begun. The building was originally planned to comprise six sections, and two sections have been in operation for a long time. The new addition, it is expected, will be finished by autumn. It will be

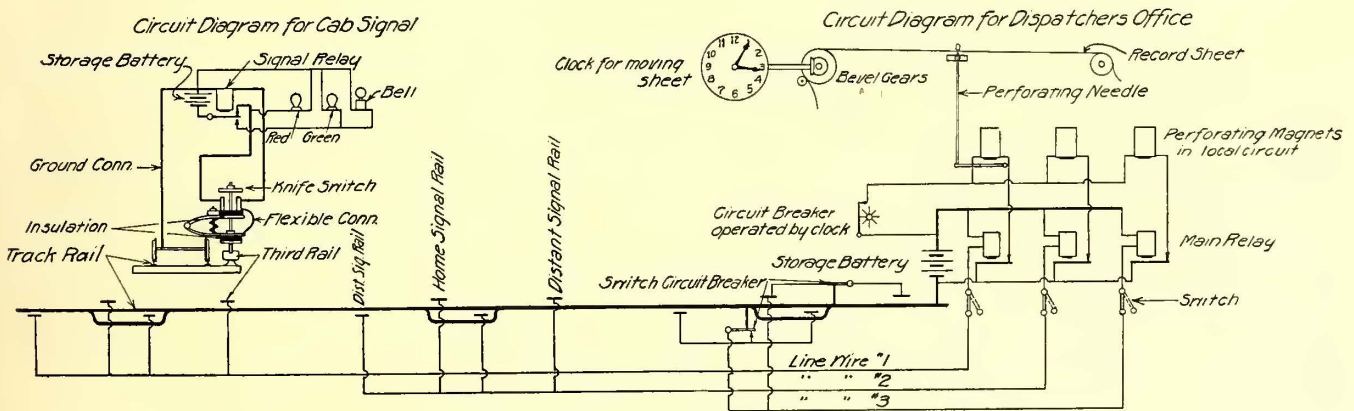


Fig. 3.—Wiring Circuits and Apparatus for Signal System

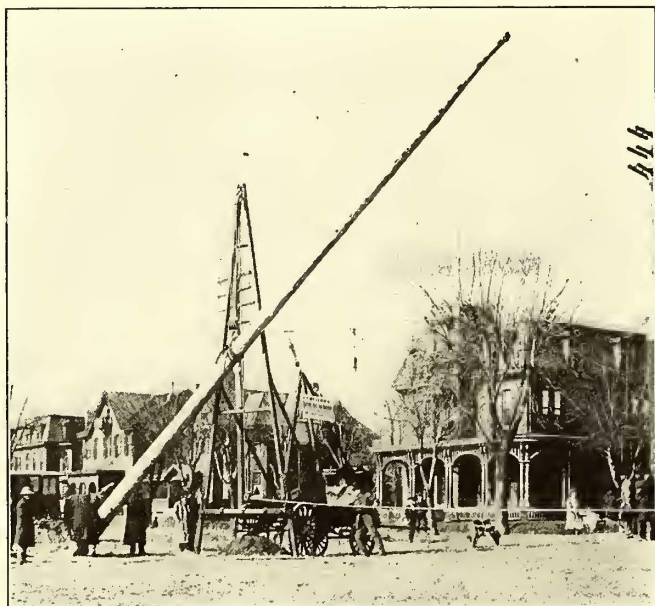
controlling the signal are concentrated at one point, interlocking is possible to preventing wrong manipulation of switches by the dispatcher.

Fig. 4 shows the apparatus used to simulate the alternate energizing and de-energizing of the third-rail and with which two and one-half million signal indications have been secured without a failure. It consists principally of a wheel 10 ft. in diameter on which a third-rail is placed for half the circumference. As the wheel is made to revolve

80 ft. x 180 ft., and will be divided into three parts, as are the present sections. One subdivision will be for boilers, the middle, or second section, for the turbines, and the third for switchboards. A contract for the foundation for the new section has been awarded to P. Sanford Ross. For the building proper bids are being received and a contract will be given out on a competitive basis. The electrical equipment of the new section will be supplied by the General Electric Company, Schenectady, N. Y.

MECHANICAL POLE HOISTER

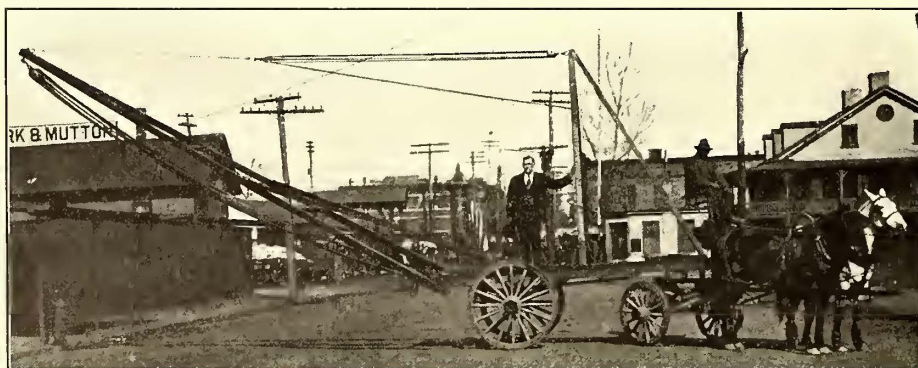
The accompanying illustrations show a mechanical pole hoister recently invented by B. F. Shafer and manufactured by W. N. Matthews & Brother, of St. Louis. As shown in the views, the apparatus is mounted on an ordinary wagon truck, which is collapsible, so that it can be easily shipped. It weighs about 700 lb. when crated. When on the wagon it can be lowered so that it will pass under trolley wires, bridges and other aerial obstructions. One of the illustra-



Pole Being Lowered in the Hole

tions shows the machine mounted on an ordinary wagon and lowered to pass under a trolley wire.

Another view illustrates the raising and setting of a 51-ft. chestnut pole. Two linemen and a man to handle the team were all the labor required in this work. During the test shown it took only six minutes to put this 2000-lb. pole in position after the wagon left its starting place. The inventor claims that 48 poles any length up to 50 ft. can be put in their holes in an eight-hour day by two linemen and a boy to handle the team.

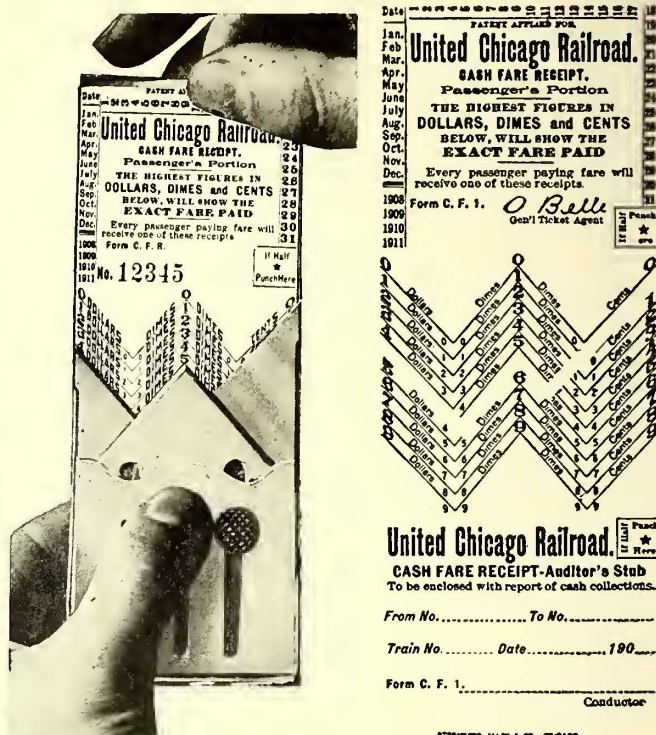


Standard Machine Mounted on Common Truck Lowered to Pass Under the Trolley Wires

The apparatus used in the test mentioned was afterwards employed in Media to take down 198 telephone poles which were from 50 ft. to 65 ft. in length, and which the company had to remove from the streets to put its wires underground. From 20 to 24 of these poles were pulled out of the ground during each day of nine hours each.

A NEW CASH FARE CUTTER AND CASH RECEIPT

Stromberg, Allen & Company, of Chicago, are introducing for use on electric railways their Rose cash fare cutter and cash receipt, which is designed to prevent manipulation of the transfer by either passenger or conductor. The cut-



Fare Cutter and Auditor's Stub

ter is about 2 3/8 in. wide by 5 3/4 in. high, being small enough to be carried in the vest pocket. The box portion is made of aluminum and will hold 50 receipts. Hinged to the lower portion of the box is a frame holding three flat, angular blades, made of sheet steel and hardened on the angular edges. The blades are held in position by thumb screws and work independently. The frame carrying the blades is raised from the box so that the stubs can be removed and new receipts inserted.

As shown in the accompanying illustration, the receipts are printed with zigzag lines through the center with angles corresponding to the angles of the blades. The lines on the left indicate dollars, those in the center, dimes and those on the right, cents. The points of the blades are placed under the figures desired, and with a quick pull the receipt is cut. It is evident that after a receipt is issued the passenger's portion cannot be altered without decreasing its value and the conductor's stub cannot be altered without increasing its value. The cutters are furnished to companies adopting the receipt.

The German Consult at Seoul, Corea, states that the American Korean Electric Company reports for the fiscal year receipts of 179,895 yen and 132,823 yen expenditure. The line is 18 miles long.

LONDON LETTER

FROM OUR REGULAR CORRESPONDENT

The London United Tramways Company, which has an extensive system of tramways in the western and south-western suburbs of London, has succeeded in having approved the preamble of its bill, before the House of Commons. The object of the bill is to obtain authority for the construction of tramways across Kew Bridge which would enable the company to connect the system on the north side of the river with Richmond. The County Councils of Surrey and Middlesex demanded exorbitant terms, but a clause was inserted in the bill which will leave the amount to be paid to be determined by an arbitrator, so that the work of construction may proceed.

J. B. Hamilton, general manager of the Leeds Corporation Tramways, received from the employees a handsome testimonial in the form of a large silver rose-bowl, a pair of silver candlesticks and a meerscham pipe on the occasion of his recently celebrated silver wedding.

The London County Council has not yet opened its system in Mile End Road, Whitechapel, which was equipped a few months ago with the G. B. surface contact system. The long delay in opening the line and one or two accidents to horses have been made the subject of question in the House of Commons, and assurances have had to be made that the system will not be opened for traffic until the Board of Trade is sure that everything is all right. The Council has recently ordered a large quantity of rails and again had to decide whether to order foreign or British rails. The committee finally decided to place the order with an English company, despite the fact that the price is about 10 per cent higher than the foreign bid. As a result the question has again come up for discussion whether it is better to preserve trade for Englishmen or to charge less to the rates. Acting on the same principle, the Council has also ordered 175 maximum traction trucks from Heenan & Froude, although the tender of Mountain & Gibson was lower, but unfortunately included steel of foreign manufacture. The Council is constructing a new underground conduit tramway from Dulwich Library to Forest Hill and has decided to purchase all of the Lea Bridge, Leyton & Walthamstow Tramway within the county of London. This system will be equipped with the overhead trolley and leased to the Leyton District Council. The new tramway from Hammersmith to Wood Lane, in which is the main entrance of the Franco-British Exhibition, was opened last month. It is equipped with the overhead trolley.

Owing to recent accidents, considerable interest has been shown in the trials at Leicester of a new emergency brake, the invention of P. J. Pringle, manager of the Burton Tramways. The brake will probably be handled by Mountain & Gibson, Bury. It has been fully described in our columns. Briefly, it consists of a skid which falls into the groove of the rail and allows the flanges of the trailing wheels of the car to run up on it. In this way about half of the weight of the car is supported on the skids, which slide along the groove until the friction brings the car to a standstill.

John Burns again referred to tramways in an interesting speech made at Ealing, near London, where certain districts are being developed with the idea of making them ideal communities. Mr. Burns stated that he hoped to see tramways all through Greater London at the uniform fare of a penny before many years, and that tramways would run into the country on all sides developing the adjacent county along the lines indicated in the new town bill. He says that the solution of the housing problem, as many tramway managers have insisted, is to be found neither in garden cities alone nor in the extension of facilities of communication, but in a successful combination of the two.

To encourage traffic the Wakefield & District Light Railway has opened a park at Lofthouse, near Wakefield. A skating ring, an aerial flight, an aerial railway, a dancing saloon, a cinematograph, a bowling green, a maze and other entertainments are provided; a chute and an artificial lake are being constructed and a Philippine village, to be inhabited by natives of the Philippines, is being laid out. Open-air band concerts are also being given. The company has spent about £32,000 in laying out and equipping the place. No charge is made for admission, a return tram ticket from Wakefield or Leeds being all that is necessary to gain entrance to the ground. The park has already had an appreciable effect in increasing traffic, and it is interesting to note that pleasure resorts are being built elsewhere for the purpose of encouraging traffic in the American fashion.

The London electric power bills have been occupying the attention of Lord Cromer's select committee. The case for the London & District Electric Power bill has been

finished. The other bills, one for a consolidation of the interests of eight of the existing companies and the other for a mutual agreement of four of the companies, are being considered. It is hoped that Lloyd George, who has been instrumental in solving many of the complicated disputes in England since he was appointed president of the board of trade, will come forward with a plan which will serve to unify the conflicting interests. At present it is impossible to foresee what the outcome of the inquiry will be, but it seems extremely improbable that any new company will be allowed to come in to the detriment of the existing companies and municipalities with large sums invested.

The verdict of the jury in the recent Bournemouth accident in which seven people were killed states that the accident was caused by the ear getting beyond control because of the failure of the brake to act. The driver is exonerated from all blame. The jury recommended that greater care be taken in making repairs and that no ears be permitted to leave any depot unless perfectly equipped.

The electrification of the Heysham, Morecambe & Lancaster branch of the Midland Railway has been completed and the line has been placed in operation. A description of the system is published elsewhere in this issue. As this is the first railway in England to be equipped with the single-phase system it is naturally eliciting a great deal of attention. It will be remembered that the honor of first deciding to use the single-phase system in Great Britain belongs to the London, Brighton & South Coast Railway, which is equipping about 12 miles of double track in the south of London. Philip Dawson is the consulting engineer for the Brighton Railway, but the work of electrification has taken a long time, it being nearly three years since the decision was made. While all rejoice at the success of the Midland Railway, many are anxious to see the Brighton Railway in operation, as this system is in the heart of London with a dense train service and surrounded by all the difficulties of a railway in crowded districts. We understand that the first train, composed of two motor ears and a trailer, has been completed at the works of the Metropolitan Amalgamated Railway Carriage & Wagon Company and that all the trains will be delivered by August. Soon thereafter the road will be opened to the public.

The Liverpool Tramways Committee has decided to institute on one of its routes leading to a fashionable suburb an experimental service of first-class trams at fares double those at present charged on the stages. The committee has been criticized for snobbery. Nevertheless the experiment will be watched with interest. There is much to be said in favor of such a service. On the other hand, many hold that the experiment is irrational, impossible and impracticable. It is interesting to note that C. W. Mallins, who has been connected with the Liverpool Tramway for 30 years under the Tramways Company and under the municipality as traffic manager since it took over the tramways, has been appointed general manager. It will be remembered that since the death of C. R. Bellamy there has been no general manager in Liverpool, the duties of that office being performed by Mr. Mallins and the chiefs of the other departments. Mr. Mallins has placed several of his inventions at the service of the corporation and the success of the system is in a large measure due to the initiative of Mr. Mallins.

It has been definitely settled that this year's congress of the Light Railways & Tramways Association shall be held at the Franco-British Exhibition on July 9-10. Members will be received in the congress hall of the exhibition by the chairman of the association and by the members of the reception committee at 10:30 a. m. July 9. At 11 a. m. Sir Clifton Robinson, Assoc. Inst. C.E., M. Inst. E.E., one of the vice-presidents, will open the proceedings with a paper entitled "The Tramways of the World." At noon A. H. Gibbings, Assoc. M. Inst. C. E., M.I.E.E., will read a paper on "Tramway Rail Joints." On July 10 A. L. C. Fell, vice-chairman of the association, will take the chair at 11 a. m., and Professor C. A. Carus-Wilson, M.I.E.E., Assoc. M. Inst. C.E., will read a paper entitled "Rail Corrugation." Members will be given an opportunity to discuss the papers at a meeting to be held at 35 Parliament Street, Westminster, July 24. At 7:30 p. m. July 10 the banquet hall at the Franco-British Exposition will be reserved, and dinner will be served to members and their friends.

The decision of the Mexborough & Swinton Tramway Company to abandon the Dolter system and revert to the overhead trolley is about to be put into effect. A sub-committee has been appointed to decide upon the exact and most convenient places for fixing the poles. The present cables in the center of the tracks will be utilized for conveying the power, which will be carried up the poles to the wires for driving the cars. The studs will be removed and granite pitching substituted.

A. C. S.

News of Electric Railways

Work of the Public Service Commission, First District, for the Year

William R. Willcox, chairman of the Public Service Commission of the First District of New York, made public a statement on June 27 reviewing the work of the commission for its first year. Mr. Willcox said in part:

"In looking back over the 12 months I have every reason to be satisfied with the progress made by the commission. Considering the work which devolved upon the commission and which had been taken up immediately upon its appointment and then looking at what has been accomplished, I feel that a great deal of ground has been covered and that everything which could be done has been done.

"Clothed with the power to remedy transportation abuses and service deficiencies, the commission has issued a great many orders to street railroad and other railroad corporations and those orders have been obeyed. A few of the most notable results are better express and local service in the subway, better and more frequent service on all the elevated roads and greatly increased service on all the most important surface lines; the car movement over the Brooklyn Bridge has been materially accelerated owing to the action of the commission in insisting upon proper repairs to the rolling stock, and in regulating truck traffic so that vehicles may not delay the cars.

"Evils of financial mismanagement and consequent deterioration in operating service were disclosed by the commission's investigation into the Interborough-Metropolitan system and the experience gained at this investigation has resulted in action by the commission looking toward the prevention in future of the abuses of the past. We have already taken, or will soon take, action which will prevent the over-capitalization of public service corporations and the distribution to political or other favorites of such securities at 'inside' rates which are not available to the general public. In two important bond issues authorized by this commission, the principle has been laid down and will be adhered to that all bond issues by such corporations shall be opened to public bidding unless arrangements are made for private sale at a figure which the market justifies.

"The commission also proposes to reform the system of accounting in full by such corporations and will make such changes as will compel the companies to make monthly allowances for depreciation and to set aside funds for the replacement of wornout rolling stock.

"The commission has also established a precedent as to the authorization of new corporations in a field already well occupied by denying the application of the Long Acre Electric Light & Power Company to make a large issue of bonds for the purpose of getting capital to enter into general competition with existing electric light and power companies. After much study, the commission has decided that where the field is monopolistic, that is, where a monopoly properly regulated can best supply the needs of the community, it is inadvisable to encourage the entrance of competitors. The soundness of this principle, we believe, will be vindicated in a few years by the improvement in service of the public service corporations now for the first time under adequate State regulation.

"The commission has also taken definite steps toward building new subways and elevated lines so badly needed. It has awarded contracts for the Fourth Avenue subway in Brooklyn, laid down the route for the Broadway-Lexington Avenue and Canal Street crosstown subways in Manhattan and the Bronx and is preparing plans for the Brooklyn extension of the Brooklyn loop subways. The commission perfected the plans for the Fourth Avenue subway, had them approved by the board of estimate and apportionment and only asked for an appropriation of \$2,850,000 to start the work. That was as far as the commission could go with the undertaking, for the law requires that the board of estimate and apportionment appropriate the money for building subways. Owing to a dispute over the debt limit, the board of estimate has been enjoined from making the appropriation and that is the only reason that actual work upon this great undertaking is not in progress at the present time. This commission did everything in its power to start the undertaking.

"Much of the betterment in street railway service is due to the orders of the commission requiring the thorough overhauling and repair of cars. This work has been pushed so that practically all the open cars placed in service in the spring were put out in a thoroughly renovated condition. The result has been fewer accidents during operation

and consequently fewer delays, with the result of better and quicker transportation.

"The closing of the first year of the commission's work is signalized by the first exercise of its powers to regulate the fares charged by street railway companies. A 5-cent fare in place of a 9-cent fare has been ordered on the Putnam division of the New York Central & Hudson River Railroad from 155th Street to University Heights. Similar questions involving as well the problem of free transfers will be considered in a short time in connection with the surface railroads in Manhattan and the Bronx and in order to gain information necessarily preliminary to action, the commission has ordered an appraisal of all the property owned by such companies. This appraisal will be undertaken at once under the direction of experts.

"For months the commission has been investigating the propriety of the 10-cent fare to Coney Island and within a short time a decision will be announced."

Outing of the New England Street Railway Club

The annual outing of the New England Street Railway Club was held in Portland, Me., on June 25, and was attended by 175 members of the organization. Most of the party left Boston at 7 p. m. June 24 on the steamship *Governor Dingley* and arrived in Portland early in the morning of the next day. At the wharf in Portland the party was welcomed by General Manager E. A. Newman, of the Portland Railroad, and three special double-truck, 14-bench open cars were boarded at 6:45 a. m. for Riverton Park, where breakfast was served at the Casino, Manager D. B. Smith being master of ceremonies. Music was furnished by Trainor's orchestra of seven pieces. At the conclusion of the breakfast the attractions of the park were inspected and the cars took the party to the wharf of the Casco Bay & Harpswell Steamboat Company. At the wharf the party was greeted by Charles F. Libby, president of the Portland Railroad, and William A. Wheeler, president of the Portland Board of Trade. The steamer *Aucisco* was then taken for a complimentary 25-mile trip around the islands of Portland harbor. The route was between House and Cushings, Great Diamond, Peaks, Long, Great Chebeague, Hope and Cliff Islands, the party reaching the wharf again at noon.

Cars were then taken to the Cape Cottage Casino, where a shore dinner was served, after which the members of the club attended the performance of "Graustark" at the Cape Cottage Theater. At the Casino brief addresses of welcome were made and a unanimous vote of thanks was tendered by the club to all its hosts for the hospitality shown. The party left for Old Orchard Beach about 3:45 p. m. and returned in time to sail on the *Governor Dingley* for Boston in the evening. Fifty miles of trolley riding was given the members during the day, and the breakfast, dinner, car service and theater were given by the Portland Railroad. The outing was the most successful in the history of the club.

The Situation in Cleveland

Those interested in the movement for a referendum vote on the security franchise of the Cleveland Electric Railway spent several days last week investigating the names of the 11,000 signers that were rejected when the petition was examined by the city officials. At the end of the week the investigators said they had found that at least 2000 names had been discarded for no other reason than that their owners had moved from one precinct to another since they last registered as voters. Attorneys claim that this will not invalidate the names and that there is no reason why they should not be counted. One of the Cleveland papers secured opinions from the Secretary of State and the Attorney General to the effect that under the Schmidt law these names should have been counted. If those opinions are correct, the petition contains enough names to require a vote.

On June 26 the Municipal Traction Company put on the full service called for by the franchise enacted by the Council of East Cleveland on May 7; that is, a car every four minutes through the rush hours, every eight minutes to midnight and every 30 minutes from midnight until morning. President DuPont says that the bond required by the court, when the mandatory order was made, will protect the company if it loses money in the operation of cars on that schedule. To that end he is having the pas-

sengers on the East Cleveland cars counted at the city line. Mayor McQuigg, of East Cleveland, says that the bond will protect the company only in the event that a higher court reverses the decision of the Common Pleas Court.

An injunction against the officials of the village of Lakewood, a western suburb, was secured last week to prevent them from interfering with the cars of the Lake Shore Electric Railway. Because transfers were refused by this company the village officials stopped all but mail cars at the western limits and people were compelled to change and take the local cars through the village. The Municipal Traction Company and the Lake Shore Electric Railway joined in asking for the injunction, as the cars are run over the local tracks after they reach Lakewood.

Mayor Johnson is having fare boxes of his own design made for use on the pay-as-you-enter cars which will soon be put into service on Payne Avenue. An effort will be made to induce passengers to use the aluminum tickets. So far people have shown little inclination to use the tickets, since no discount is given. It is said that the idea of the company in ordering conductors to refuse to change anything higher than a \$2 bill was to force the use of the disks. The order was without effect, as conductors hesitated to carry out the instructions when they had change in their pockets.

Delay for Brooklyn Subway

The building of a subway through Fourth Avenue, Brooklyn, planned and approved by the Public Service Commission of the First District of New York, will be delayed several months through a taxpayers' action, argument on which was heard in the Supreme Court last week by Justice Blanchard, who reserved decision, saying it would be impossible for him to make known his findings on the day the board of estimate met for the last time before the summer vacation. The suit was brought by Jefferson M. Levy, as a taxpayer, but was known to have been instigated by Comptroller Metz, of New York City. The application for the injunction was based on the assumption that the appropriating of the money for the carrying out of the contracts would constitute an illegal act, inasmuch as the constitutional debt limit would be exceeded.

Subsequently Comptroller Metz advocated a plan to permit the operation of the Steinway tunnel by the Interborough Rapid Transit Company and the construction of the Fourth Avenue subway before 1910. Mr. Metz proposes that the Interborough Rapid Transit Company be voted a franchise to operate the Steinway tunnel for 25 years, after which the tunnel shall become the property of the city. He also suggests that as further compensation the Interborough Rapid Transit Company turn over to the city, to form part of the Fourth Avenue subway route, two of the four tracks in the present Brooklyn subway between Fulton Street and Atlantic Avenue. If such a plan were adopted, and the Fourth Avenue subway were reduced from a four-track to a two-track line throughout, the Comptroller thinks the work of building the upper end of it could be begun in a few months, and that the subway could be finished from Manhattan to Flatbush and Atlantic Avenues by 1910. In building the Fourth Avenue subway from Manhattan Bridge to Forty-second Street, Mr. Metz says space ought to be left for two additional tracks. If such a modified plan for the Fourth Avenue subway were agreed to, Mr. Metz says the main line and the branches to Coney Island and Fort Hamilton could be built for \$15,000,000.

Decision On Maine's New Street Sprinkling Law

The first legal interpretation of the new Maine law empowering cities to assess street railways for part of the expense of street sprinkling has been made by Justices Whitehouse and Spear of the Supreme Court, serving as referees in the case of City of Waterville v. Waterville & Fairfield Railway & Light Company. The law provides that the assessment shall be made only for thickly settled portions of streets, and shall not be made where the street railway is "along the side" of the street. The company refused to pay on the ground that all of the railway except a short distance was "along the side" of the street and that for more than half the distance the line was along a street that is not "thickly settled." The city answered that interpretation of the term "thickly settled" is a matter to be determined by a jury or referee, and that the term "along the side" of the street means outside the street limits and not at or toward one edge of the street limits.

The referees decide that about 1 mile of the disputed distance from the upper College Avenue crossing to the Fairfield town line is not in a "thickly settled" portion and that the company cannot be held to pay for the sprinkling.

On the other mile, from upper College Avenue crossing to Elmwood Square and from Lockwood Square to Cemetery Hill, the referees find that though the track is at one side of the street, it is not "along the side" of the street. They refuse to lay down a rule for interpreting the term "along the side," saying that its meaning must differ as conditions differ and that each case must be considered in the light of its own peculiar conditions. In this case they find that the railroad must pay the assessment. There was no dispute about the half mile in the middle of the street between Elmwood Square and Lockwood Square in the heart of the city's business section.

The law provides that the assessment shall be made a part of the municipal taxes, be committed to the collector the same as other taxes and shall be a lien on the property. The Aldermen shall make the assessment, and the railway shall be assessed its proportional part of the total width of the street between outer limits, the railway being measured at one foot outside the outer rails on either side, except that the total assessment upon the railroad shall never exceed one-third the total assessment for that street or portion of the street. The rest of the assessment is placed upon the abutments in proportion to their frontage.

Philadelphia Subway Extension.—John B. Parsons, president of the Philadelphia Rapid Transit Company, has announced that the extension of the subway will be placed in operation on August 3.

Line Between Pittsburg and Natrona, Pa., Opened.—The Allegheny Valley Street Railway Company, of Tarentum, Pa., has begun operating its newly constructed line between Pittsburg and Natrona, a distance of 23 miles.

Chicago & Oak Park Elevated Railway and the City Reach an Agreement.—The Chicago & Oak Park Elevated Railway and the city of Chicago have settled their differences except that over the car license fee. As a result the company will elevate its tracks from Fifty-second Avenue to Austin Avenue.

Rochester, Syracuse & Eastern Railroad Opened Between Clyde and Savannah.—The Rochester, Syracuse & Eastern Railroad on June 24 opened its line between Clyde and Savannah and it is now possible to go from Rochester to Savannah by electric railway. Work is in progress on the road between Savannah and Port Byron.

Meeting of Executive Committee of Central Electric Railway Association.—The executive committee of the Central Electric Railway Association held a meeting in Fort Wayne on June 25 and discussed the new mileage book, the progress made by the Central Electric Traffic Association and plans for the autumn meeting of the association.

Action of Iowa Railroad Commission on Interstate Commerce Classification.—Dwight N. Lewis, secretary of the Iowa Board of Railroad Commissioners, Des Moines, Ia., writes to the ELECTRIC RAILWAY JOURNAL as follows: "This commission will adopt the classification of accounts for electric railways proposed by the Interstate Commerce Commission."

Line Between Selinsgrove and Sunbury Opened.—The new Sunbury & Selinsgrove Electric Railway was opened for traffic June 24 and was largely patronized. The new line makes the two places only 25 minutes apart, with a 10-cent fare and half-hour schedule. The company has also built a bridge across the Susquehanna River from Shamokin Dam to Sunbury.

Pittsburg, Harmony, Butler & New Castle Railway to Open Extension July 4.—R. H. Boggs, Pittsburg, president of the Pittsburg, Harmony, Butler & New Castle Railway, announces that the road will be opened for traffic between Butler and New Castle on July 4. Cars will be operated hourly between the cities, and the run of 35 miles is scheduled to be made in 1 hour and 45 minutes.

Toledo, Fostoria & Findlay Railway Completed to Toledo.—The Toledo, Fostoria & Findlay Railway has been completed between Pemberville and the interurban station on Superior Street, Toledo, and was placed in operation between these points last week. The portion of the road between Findlay and Fostoria was placed in operation in 1901 and in 1905 the road was opened as far as Pemberville.

Interstate Commerce Commission to Supervise Railways in District of Columbia.—In accordance with a bill passed by Congress at the last session, the Interstate Commerce Commission has taken up the problem of supervising the service of the street railways in the District of Columbia. The work may be placed in the hands of one of the three commissioners, but with the entire commission acting on important questions.

Date of Meeting for MacAfee Properties Association.—The next meeting of the general managers of the MacAfee properties, which include the Norfolk & Portsmouth Traction Company, Fort Wayne & Wabash Valley Traction Company, Lexington & Interurban Railway, Newport News & Old Point Railway & Electric Company and the Ohio River Electric Railway & Power Company, will be held at the Ocean View Hotel, Norfolk, Va., on July 7 and 8.

Coney Island & Brooklyn Railroad and Employees Renew Working Agreement.—A working agreement, effective on July 1, was signed by the officials and the representatives of the employees of the Coney Island & Brooklyn Railroad on Monday, June 29. In most of its features it is a ratification of the agreement between the men and the company which was about to expire. The only modification of the 1907 agreement that was of any importance is in favor of the men who are put on as substitutes and during periods of extra traffic. This change permits the men to make their runs during 13 hours per day instead of 12 hours, and they are allowed "swings" for meals, so that they may earn more daily. The new agreement is for one year and will expire on July 1, 1909.

Chicago City Railway Rushing Rehabilitation.—The Chicago City Railway announces that one-half of the entire rehabilitation work planned for this year has been completed. The total improvements for 1908 contemplate the relaying and overhauling of 52.8 miles of single track and the building of 6 miles of extensions. The only obstacle so far met with has been the inability to secure a sufficient supply of granite blocks when wanted. Last year the company laid 31½ miles of new track. Work will begin soon, it is expected, on the construction of two new car houses. Approval by the City Council of the contract between the Chicago City Railway and the Calumet & South Chicago Railway will enable the former to undertake the rehabilitation work along the Calumet & South Chicago Railway.

Chicago Elevated Railway Situation.—The legal representatives of the transportation committee of the Chicago City Council are searching for a law under which it will be possible for the committee to enforce reforms in the elevated traffic to which the companies have objected. The ELECTRIC RAILWAY JOURNAL for June 27, page 182, outlined a report recently presented to the transportation committee by George Weston, consulting engineer. This report included the arguments of those elevated railways which opposed the desired schemes of through routing and universal transferring of elevated traffic. The transportation committee is so anxious to thus regulate the elevated service that it is making strenuous efforts to find some flaw in the franchises of the elevated roads by which it may control the situation.

Arkansas Public Service Corporations to Form An Association.—A preliminary call has been sent out for a meeting of representatives of the public service corporations of Arkansas at Little Rock on July 17, and responses have been received from nearly all the companies in the State. The plan is to organize a State association similar to the Street Railway Association of the State of New York and the Central Electric Railway Association. Membership in the association will not be confined to companies within the State of Arkansas, but companies in neighboring States will be admitted. Preceding the formal meeting on July 17 there will be an installation of the Sons of Jove. D. A. Hegarty, general manager of the Little Rock Railway & Electric Company, is interested in the movement and reports that satisfactory progress has been made.

Chicago Subways.—The committee on local transportation, Chicago Council, Milton J. Foreman, chairman, has been authorized to employ experts and appoint the necessary sub-committees to proceed with the work of investigating the feasibility of subways for the business district of Chicago. Some of the problems at hand are: To determine a means of financing the undertaking; the relation of the proposed new sewer system to the subway plan and the interference of the subways with the new water supply system and the new fire-fighting system. It is stated that the chairman will appoint the sub-committees within the present week. In connection with the public works subsidiary to the subways, the transportation committee has received from George Weston, consulting engineer, a report on the plan of placing a high-pressure water main on the present elevated loop structure. Mr. Weston opposed the plan saying that an 18-in. water main would be too heavy for the structure to carry; the vibration from passing trains would cause leaky joints and the first cost of constructing the main would be excessive in such a location. The committee has accepted this opinion and therefore the high-pressure piping system will be placed underground when the subway is constructed.

Financial and Corporate

New York Stock and Money Markets

NEW YORK, July 1, 1908.

The market in Wall Street for the week ended July 1 was so dull and trading was so light that price changes were not significant. The tendency of prices cannot be said to be either downward or upward, net changes for the week being fairly well balanced and only of importance in a few instances where special causes controlled. The return to work of many thousands of railroad employees and factory operatives, announced for July 1, improved the sentiment in financial circles, and the comparatively few instances of failure to make dividend disbursements also helped to develop the belief that the worst of the period of depression had been passed. The estimates for the fiscal year ended June 30, given out by many of the railroads and industrial corporations, while showing losses in gross earnings, practically without exception gave evidence of wise economies and conservative management. In some instances, notably the Southern Railway, a large decrease in gross receipts was followed by a small increase in net earnings and in almost every instance the percentage of loss in gross was far greater than in net earnings. It is too early for disturbing fears as to the result of the election. Crop news was sufficiently encouraging to increase faith in the future, and while the money market on June 30 became a little firmer, the conditions were easy. Call loans were quoted at 1¼@2 per cent and 90-day paper at 2½@2¾ per cent. Among the notable advances for the week were those of Westinghouse Electric & Manufacturing, the common stock advancing 5½ points and the preferred 10 points, due to the success of the reorganization plan. An advance of 4 points in American Locomotive common stock was due to the fact that the regular quarterly dividend was declared, in spite of the decrease in earnings.

Other Markets

Traction securities in the Philadelphia market have been a trifle more active with prices slightly higher. Philadelphia Rapid Transit closed June 30 at 15¾, an advance of 1¼ points for the week, while Union Traction closed at 49¼, an advance of 2 points.

In Chicago prices were about the same. South Side Elevated displayed some strength, on June 30 selling up to 54 and closing at 53.

The Boston market was featureless as far as traction securities were concerned, only a few sales of small lots being recorded. Massachusetts Electric preferred closed June 30 at 46½, a fractional loss from the previous week. There was no especial interest in Boston Elevated.

The first sale of Cleveland Railway stock for immediate delivery was made on the Cleveland Stock Exchange June 24 at 90. Fifty-five shares changed hands at that figure. The asked price rose to 91¼. Cleveland Electric Railway has not shown much activity and is quoted around 50. Washington, Baltimore & Annapolis dropped to 11½ June 26 and on June 29 reached 10¼. A demand developed at this price.

In Baltimore trading was practically suspended in traction securities and prices were nominal. United Railway 4s were still quoted at 85¼ asked and the income bonds at 50 bid.

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

	June 23.	June 30.
American Railways Company, Philadelphia.....	44½	45
Boston Elevated Railway.....	134	134
Brooklyn Rapid Transit Company.....	45½	47½
Chicago City Railway.....	190	190
Cleveland Electric Railway.....	50	50½
Consolidated Traction Company of New Jersey.....	70	70
Consolidated Traction Company of New Jersey, 5 per cent bonds.....	102½	103
Detroit United Railway.....	38	42
Interborough-Metropolitan Company.....	110½	111
Interborough-Metropolitan Company (preferred).....	28	29½
Manhattan Railway.....	138	136
Massachusetts Electric Companies (common).....	10½	9½
Massachusetts Electric Companies (preferred).....	47	46
Metropolitan West Side Elevated Railway, Chicago (common).....	16½	16
Metropolitan West Side Elevated Railway, Chicago (preferred).....	50	50
Metropolitan Street Railway.....	25	25
North American Company.....	59	60½
Philadelphia Company, Pittsburg (common).....	38	38½
Philadelphia Company, Pittsburg (preferred).....	40½	40½
Philadelphia Rapid Transit Company.....	14½	15¼
Philadelphia Traction Company.....	87	88
Public Service Corporation, 5 per cent collateral notes.....	97	97
Public Service Corporation, certificates.....	268	268
Twin City Rapid Transit Company, Minneapolis (common).....	87½	90
Union Traction Company, Philadelphia.....	47¼	49¼

a Asked. * Last sale.

Disintegration of the New York City Railway System

The Farmers' Loan & Trust Company, New York, filed a suit in the United States Circuit Court on June 24 against the Central Park, North & East River Railroad, the Metropolitan Street Railway (its lessee), the New York City Railway, the Morton Trust Company, the Guaranty Trust Company, the Pennsylvania Steel Company, the Degnon Contracting Company and the Central Crosstown Railroad. The suit is instituted to recover \$1,200,000 and interest, the amount of a mortgage made to the plaintiff by the Central Park, North & East River Railroad on Dec. 1, 1872, to secure the payment of an issue of bonds payable Dec. 1, 1902. It is held by the plaintiff that the mortgage constitutes a lien having priority over all other claims, and that the Trust Company is now prevented from fulfilling its obligations by the insolvent conditions of the New York City Railway. According to the terms of the leases the Metropolitan Street Railway and the New York City Railway are responsible for all the defendants' obligations. The lessees have been operating the lines since Oct. 14, 1892. In addition to asking for the recovery of the amount of the original trust mortgage the Farmers' Loan & Trust Company asks that all the money on hand, and the earnings of the property, be placed in the hands and under the control of a receiver or receivers to be appointed by the court.

Judge Lacombe heard the case June 26 and reversed decision, putting over three other motions, one of which asks for the discharge of the receivers of the New York City Railway and the restoration of the various surface lines to the Metropolitan Street Railway.

In the case of the New York City Railway and the Metropolitan Street Railway to cancel the lease of the Twenty-eighth & Twenty-ninth Street Crosstown Railway, Alton B. Parker, representing holders of \$500,000 of the bonds of the company, declared that if the lease was broken and the road given back to the original company, which at present has no cars or power equipment, the franchise would be forfeited. All the stock, he said, was in the possession of the Metropolitan Securities Company, and he asked the court's protection for the bondholders, many of whom had paid par for their holdings. Ex-Judge Parker said further that he did not agree with Messrs. Joline and Robinson, the receivers, that the road's operating expenses exceeded its receipts.

Charles Francis Stone, of Davies, Stone & Auerbach, representing the Guaranty Trust Company, appeared in opposition to the cancellation of the lease of the Central Park, North & East River Railroad. The figures given in the petition, he declared, were misleading because they did not include the rental which should be paid by the roads using its lines. He declared that 3 per cent of the transfer traffic was carried on the Fifty-ninth Street Crosstown line. He referred to the fact that the Blackwell's Island Bridge, when opened to the public, would serve as an important feeder to the line which, if forced back on the original company, would have to suspend operations, as it had no power plant of its own.

It is said that if plans now proposed are perfected, application for a third receiver for the Metropolitan Street Railway and the New York City Railway will be made on behalf of the protective committees of the \$12,500,000 collateral trust 5 per cent bonds of the Metropolitan Street Railway and the \$16,604,000 refunding mortgage 4 per cent bonds. Whether or not application will be made and a receiver appointed depends upon whether or not the two committees can reach an understanding.

Judge Lacombe, of the United States Circuit Court, on June 29 decided to grant the request of the receivers of the Metropolitan Street Railway to cancel the lease to that company of the Central Park, North & East River Railroad. A meeting of the stockholders of the company has been called for July 10 to elect a new board of directors to take over the road and operate it as a separate company. Until this is done the present system of transfers will be continued. Under the lease the New York City Railway agreed to pay a rental equivalent to 9 per cent on the stock, which now amounts to \$162,000 a year. The gross earnings of the lines for the year ended March 31 were \$749,624 and the total operating expenses \$607,896, besides which there were paid for taxes and other purposes enough to make the total disbursements \$650,199, which does not include the franchise tax now in litigation. The net loss annually to the lessee is more than \$60,000. Construction expenses must be incurred in the near future and the franchise taxes must eventually be paid.

"Under these circumstances," Judge Lacombe says, "by payment of the stipulated rental to the lessor company the receivers would evidently be 'serving the stockholders,' as the chairman of the Public Service Commission aptly expresses it. Whether the rental was excessive when agreed to is of no moment. It was stipulated for 16 years at a time

when conditions were such that the Belt line, operated entirely by horse-power, issuing practically no transfers and assessed for no franchise tax, earned 10 per cent on its capital stock over and above all operating expenses and fixed charges. But under the conditions of to-day the rental is surely excessive for the lessees to pay, and it is with existing conditions only that we are now concerned. Great changes like this, ghastly sometimes in their results to innocent individuals, are contingencies to which all investments in public service corporations are peculiarly exposed. Nor is it at all material to inquire whether the rental is high because of the presence of 'water' in the capitalization of the lessor company. Neither its stock nor its bonds have been increased since the time 16 years ago when it was a very profitable property, and in the interim 7 miles of its roadway has been transformed wholly at the expense of the lessee. Not a dollar of the cost has been repaid by the Belt line to the lessee by issue of additional stock or bonds, nor, so far as the receivers can discover, even by the giving of notes, as was done in the case of other lines. But even if there were water in the capitalization certainly the receivers of the New York City Railway have no power to pump it out, nor indeed has this court; that is a matter which must be left for the consideration of State authorities and State courts."

The manifest thing to do, says Judge Lacombe, is to terminate promptly the existing arrangement, and if the lessor should in the future offer the property on more favorable terms as to rental and construction expenses such a proposition might be then considered. The whole system should be relieved of the present drain and the \$60,000 a year expended in improving the remaining lines.

While it may be necessary to continue the leases of other small lines even at a loss in order to make connections, the court says that there is no such need in the case of the Central Park, North & East River Railroad. Passengers now using the line running through Fifty-ninth Street from First Avenue and down Sixth Avenue to the shopping district can be carried by the Second Avenue line and the Eighth, Fourteenth, Twenty-third or Thirty-fourth Street lines. The Columbus Avenue cars and the Amsterdam and Sixth Avenue cars, which now run along Fifty-ninth Street, can use the old line in Fifty-third Street, now unused.

Judge Lacombe suggests that until the new directors organize and equip an operating force the receivers of the New York City Railway make contracts for the temporary operation of the lines in order that there may be no falling off in the service. Until the actual operation is taken over by the Belt Line Company and one week's notice shall have been posted in the cars the exchange of transfers is to be continued. Judge Lacombe also denied the application made by the Farmers' Loan & Trust Company for a receiver on the ground that the company is competent to run its road and the mortgage property is in no danger. He also authorized the receivers of the Metropolitan Street Railway to cancel the agreement of Sept. 29, 1906, between the Twenty-eighth Street & Twenty-ninth Street Crosstown Railroad and the Metropolitan. By this agreement there was granted to the Metropolitan Street Railway the right and privilege to use the Crosstown Company's tracks, to operate cars in common and to collect all fares of passengers riding in such cars. The Metropolitan Street Railway Company agreed to run a sufficient number of cars daily to accommodate the traffic, to pay the principal of certain first mortgage bonds (\$1,500,000) and to pay \$75,000 a year interest thereon; also to pay all taxes and to maintain the railroad in good condition and repair. The agreement was to continue during the corporate existence of the parties. The Metropolitan Street Railway has been losing more than \$70,000 a year under the agreement.

Public Service Commission of New York Orders Auction or Private Sale of Utility Securities

The Public Service Commission of the First District of New York has granted the application of the Manhattan (Elevated) Railway to make two refunding bond issues of \$10,818,000 and \$894,000, respectively, subject to conditions, of which one is that the bonds must be sold at a price of 91 or over at private sale, or shall be offered at public sale to the highest bidder. This is a departure, and is said to mean that the board intends to require that all issues of bonds of public utilities companies subject to its control shall be offered at public auction or in some equivalent manner. The conditions under which the Manhattan Railway is permitted to sell its bonds are as follows:

"That the company may sell the bonds hereby authorized, but only so many thereof shall be sold as shall be sufficient to realize an amount which will pay the principal of the bonds of the Metropolitan Elevated Railway, due on July

1, 1908, and the reasonable expenses of refunding, which expenses shall not include, however, any commission for the sale of said bonds or for entering into any underwriting or purchase agreement; and the said proceeds of the sale of the bonds hereby authorized shall be applied by said Manhattan Railway only to or toward the payment on July 1, 1908, of the principal of said Metropolitan bonds and the said reasonable expenses of such refunding.

"Unless the said bonds shall be sold at private sale on a basis of not exceeding 4 4-10 per cent and accrued interest, the treasurer of the company shall invite proposals for the purchase of said bonds to be publicly advertised daily for not less than six days in at least four daily newspapers published in the city of New York to the end that the time and place of the sale shall be generally known; and the treasurer shall award the said bonds to the highest bidder or bidders therefor. Said proposals shall only be opened publicly by the treasurer of the company and in the presence of all the members of the Public Service Commission for the First District, or such of them as shall attend at the time and place specified in said public advertisement.

"It shall be a condition of said sale (and the advertisement calling for proposals therefor shall so declare) that any bidder may bid as to said bonds for all or none at one price, or for all or any part at one price, or for portions of said bonds at different prices, and any bidder who shall bid for a portion of said bonds may be required to accept a part of the amount bid for by him at the same rate, or proportionately, as may be specified in his bid, and any bid which conflicts with this condition may be rejected; and if the board of directors deems it to be in the interest of the company so to do it may award the bonds to the bidder offering the highest price for all or a number of said bonds, provided, however, that if the board of directors deems it to be in the interest of the company it may reject all bids. The board of directors may prescribe such other conditions incident to and providing for the proposal for the purchase of bonds as may seem fit."

Readjustment Committee of Westinghouse Electric & Manufacturing Company Extends Date of Readjustment Plan

It has been decided by the readjustment committee of the Westinghouse Electric & Manufacturing Company to extend the date for the operation of the plan until the early part of September. This means that the Merchandise Creditors' plan will be accepted. The extension will enable the committee to work out the reorganization as proposed, details of which have not been announced. This includes the personnel of the new directors, which will probably be announced on or before Sept. 1. It seems likely that subscriptions will be increased beyond \$10,000,000 as a result of action on the part of interests not now identified with the plan.

Judge James S. Young, in the United States District Court, directed the receivers of the Westinghouse Electric & Manufacturing Company to pay the regular semi-annual interest on the convertible sinking fund 5 per cent bonds and the interest on the debenture bonds, due on July 1. The first calls for the disbursement of \$462,500 and the second for \$49,225.

Boston & Worcester Street Railway, Worcester, Mass.—Arrangements having been made with the various institutions holding Boston & Worcester Street Railway stock for the account of James F. Shaw & Company, Inc., whereby all become parties to a trust agreement providing that said stocks be held for a fixed period, the injunction against the transfer and sale of these stocks has been dissolved by the court, as it is of no further moment.

Cleveland, Painesville & Eastern Railroad, Willoughby, Ohio.—This company has filed its new mortgage for \$5,000,000 for record at Cleveland. It covers all the real estate and other property of the company between Cleveland and Painesville. None of the bonds to be issued under the mortgage will be sold at this time; they will be used for collateral purposes, it is said. The deed provides for refunding the existing bonds and notes amounting to \$1,631,000. The bonds will be due in 40 years and will bear 5 per cent interest. The Citizens' Savings & Trust Company was named as trustee.

Chicago Consolidated Traction Company.—David R. Forgan, president of the National City Bank, of Chicago, and John M. Roach, president of the Chicago Railways Company, were appointed receivers for the Chicago Consolidated Traction Company on June 24 by Judge Grosscup in the United States Circuit Court. The receivership was asked by the Central Trust Company, New York, which is the trustee of the Equitable Trust Company, Chicago, which holds a mortgage covering the properties. The Chicago Consolidated Traction Company defaulted on June 1 on the

interest on its bonds. The mortgage secures an issue of \$6,750,000 bonds, of which amount about \$4,000,000 bonds are held by the estate of Charles T. Yerkes. The company operates 184 miles of electric railway in the suburban districts of the North and West sides of Chicago. Eight underlying companies are involved in the receivership as follows: Chicago North Shore Street Railway, Chicago Electric Transit Company, The North Side Electric Street Railway, Ogden Street Railway, Chicago & Jefferson Urban Transit Company, Cicero & Proviso Railway, Evanston Electric Railway, North Chicago Electric Railway. It is believed that the Chicago Consolidated Traction Company property will be acquired by the Chicago Railways Company.

Detroit, Flint & Saginaw Railroad, Flint, Mich.—In accordance with an order by Circuit Judge Wisner, the Detroit, Flint & Saginaw Electric Railroad, which has 14 miles of road in operation, was sold on June 25 at public auction. Isaac Applebaum, of Detroit, who holds the bonds of the road to the amount of \$250,000, was awarded the property on his bid of \$50,000. The Detroit Trust Company, of Detroit, has been acting as receiver for the property. It is said that Mr. Applebaum will complete the construction of the line to Flint.

Eastern New York Railroad Company, Ballston Spa, N. Y.—Frederick H. Beach on June 23 was appointed receiver of the Eastern New York Railroad, a 15-mile electric railway between Ballston Spa and Middle Grove.

Kansas City (Mo.) Railway & Light Company.—Spencer Trask & Company, New York, have purchased from the Kansas City Railway & Light Company \$800,000 of first and refunding 5 per cent bonds, due 1913, which will be offered to investors to net about 6 per cent. Perry, Coffin & Burr, of Boston, Mass., are associated in offering the bonds.

New York, New Haven & Hartford Railroad.—A final decree restraining the New York, New Haven & Hartford Railroad from holding the stock of any of the electric railway companies named in the information recently filed against the company by Attorney-General Malone, of Massachusetts, was handed down by Judge Rugg in the Supreme Court of Massachusetts last week. The decree gives the company until July 1, 1909, to dispose of its holdings in these companies. Before announcing the decree, the court denied the motion of the company for leave to show that it had parted with all its electric railway holdings except in the Worcester & Webster Street Railway and Webster & Dudley Street Railway.

Philadelphia (Pa.) Rapid Transit Company.—The City Council of Philadelphia has approved the application of the Philadelphia Rapid Transit Company for authority to borrow \$5,000,000 to be used for extensions and improvements.

Portland (Ore.) Railway, Light & Power Company Increases Directors.—The company has increased the number of directors from 11 to 13. Two directors, S. G. Reed and F. G. Sykes, of Portland, resigned and four, T. B. Wilcox, C. F. Swigent, W. M. Todd and J. C. Ainsworth, were elected to fill vacancies.

Public Service Corporation, Newark, N. J.—A quarterly dividend of 1 per cent, payable on June 30 to the stockholders of record June 29, was declared June 27 by the directors of the Public Service Corporation of New Jersey. As the company has \$12,500,000 on stock outstanding the dividend will call for the distribution of \$125,000.

Southern Railway & Light Company, Natchez, Miss.—This company has been incorporated, with \$456,700 stock, as successor to the Southern Light & Traction Company, recently purchased at receiver's sale by Lynn H. Dinkins, president of the Inter-State Trust & Banking Company, New Orleans, La. The directors are: Lynn H. Dinkins, Jonas H. Levy, G. P. Bullis, H. M. Youree and Silas L. Lyman. Henry M. Young, secretary of the Inter-State Trust & Banking Company, is secretary and treasurer of the new company.

St. Joseph Valley Traction Company, Elkhart, Ind.—The Wabash Railroad is said to be negotiating for the purchase of the property of the St. Joseph Valley Traction Company. Gasoline-electric motor cars were originally operated over the line, but they were supplanted recently by steam locomotives.

Union Traction Company of Indiana, Anderson, Ind.—The Philadelphia Stock Exchange has listed \$570,000 additional general mortgage 5 per cent bonds, making the total listed \$4,920,000.

Winnebago Traction Company, Oshkosh, Wis.—On Aug. 6 the Winnebago Traction Company, operating an interurban railway between Neenah, Oshkosh and Omro, will be sold at auction by virtue of judgment of foreclosure and sale.

Traffic and Transportation

Hearing on Proposal to Order Side-Entrance Doors for New York Subway

A hearing was held before the Public Service Commission of the First District of New York on June 29 on the proposal by the commission to the Interborough Rapid Transit Company that it begin at once to put side doors in its subway cars and that all cars in the subway be so equipped within two years. Frank Hedley, general manager of the company, said that the proposed additional doors would not relieve the congestion in the subway, as the New York public could not be induced to maintain the needed "circulatory movement necessary to the proper use of the doors." Albert A. Gardner, counsel for the company, advanced the objection that it was hard for the motormen to stop cars properly where there were railings on the station platforms, as would be necessary, and that the railings themselves would probably cause accidents. Mr. Gardner also made a point of the fact that the additional doors would reduce the seating capacity of each car 15 per cent, and that to provide a seat for every passenger would require an additional car mileage of 18 per cent. At the end of the hearing Commissioner Eustis said the commission did not wish to cripple the road by withdrawing too many cars from service in order that the alterations might be made. A trial of the plan, he said, would first be made with a few cars. B. J. Arnold, as special expert to the commission, estimated the cost of making the alterations at \$2,000 for each of the 350 steel cars and \$1,500 for each of the composite cars, of which there are 500. This would make the total cost \$1,450,000. The company's engineers, however, say that this figure is too low, and that the installation of side doors will cost \$1,800,000.

Handling Convention Crowds at Chicago

The Chicago *Record-Herald* of June 20 contained an article regarding the transportation of the crowds attending the Republican national convention on the cars of the Chicago City Railway, which said in part:

"Chicago's rehabilitated traction system proved its efficiency in handling the convention crowds. On all sides was heard praise of the manner in which the Chicago City Railway took care of the visitors. It was a supreme test in surface transportation, and officials of the company are willing to be judged by the records established.

"Without delay an almost continuous stream of cars was maintained in Wabash Avenue and not a visitor to the Coliseum was obliged to walk who wanted to ride. The big pay-as-you-enter cars were run on a headway of 26¾ seconds every day of the convention. That is the schedule maintained during rush hours, and it was extended for the period of the big meeting. Only a few extra cars were needed to handle the crowds.

"President T. E. Mitten, of the company, took personal charge of the work at the Coliseum. At every street intersection in the downtown district supervisors were stationed to direct the movement of the cars. So effective was the work that on one afternoon it was shown by actual observation that within 20 minutes after the convention adjourned the northbound cars proceeded downtown only half filled. It was declared by interested officials to have been the best exhibition of street railroading which the city has ever witnessed.

"No trouble was experienced with visitors who rode on the pay-as-you-enter cars for the first time. Officials of the company said that the visitors took to the new system naturally and that there were no unnecessary delays. The new cars proved their superiority over the old type for expeditious work.

"We naturally feel a little proud of the way we handled the crowds," said F. A. Stowe, assistant to the president, "Chicago gave the thousands of visitors a lesson in transportation. We demonstrated that when the rehabilitation is complete Chicago will have the best traction system in the country."

Sprinkler on Milwaukee Northern Railway.—The Milwaukee Northern Railway Company has entered into a contract with the city of Milwaukee to sprinkle its tracks within the city limits. The sprinkler has a capacity of 600 gal.

New Transfer Rule in Woonsocket.—The Woonsocket (R. I.) Street Railway, controlled by the Connecticut Company, commenced on June 22 to allow passengers with a transfer punched for the first intersecting point to transfer at any point they desire.

Elevated Railroad Accident in New York.—More than 50 persons were injured on June 27 when a seven-car northbound Bronx Park train of the elevated division of the Interborough Rapid Transit Company ran head-on into a three-car northbound 129th Street train at 101st Street and Third Avenue.

Saving Lives By Preventing Flipping.—The management of the Tri-City Railway Company, Davenport, Ia., has requested the Mayor of Davenport to appoint six conductors on one of the electric railway company's lines as special officers with power to arrest children who climb on the cars. The Mayor recognizes the danger of the practice of flipping and will co-operate with the railway company to prevent it.

Decision in Indiana Express Case.—The Indiana Supreme Court has decided in favor of three express companies in the mandamus proceedings brought by the Indiana Railroad Commission to compel the companies to deliver express packages free of charge to any point within the corporate limits of all cities of 2500 population or more. The court holds that under the Interstate Commerce Act the State officers and State courts have no jurisdiction over express shipments that are brought into one State from another State.

Through Boston and Providence Service.—Effective on July 1, the Old Colony Street Railway Company operates daily except Sundays, a through car, leaving Postoffice Square, Boston, at 2:30 p. m., which will run without change to Providence, reaching there in time to enable those who desire to take the night boats from that city to New York. This car will also take returning Fall River passengers, the only change necessary being at Fall River. A through service to Boston from Fall River and Providence was started at the same time.

Kenosha Ordinance Declared Invalid.—Judge E. B. Belden has filed a judgment in the Circuit Court at Kenosha, Wis., holding invalid two of the franchise ordinances under which the Kenosha Electric Railway Company is planning to operate cars in Kenosha. The ordinances provide for long extensions of the line, and the court holds that the condition of the streets on which the lines are to be built is such as to make the action of the Council unreasonable and that on this account the Council had no right to grant the franchises. A. C. Frost, president of the company, has directed his attorneys to appeal the case.

Interurban Railway Timetable.—The Interurban Railway, Des Moines, Ia., R. A. Belding, traffic manager, has issued under date of June 15 a complete timetable for its Beaver Valley, Woodward and Colfax divisions. Included in the timetable, which is issued as a 10-page folder with a colored cover, are items of general information for the prospective passenger, railway connections at various steam railway intersections, special advertisements of the "Colfax limited" and the Interurban Railway freight and passenger service. A clearly printed map of the system and two well-illustrated pages describing special pleasure trips to recreation places along the lines are included.

Transfers Still Further Curtailed in New York.—Transfers from the Yonkers Railroad to the Third Avenue Elevated Railroad, New York, were abolished last week. Receiver Whitridge, of the Union Railway, has announced that after Aug. 1 transfers will be discontinued between the Westchester Electric Railway and the Union Railway. The Westchester Electric Railway operates in Westchester County and in the Bronx from the Mount Vernon line to Williamsbridge. From Williamsbridge to 128th Street, New York, the system is operated under the name of the Union Railway. The Union Railway proposes to charge 5 cents from the Harlem River to Williamsbridge and from that point to any place in Westchester County an additional fare will be required.

Berkshire Street Railway Forbidden to Carry Freight in Lenox.—Acting in accordance with a unanimous vote of the town taken at the annual meeting held last April, the Lenox, Mass., selectmen have forbidden the Berkshire Street Railway to carry freight, express packages or newspapers into the town. Refusal of the company to grant a 5-cent fare within Lenox town limits and a 10-cent fare to Pittsfield—it is now 15 cents—is said to be the cause of the action against the company by the town authorities. Levenworth Wheeler, general manager of the Berkshire Street Railway, is quoted as saying: "The ban on express packages and newspapers will cause Lenox merchants and residents more of a loss than it will the company. We have never made any money running the express car over the branch. We will continue to run it over the main line through the town. The company will never grant a 10-cent fare to Pittsfield. If the town can get along without this privilege we certainly can."

Personal Mention

Mr. W. A. Carlisle was recently elected president of the North Georgia Electric Company, Gainesville, Ga., and Mr. C. M. Merrick, vice-president.

Mr. A. B. Ford has been appointed chief engineer of the Torrington & Winchester Street Railway, Burrville, Conn., to succeed Mr. Wm. Hollenbach, resigned. Mr. Ford entered the employ of the company in 1900 as fireman.

Mr. J. J. Barnick has been appointed superintendent of the Danville & Bloomsburg Street Railway, Grovania, Pa., to succeed Mr. W. R. Miller, who was general manager of the company, but died recently. Mr. Barnick has been with the Danville & Bloomsburg Street Railway since the line was placed in operation.

Mr. H. W. Tolle has resigned as superintendent of the Mattoon Heat, Light & Power Company and the Mattoon City Railway Company, Mattoon, Ill., to become general manager of the Cairo Electric & Traction Company, Cairo, Ill., control of which is owned by the W. P. Halliday estate. Mr. Tolle will enter upon his new duties July 1.

Mr. Bion J. Arnold has been engaged by the Public Service Commission of the First District of New York to supervise the appraisal of the properties of the street railway companies in Manhattan and the Bronx in accordance with the resolution recently passed by the commission. The companies have been called on to furnish an inventory of all their properties and the appraisal will be begun within a few days.

Mr. J. W. Moyer, Pottsville, has been elected president of the Schuylkill & Dauphin Traction Company; Mr. Edgar D. Rank, Williamstown, secretary and treasurer; Mr. A. E. Dedrich, Williamstown, auditor; Mr. W. E. Harrington, Pottsville, general manager and purchase agent; Mr. S. S. Straub, Williamstown, superintendent. The election of these officers followed the lease of the Lykens & Williams Valley Street Railway by the Schuylkill & Dauphin Traction Company.

Mr. D. J. Duncan has resigned as general manager of the Chattanooga (Tenn.) Railways Company, effective on July 1. Mr. Duncan has been connected with the Chattanooga Railways Company for more than two years and has been identified with railroads for 25 years. He supervised the construction of the Johnstown (Pa.) Passenger Railway and for nine years after its completion acted as general manager of the company. Before becoming general manager of the Chattanooga Railways Company Mr. Duncan was connected with the Pottsville (Pa.) Union Traction Company. While Mr. Duncan has been connected with the Chattanooga Railways Company only since April 1, 1906, he has done much to place that road in the best physical condition. Rebuilding of considerable track and line has been done under his direction and new shops have been completed that are among the best in the United States. Mr. Duncan has made many personal friends in Chattanooga and leaves the employ of the company with the best wishes of his associates in the company and of the employees. Mr. Duncan will take a short rest before engaging in other work, and for the present will remain in Chattanooga.

Mr. E. S. Fassett, who has just been elected president of the Street Railway Association of the State of New York, has long been a prominent member of the association and



Mr. E. S. Fassett

has served on many of its important committees. Mr. Fassett is a native of Albany and for 23 years has been connected with the Albany railway system. He started as an inspector in 1885 when the system was known as the Albany Railway Company and was operated by horses. From inspector Mr. Fassett was advanced to assistant division superintendent, to division superintendent and in 1893 to superintendent of the company. In 1900 the United Traction Company was organized by the consolidation of the Albany Railway Company, the Watervliet Turnpike & Railroad Company and the Troy City Railway Company, and Mr. Fassett was appointed general manager of the company. In 1906, the control of the system passed to the Delaware & Hudson Railroad Company and Mr. Fassett was appointed general manager of the company, which includes the United Traction Company, Cohoes Railway Company, Troy & New England Railroad Company, Hudson Valley Railway Company, Northern New

York Railway Company, Warren County Light, Heat & Power Company.

Mr. William A. Carson, for the last two years assistant general manager of the Indianapolis, Columbus & Southern Traction Company, with headquarters at Greenwood, Ind., has resigned to accept the position of general manager of the Evansville (Ind.) Railway Company. Mr. Carson's first railway experience was with the Indianapolis & Cincinnati Traction Company, under Mr. A. A. Anderson. From this company he went to the Indianapolis, Columbus & Southern Traction Company. On account of Mr. Carson's resignation Mr. L. M. Brown, train dispatcher in the Greenwood office, has been appointed trainmaster of the company, a new position, and Mr. C. W. Wells, night train dispatcher, has been appointed chief of the train service.

OBITUARY

David J. Molloy, formerly superintendent of the Atlantic Avenue Railroad, Brooklyn, now part of the Brooklyn Rapid Transit System, is dead. Mr. Molloy had been identified in recent years with real estate development in Brooklyn and was a member of the firm of Miller & Molloy.

NEW PUBLICATIONS

Technograph, Champaign, Ill.—Published by Engineering Societies of the University of Illinois; 1907-1908; 170 pages (6 in. x 8¾ in.), paper bound; illustrated. Price 50c.

This publication is an annual issued by the engineering societies of the University of Illinois, and consists of a wide variety of papers by students, graduates and faculty members. Several articles of electric railway interest are published in this number, among them being the following: The Acceleration, Resistance and Kinetic Energy of Typical Electric Cars, by G. E. Jaquet; Gasoline Traction on Railways, by W. B. Greene; The Heating of Feed Water for Boiler Purposes, by T. Weinschank, and Method of Drying Transformers, by L. P. Brode.

Reinforced Concrete—A Manual of Practice, by Ernest McCullough. Chicago: Cement Era Publishing Company; 1908; 125 pages (7½ in. x 4¾ in.); illustrated. Price, \$1 postpaid.

The writer is an engineer who is in close touch with reinforced concrete construction and he has endeavored in this work to prepare a handbook on that subject suitable even for those without advanced technical training. Mr. McCullough appears to hold no brief for any particular system, saying, for instance, that "each designer seems to be at present a law unto himself as to the manner of bending the bars." Neither is the author over-enthusiastic about the supposed cheapness of reinforced concrete structures judging by what he writes about the difficulty of securing suitable labor and accurately estimating the influence of other factors.

In a letter addressed to Mayor McClellan, of New York, Ralph Peters, president of the Long Island Railroad, has served notice that the company will discontinue negotiations relative to the elimination of grade crossings in the Borough of Queens unless the municipality shares the attendant expense. Mr. Peters expresses regret that the city authorities "seem opposed to have the city co-operate with the company." He says that the elimination of grade crossings tends to accelerate property values and consequent tax yields, holding this to be a reason why the municipality should share expense burdens. He points out that readjustment of the line from Long Island City to Jamaica, with the abolition of all grade crossings, will require an expenditure of \$4,570,000, of which the city has been asked to contribute \$500,000. Mr. Peters says in part: "Under the laws of the State of New York grade crossings must be eliminated at the joint expense of the railroad and the municipality. As long as that is the law it seems unreasonable on the part of the city authorities to set up arguments against the law or to suggest ways of evading it. It is no more right for the municipality to attempt to take unfair advantage of the corporation than for the corporation to attempt to get the better of the municipality; if either succeeds the other will even up in the long run. If the situation is such that those in charge of the affairs of the City of New York cannot see their way clear to join in this effort to improve the situation in the Borough of Queens, and if they will insist that the responsibility for the grade crossing and the burden created by their elimination rest entirely with the railroad company, we will respectfully have to withdraw our communications bearing upon this subject and drop all further consideration of the effort to eliminate the crossing between Woodside and Winfield, continuing to operate upon our present alignment. The responsibility for the failure will rest upon the city."

Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (*) indicates a project not previously reported.

FRANCHISES

Berkeley, Cal.—The San Francisco, Oakland & San Jose Railway has applied for a 50-year franchise to extend its line from Alcatraz Avenue through Sacramento Street to Hopkins Street, the northern boundary of the city.

***Keokuk, Ia.**—Hugh Cooper is reported to have made an application for a franchise and grant to construct a street railway.

Boston, Mass.—The act granting the Boston Elevated Railway the right to extend the elevated system from Sullivan Square through Somerville in the vicinity of Mystic Avenue to a point near Medford Square was amended by the Legislature, extending the time for its acceptance by the cities of Somerville and Medford from June 14 to Oct. 1, 1908.

Natick, Mass.—The Boston & Worcester Street Railway has been granted a franchise to construct a spur track into Natick Center. The company expects to begin work immediately, construction material having already been purchased.

Asheville, N. C.—The Asheville Electric Company is reported to have applied for a franchise to operate a branch line over Merrimon Avenue.

East Syracuse, N. Y.—The Syracuse Rapid Transit Company has made an application for an extension of one year upon the franchise granted the company on Sept. 1 last, which was for the double-tracking of Manlius Street in Clark Street and the lower part of East Ellis Street.

New York, N. Y.—The New York & Port Chester Railway Company has petitioned the Board of Estimate and Apportionment for an extension of time until June 11, 1910, to comply with the provisions of the contract regarding work performed. The board gave the company 6 months' extension of time.

New York, N. Y.—The Brooklyn Rapid Transit Company has filed an application with the Board of Estimate for a franchise to build a line from the intersection of Atlantic and Alabama Avenues and extending thence southerly on Alabama Avenue to Livonia Avenue; and on Livonia Avenue from Vesta Avenue to New Lots Road. From the intersection of Livonia Avenue with New Lots Road it is proposed to construct a double-track line on New Lots Road, from Livonia Avenue to Berriman Street, on Berriman Street, from New Lots Road to Sutter Avenue, and on Sutter Avenue easterly to the old Brooklyn city line, at or near Forbell Avenue. The company also proposes to build a spur connecting the Old Mill with the line at Liberty and Forbell Avenues.

Santa Monica, Cal.—The Los Angeles-Pacific Company is said to have applied to the City Council for a franchise to build a double-track line on Seventh Street from San Vicente Boulevard, south to Oregon Avenue. This new branch is to take the place of the Third Street line, which has been abandoned by the company.

***Brownwood, Tex.**—A. E. Chandler, of Granbury, Tex., is reported to have petitioned for a franchise to construct and operate a street railway in this city.

***Cleburne, Tex.**—A 25-year franchise has been granted to H. M. Hyatt, of Kansas City, Mo., to construct and maintain a street railway system in the city of Cleburne.

North Yakima, Wash.—The Yakima Inter-Valley Electric Railway has applied for a franchise to construct and operate an electric railway in Yakima County. J. H. Thomas is interested. [S. R. J., Feb. 22, '08.]

RECENT INCORPORATIONS

***Chanute (Kan.) Electric Railway.**—This company has been organized to build and operate a 10-mile electric railway in and about Chanute, Kan. A franchise was recently granted and it is expected to begin construction work at once. Capital stock, \$300,000. Directors: L. H. Phillips, Girard, Kan.; S. W. Brewster, H. B. Farrelly and W. D. Kennedy, Chanute, Kan.

***Suburban Land & Power Company, Durham, N. C.**—Incorporated in North Carolina to construct and operate a street railway line in Durham. Capital stock, \$10,000. Incorporators: E. J. Parrish, J. M. M. Gregory, John Sprunt Hill, W. W. Whitted and R. W. Winston.

Aberdeen-Huron Railway, Huron, S. D.—Incorporated in South Dakota to construct an electric railway from Huron

to Aberdeen, a distance of 80 miles, to cross the counties of Beadle, Spink and Brown. Headquarters, Huron. Capital stock, \$2,500,000. Incorporators: John A. Cleaver, R. W. Clarke, L. Lapiere, J. P. Stahl, G. W. Longstaff, Oscar A. Ricker, R. D. Whorton, R. C. Gibbs and H. J. Rice, all of Huron. [S. R. J., May 16, '08.]

TRACK AND ROADWAY

Alabama Railway & Electric Company, Opelika, Ala.—We are advised that this company contemplates awarding contracts during the next three weeks for the building of 30 miles of track. J. C. Chapman, 223 Century Building, Atlanta, Ga., vice-president. [E. R. J., June 13, '08.]

Calgary, Alta.—The special street railway commission is calling for tenders for supplying and laying rails on 9 blocks of the city streets. Eighty-pound rails will be used on the principal streets and 60-lb. on the others. The total length of the railway as laid out by the commission will be 7½ miles, with extensions already outlined for the future.

Vancouver Island & Eastern Railway, Edmonton, Alta.—We are advised that this company proposes to construct a steam road from Victoria, B. C., to Edmonton, Alta., and not an electric railway. [E. R. J., June 6, '08.]

Central California Traction Company, Stockton, Cal.—We are officially informed that this company contemplates extending its lines to Sacramento, also to Modesto. Work on this improvement is to be started shortly. W. Arnstein, San Francisco, secretary.

Los Angeles, Cal.—We are informed that a company will be formed soon to build and operate an incline cable railroad operated by electricity to the top of Mt. Washington. The railway will be 3000 ft. in length and will connect with the local street railway system. The promoters have recently applied to the Council for a franchise. A. St. Clair Perry, 140 West Fifth Street, Los Angeles, Cal., is interested. [E. R. J., June 13, '08.]

Ventura (Cal.) Terminal Railway.—It is officially stated that the Ventura Industrial-Securities Company, which has taken over the proposed Ventura Terminal Railway Company, will begin preliminary work at once on the electric railway from the ocean at Ventura to the cement quarries in the Matilija Valley, a distance of 22 miles. It is also proposed to build a 5-mile branch to Nordhoff. [S. R. J., Dec. 21, '07.]

Kansas-Colorado Railroad, Pueblo, Colo.—S. H. Atwater writes that this company is surveying the route for its standard-gage electric railway system which is to connect Canon City, Colo., and Garden City, Kan. It is the intention of the company to start construction work within 30 days. The entire system will comprise about 400 miles of single track. The company proposes to adopt the overhead trolley system. The power station will be located at Canon City and current will be furnished for lighting and manufacturing purposes. Headquarters: Central Block, Pueblo, Colo. Capital stock, \$5,000,000. Officers: S. H. Atwater, Canon City, president; A. H. Warner, Garden City, Kan., vice-president; E. W. Palmer, Pueblo, secretary; W. O. Bournier, Pueblo, treasurer; W. C. Davis, General Electric Company, Schenectady, N. Y., electrical engineer. [E. R. J., June 13, '08.]

New York, New Haven & Hartford Railroad, Hartford, Conn.—This company has completed preliminary arrangements for building an electric railway from Willimantic to South Coventry and has filed with the Railroad Commissioners an application to have the proposed method of construction formally approved. The needed local franchises have been procured from the city of Willimantic and the towns of Mansfield and Coventry.

Chicago, Ottumwa & Western Railway, Hamilton, Ia.—Work was begun last week by the engineers of this company on the preliminaries for its proposed railway. It is to be a standard-gage road, 85 miles in length, and will extend from Hamilton to Ottumwa and Des Moines. The company proposes to erect a power plant at Hamilton. It is also planned to adopt the overhead trolley system. Capital stock, \$3,000,000. Officers: T. J. Avery, Hiteman, Ia., president and secretary; S. P. Pascoe, Hamilton, vice-president; A. A. McGarry, Hamilton, treasurer; John A. Nelson, Hamilton, chief engineer.

Des Moines & Sioux City Railway, Lake City, Ia.—E. G. Killely and a force of surveyors have started south on the location of this proposed electric railway. It is planned to construct a line reaching from Des Moines to Lake City via Perry, Jefferson, Lake City and Sioux City. A. O. Anderson, Lake City, secretary. [S. R. J., Feb. 8, '08.]

Joliet & Southern Traction Company, Joliet, Ill.—H. A. Fisher, president, advises us that this company will build extensions to Blue Island and Chicago Heights this year.

At present two lines are under construction, one to Frankfort, 7 miles, and the other to Mokena, a distance of 4 miles.

Sterling, Dixon & Eastern Electric Railway, Dixon, Ill.—This company is about to begin the construction of a short extension from the interurban line just out of the city limits of Sterling to Mineral Springs Park.

Paris (Ill.) Traction Company.—It is said that this company will at once extend its line to Ridgefarm. C. F. Propst, Paris, general manager.

Chicago, Lake Shore & South Bend Railway, South Bend, Ind.—This company has completed its track to and in this city and service between this city and Michigan City was inaugurated July 1. Within a short time cars will be running into Chicago over the tracks of the Illinois Central.

Kokomo, Frankfort & Terre Haute Traction Company, Kokomo, Ind.—It is officially announced that this company will let contracts this summer or fall for building an electric railway from Kokomo to Terre Haute, 104 miles, via Frankfort, Crawfordsville, Rockdale, etc. Right of way is now being secured. From Kokomo to Frankfort the electric railway will parallel the Toledo, St. Louis & Western Railroad, and from Frankfort to Rockville and Terre Haute it will parallel the Vandalia Railroad. Dr. A. Guard, Frankfort, president; D. W. Bolen, Indianapolis, vice-president. Headquarters, 411 State Life Building, Indianapolis. John A. Shafer, Indianapolis, chief engineer. Capital stock, \$100,000. [S. R. J., May 30, '08.]

Albia (Iowa) Interurban Railway.—We are advised that this company has recently awarded contracts for the building of a 6-mile extension to Hiteman. It is planned to begin work this fall. W. E. Gout, general manager.

Kansas Traction Company, Coffeyville, Kan.—This company is reported to have completed its survey into Lawrence, Kansas City and Topeka. The company expects to make profiles and maps shortly in preparation for actual construction work. The total length of the line will be about 225 miles. F. B. Shirley, Coffeyville, president.

Topeka (Kan.) Railway.—The company is changing the route to Oakland which will necessitate the construction of 5 miles of new track, also a viaduct 390 ft. in length spanning the tracks of the Atchison, Topeka & Santa Fé Railway, and approaches in connection with the viaduct 950 ft. in length. This work is to be completed Aug. 1. The company also expects to build double-track extensions to two other lines. F. G. Kelley, secretary.

Wichita (Kan.) Railroad & Light Company.—This company has recently placed orders for material for the construction of 2 miles of new track. W. R. Morrison, superintendent.

New Orleans & Seashore Air Line Railway, New Orleans, La.—This company, which was incorporated in Louisiana several months ago, has issued a prospectus describing and illustrating its proposed route from New Orleans to Grand Isle, La., on the Gulf of Mexico. It is to be an electric railway, and it is aimed to make the run of about 50 miles in 90 minutes. There will be little curvature, and the road will be practically level. On the island will be erected a large building which can be used as a casino and general entertainment hall as well as for a railway station. This will be placed above the highest known tidal flood level, and the railway will also terminate at this elevation. The line will start from a point on the south side of the Mississippi River, in Jefferson parish, running west to Amesville; thence south along the Bayou Des Familles about 8 miles; thence to and across Bayou Barataria; thence along the east side of that bayou to Bayou Dupont, which will be crossed; thence to and across Bayou St. Denis and Grand Bayou; thence to Bayou L'Ourse, which will be paralleled to Grand Isle. A branch is also contemplated to and along Bayou LaFourche. Officers: James W. Porch, president; Arsene Perrilliat, vice-president; Louis P. Rice, treasurer; John H. Menge, Jr., secretary, all of whom are directors, the other member of the board being Honore Dugas, of Bayou LaFourche; the others are of New Orleans. J. W. Stephens, chief engineer. Headquarters, 303 Cotton Exchange Building, New Orleans. [S. R. J., Feb. 1, '08.]

Boston & Eastern Electric Railroad, Boston, Mass.—A continued hearing on the application of this company for permission to build was held by the Massachusetts Railroad Commission on June 11. Geo. M. Tomson, of Wakefield, Mass., was the principal opponent. He stated that the physical condition of the Boston, Revere Beach & Lynn Railroad is good and that it could be four tracked between the Maverick Street (East Boston) terminal and Oriental Heights for \$218,000, a plan which would double its capacity. Mr. Tomson also said that the electrification of the Boston, Revere Beach & Lynn Railroad is undesirable at present, as the service would not be materially improved

thereby. The cost of electrification on a narrow-gage basis was placed at \$1,000,000 with an additional \$125,000 expense to electrify the road on a standard-gage basis. As a result of a study of the electrified lines of the Central & Hudson River Railroad and the New York, New Haven & Hartford Railroad made by him, Mr. Tomson considers that the electrification of the Boston & Maine Railroad's Eastern Division would present fewer difficulties than those encountered in the Metropolis. Mr. Bickford for the Boston & Eastern Railroad said the cost figures were inadequate and discussed the limitations of the present ferry service of the Boston, Revere Beach & Lynn Railroad. A letter was read from the Westinghouse Company which stated that it could furnish 50-hp, 600-volt motors to fit narrow-gage cars, equipping each car with four motors at \$3,500 each, which would permit of as fast speed as at present. After the evidence was all in, counsel for the Boston & Maine Railroad and the Boston & Northern Railroad asked for a ruling on the authority of the Railroad Commission to continue the hearings, since legislative permission to build a tunnel under Boston Harbor had not yet been received. The hearing was concluded last week. Counsel for the opposition said that the board has no authority to hear the case, on the ground that legislative permission would have to be secured before the company could build a tunnel under Boston Harbor. The board has now issued a ruling that it has full powers and that the tunnel is an incident to the general route proposed, upon which the board has power to pass in making its final decision. [S. R. J., May 21, '08.]

Martha's Vineyard Street Railway, Oak Bluffs, Mass.—This company has a large force of men engaged in laying heavier rails between the Lagoon bridge and Vineyard Haven, while new turnouts are being built on New York Avenue and at the head of the steamboat landing. E. R. Frazier, Oak Bluffs, general manager.

Springfield (Mass.) Street Railway.—This company is reported to have filed petitions with the State Railroad Commission asking for approval of the locations granted it by the Springfield board on Sumner Avenue and Long Hill Street and on Main Street and Ludlow Avenue, Indian Orchard.

Winnipeg (Man.) Electric Railway.—This company has decided to extend its line through the municipality of St. Vital. The company has also made application to the board of works for permission to construct a loop line on Lombard, Rorie, McDermott and Main Streets. Wilford Phillips, manager.

Detroit & Bay City Interurban Railway, Bay City, Mich.—It is reported Jas. Caplis, of Detroit, and other capitalists have revived the project to construct an electric railway between Detroit and Bay City. The roadbed for such a line has been graded several miles out of Bay City toward Quanicassee.

St. Paul, Minneapolis & Seattle Electric Railroad, St. Paul, Minn.—In the issue of the ELECTRIC RAILWAY JOURNAL for June 6, 1908, the following item was published about this company: "This company is reported to have entered into a contract with A. A. Carlstrom, of Seattle, for the first 10 miles of grading for its line. J. W. Mossop is vice-president and general manager." Under date of June 27, 1908, the following letter was received from the postmaster at St. Paul, Minn.: "In reply to your letter of the 25th inst. permit me to state that under date of April 18 the Postmaster General upon evidence satisfactory to him issued a fraud order against the St. Paul, Minneapolis & Seattle Electric Railway Company and its officers, it having been made to appear that they were engaged in conducting a scheme or device for obtaining money through the mails by means of false and fraudulent pretenses, representations and promises in violation of law."

***Bismarck, Mo.**—A party of St. Louis capitalists met the Business Men's Club of Irondale at that town on June 22 and completed the preliminary arrangements for an electric railway from Bgrade to Ferryville. A dam will be built across Big River, near Irondale, to furnish the motive power.

Oregon (Mo.) Interurban Railway, Oregon.—We are advised that M. A. Hogan, of Kansas City, Mo., has been awarded the contract for building 4½ miles of line from Oregon to Forest City. Bids were opened on June 10. The highest bid was \$40,000, not including equipment. L. I. Moore, secretary. [S. R. J., May 30, '08.]

Port Jervis (N. Y.) Electric Light, Power, Gas & Railroad Company.—The Public Service Commission has approved the plans of this company for the reconstruction of its railway system which will call for an expenditure of \$94,053. D. R. Thomas, general manager.

Rochester (N. Y.) Railway.—This company has just completed and begun operating cars on the Arnett and Clifford

Street line. The route will take the cars through Arnett Street to Genesee, out Main Street to Plymouth Avenue North, thence to Allen Street and State and out Central Avenue to North Street, proceeding to Portland Avenue and out Clifford Street.

Cincinnati, Dayton & Fort Wayne Railway, Dayton, Ohio.—We are officially advised that this company plans to undertake construction work on its proposed standard-gage railway system shortly. It is the intention to build from Cincinnati to Dayton and Fort Wayne, Ind., a distance of 194 miles. Current to operate the cars will be supplied through the third-rail. Power stations will be built at Seven Mile and Celina, Ohio. West Elkton, Ohio, has been selected as the location of the repair shops. In addition the company contemplates furnishing power for lighting. Capital stock authorized, \$3,000,000; issued, \$450,000. Bonds authorized, \$2,000,000. Headquarters, 51 Davies Building, Dayton, Ohio. Officers: S. F. George, Dayton, president and general manager; D. W. La Fetra, New York, first vice-president; Chas. L. Hyde, Pierre, S. D., second vice-president; Wm. D. Freeman, Dayton, secretary and treasurer; B. B. George, Dayton, purchasing agent. [E. R. J., June 6, '08.]

Amarillo (Okla.) Street Railway.—We are informed that this company expects to build an extension of 1 mile to its lines within 60 days. John K. Shirman, secretary.

Brantford (Ont.) Street Railway.—This company has been given permission to extend its line from Mohawk to Cainsville. M. A. Verner, Brantford, general manager.

St. Thomas (Ont.) Street Railway.—A. S. Balsdon, general manager, writes that this company contemplates extending its system to Port Stanley, a distance of about 9 miles.

Wasco County Electric & Water Power Company, Portland, Ore.—The contract for the building of this electric railway has been awarded to the Portland Construction Company, 318 Marquam Building, Portland, Ore. The electric railway will enter the Deschutes and John Day valleys and will be built south from Condon to Antelope, Madras and Bend. Branches will be built to Howard and Dayville. The company also plans the construction of power stations on the Deschutes and John Day rivers. It is announced that construction work will be begun shortly. Officers: G. S. Carpenter, Fossil, president; Dr. H. I. Keeney, Portland, first vice-president; R. L. Hunt, Condon, second vice-president; W. H. Greindstaff, Portland, third vice-president; E. P. Schow, Portland, secretary; C. W. Lord, Condon, assistant secretary; F. T. Hurlburt, Condon National Bank, treasurer; R. L. Donald, Portland, general manager; J. C. Stevens, Portland, superintendent; D. R. Parker, Condon; C. D. Charles, Mark W. Gill, F. S. Munn, O. B. Hathaway, H. J. Martin, Portland, directors. [E. R. J., June 6, '08.]

Salem, Ore.—A committee of business men of Salem and Stayton recently closed a contract with A. Welch, general manager of the Portland, Eugene & Eastern Railway, by which the latter agrees to build an electric railway from Salem to Stayton within one year. The railroad will cost approximately \$300,000, and the business men of Salem and Stayton are to subscribe \$100,000 of this amount. Work will begin on the road in about two weeks if the \$100,000 has been subscribed.

The Montreal & Southern Counties Electric Railway, Montreal, Que.—This company has opened offices at 606 Canadian Express Building, McGill Street, Montreal. W. B. Powell, manager; J. A. Burnett, superintendent and electrical engineer. Work is now proceeding on the Montreal-St. Lambert section of this road, and entry into the city of Montreal has been arranged for. [E. R. J., June 20, '08.]

Lake View Traction Company, Memphis, Tenn.—H. E. Craft, vice-president of this company, has announced that contracts probably will be let within the next 30 days. The company proposes to build an electric railway from Memphis to Lake View, Tenn., and Clarksdale, Miss., 77 miles. Also from Memphis to Collierville, 28 miles; from Memphis to Covington, 33 miles; and 15 miles within city limits of Memphis. Surveys are made and right of way secured. Capital is obtained. R. F. Tate, president; W. W. Hayden, chief engineer, Memphis. [S. R. J., April 18, '08.]

***Mesa Valley & El Paso Railway, El Paso, Tex.**—This company has been organized in El Paso for the purpose of constructing an electric railway between El Paso and Las Cruces, N. M. Capital stock, \$1,000,000. Papers of incorporation are being drawn up, and it is expected to begin work on the line within 30 days and complete the line within one year. The line will be 44 miles in length. Among those interested in the project are: Felix Martinez, J. C. Wilmarth, O. H. Baum, H. C. Myles and S. J. Larkin, all of El Paso.

***McKinney, Tex.**—At a meeting of citizens of this place, Bonham, Blue Ridge and other points, held here, W. S. Cole, of Detroit, Mich., representing Eastern capitalists, presented a proposition for the construction of an electric railway between Fort Worth and Bonham. The proposition was accepted and organization of stockholders in promotion fund was effected with J. L. Lovejoy as chairman.

***Bridgeport, Wash.**—James Fullerton, of Seattle, is reported to be interested in a plan to build an electric railroad from Coulee City up Grand Coulee to a point on the Columbia opposite the San Poil. The rights of way for the entire distance have been procured. It is planned to build branches from Steamboat Rock to Bridgeport and from Coulee City to Waterville. It is also the intention of the promoters to furnish electric power and light along its lines.

Seattle, Renton & Southern Railway, Seattle, Wash.—This company, having negotiated for the sale of \$1,000,000 in bonds, expects to immediately begin making extensions and improvements to its system. The franchise recently secured by the company for the construction of a line in Seattle provides for a system from Dearborn Street to Fourth Avenue, on Fourth Avenue to Blanchard Street, from Blanchard to Third Avenue, on Third to Stewart Street, east on Stewart to Fourth Avenue, south on Fourth to Main Street, east on Main to Fifth Avenue, south on Fifth to Dearborn Street and east on Dearborn to the Seattle Boulevard, connecting with the Rainier Valley and Renton line. D. D. Egan, Seattle, general manager.

Milwaukee, Wis.—The Milwaukee Railway & Light Company has been granted franchises to build a line on Center Street, from Seventeenth Street to Twenty-seventh Street, also to extend the Eighth Street line north on Teutonia Avenue, to tap territory now reached by the Twelfth Street line. The Twelfth Street line will be discontinued upon the completion of the extensions.

Sparta-Melrose Electric Railway & Power Company, Melrose, Wis.—We are officially advised that this company is planning to begin work on its proposed standard-gage electric railway between Sparta and Melrose about Sept. 1. Already \$60,000 aid in bonds of towns along the route has been secured and a proposition for \$45,000 is soon to be voted upon. As soon as this amount has been obtained the company intends to make the surveys and other preliminary arrangements. The company is considering the use of gasoline electric cars, and investigations toward that end are now being made. This road will do a considerable freight business as it is to act as a feeder to the main line of the Chicago, Milwaukee & St. Paul Railway or the Chicago & Northwestern Railway, as both of these roads pass through Sparta. The United States Military Reserve Station and Trout Falls will also be reached by this line. Capital stock, \$300,000. Officers: Charles Newland, Melrose, president; J. A. Cole, Cataract, Wis., vice-president; Howard Teasdale, Sparta, secretary; W. A. Scholes, Melrose, treasurer. [S. R. J., May 4, '07.]

POWER HOUSES AND SUBSTATIONS

Columbus (Miss.) Railway, Light & Power Company.—We are advised that this company expects to install a 350-hp water-tube boiler at its plant very shortly. S. W. Greenland, general manager.

Syracuse & South Bay Railroad, Syracuse, N. Y.—The Public Service Commission of the Second District has granted the amended application of this company for its electrical power transmission line. Work on the construction was begun last week. The new route is from the line of the Niagara, Lockport & Ontario Power Company's transmission wire to the railroad company's property.

SHOPS AND BUILDINGS

Boston & Northern Street Railway.—The company's car house at Marblehead was destroyed by fire on June 21. One car and sundry snow equipment were also burned. The loss is estimated to be about \$11,000.

Connecticut Company, Bridgeport, Conn.—This company has made an appropriation of \$250,000 for the construction of new car-house headquarters in Bridgeport upon the railroad property south of Congress Street, north of Stratford Avenue and east of Housatonic Avenue. The company has authorized the immediate construction of the building, and the ground will be broken in a very few days. The details of the project are now being arranged by the construction department at New Haven.

AMUSEMENT PARKS

British Columbia Electric Railway, Vancouver, B. C.—This company is engaged in erecting a new band stand at Kitsilano Beach, Vancouver.

Manufactures & Supplies

ROLLING STOCK

Western Ohio Railway, Lima, Ohio, it is reported, will build seven freight trailers.

Columbus, Delaware & Marion Railway, Columbus, Ohio, will build two freight trailers.

Columbus (Miss.) Railway, Light & Power Company expects to purchase a number of semi-convertible cars.

Toledo & Chicago Interurban Railway, Kendallville, Ind., is reported to be in the market for motors for four cars.

Hull Electric Company, Aylmer, Que., has just received a shipment of five cars from the Ottawa Car Company, Ottawa, Ont.

East St. Louis & Suburban Railway, East St. Louis, Ill., has placed an order with the American Car Company for 20 suburban cars.

Yonkers (N. Y.) Railroad Company will be in the market for 16 new cars for winter service. The cars will be needed next fall.

Union Traction Company, Santa Cruz, Cal., has ordered eight semi-automatic-brake equipments from the National Brake & Electric Company.

Toledo (Ohio) Railway & Light Company has ordered straight air-brake equipment for 12 new cars from the National Brake & Electric Company.

Lexington & Interurban Railways Company, Lexington, Ky., has placed an order with the J. G. Brill Company for two large interurban cars complete, weighing 42 tons.

Rio de Janeiro Tramways, Light & Power Company, Sao Paulo, Brazil, has ordered semi-automatic brake equipment for 35 new cars from the National Brake & Electric Company.

Mexico (Mex.) Tramways is building at its shops in Mexico City 16 passenger cars and a number of freight cars. The motor equipment for the passenger cars has been ordered from the General Electric Company.

Sterling, Dixon & Eastern Electric Railway, Dixon, Ill., has placed an order with the St. Louis Car Company for four single-truck closed motor cars. These will be 32 ft. over bumpers, well built and equipped with reversible back cross seats.

Portland (Ore.) Railway, Light & Power Company has placed an order with the American Car Company for 5 broad-gage and 20 standard-gage cars. The company has also ordered from the National Brake & Electric Company semi-automatic brake equipment for 38 new cars.

Chicago & Milwaukee Electric Railroad, Chicago, Ill., is in the market for three combination baggage, smoking and passenger cars, three passenger cars and four parlor cars. The plan of the company is to run limited express trains composed of a parlor car, a passenger car and a combination baggage, smoking and passenger car. The new cars will be 52 ft. 3 in. long over all and 8 ft. 7 $\frac{3}{4}$ in. wide. The contract will be placed through A. L. Drum & Company, 624 American Trust Building, Chicago.

TRADE NOTES

E. G. Long Company, New York, has moved from 95-97 Liberty Street to 50 Church Street, the Hudson Terminal Building.

Crane Company, Chicago, on July 1, opened a branch in Vancouver, B. C., in charge of J. E. McIlreavy, who is well acquainted with the territory to be served. A large line of supplies and fittings will be carried in stock at the new branch.

T. H. Symington Company, Baltimore, Md., announces that Carl Tucker, who has been connected with the sales department of the T. H. Symington Company for several years, has resigned to accept a position with the General Rubber Company, with headquarters in New York.

American Brake Shoe & Foundry Company, Mahwah, N. J., states that the cost of the brake-shoe-testing machine described in the ELECTRIC RAILWAY JOURNAL, June 27, page 179, was \$8,100, and not \$81,000, as given in the article. The company adds that tests will also soon be conducted on this machine with rolled steel wheels.

Continental Construction Company, Toledo, Ohio, has been incorporated, with a capital stock of \$10,000, to construct electric railways. G. A. Gessner, Jr., F. H. Geer, G. H. Hannon, J. W. Lane and Richard W. Kirkley are the incorporators. Riggs & Sherman, the Nasby, Toledo, are said to be largely interested in the new company.

Wesco Supply Company, St. Louis, announces a large increase in its domestic and foreign orders for street railway

supplies. In addition to a complete line of overhead material it offers the Milloy trolley base, Crouse-Hinds headlight, Lyon steel gear case, hand-made armature coils, steel and iron poles, Wesco trolley wheel, American Steel & Wire Company's rail bonds and a full line of car equipment material.

Charles Schellenberg, Boston, Mass., president of the New England Car Advertising Company, who was reported in the ELECTRIC RAILWAY JOURNAL of June 27 to have formed the W. S. Temple Advertising Company, Boston, explains that the company he has formed is the United States Transfer Company, and that this company "is absolutely out of any street car advertising business of any description in New England, except for the interest of the Eastern Advertising Company." The New England Car Advertising Company is still an active business concern, but does not interfere with any of the street car advertising in the New England States, as the Eastern Advertising Company, with which Mr. Schellenberg is associated, controls that.

Consolidated Car Heating Company, Albany, N. Y., at its annual meeting on June 9, elected the following officers: President, James H. Manning; vice-president and general manager, Cornell S. Hawley; treasurer, Frederic Pruyn. C. C. Nuckols was appointed superintendent and purchasing agent and Thomas Farmer, Jr., was appointed district manager for the Eastern territory. Mr. Hawley, who succeeds F. C. Green in the management of the company, has been connected with the company for nine years, eight of which have been spent in the New York office. For the last four years Mr. Hawley has been sales manager of the company and is one of the best known men in the street railway supply business. His headquarters will be in Albany, but he will naturally spend considerable time in New York.

ADVERTISING LITERATURE

Brown Hoisting Machinery Company.—"Brownhoist Machinery" is the title of a publication issued by this company, describing its hoisting machinery as adapted to the use of artificial gas, coke and electric light companies for the rapid and economical handling of coal, coke and other materials.

F. Bissell Company, Toledo, Ohio.—This company has issued its calendar for June. The token is a firecracker, which is pasted to the calendar. The statement is made that "the cracker can't possibly hurt you." The cards issued regularly by this company are serviceable for desk use, and will be sent regularly on request to the company.

Crane Company, Chicago, Ill.—The *Valve World* for June contains as a leading article a description of rifled pipe for transporting crude oil for the use of the Southern Pacific Railroad. The line is 285 miles long and cost \$5,000,000. There are 23 pumping stations on the line. Mr. Crane continues his article "Some Fallacies in Education," and there are a number of editorials on timely subjects.

Ohio Brass Company, Mansfield, Ohio.—The bulletin of this company for June contains as its feature an abstract of the paper on the insulation of high-tension lines read before the Central Electric Railway Association at Toledo, Ohio, May 26, 1908, by F. S. Denneen, assistant chief engineer of the Ohio Brass Company. Another feature of the bulletin is an illustrated description of the company's new 10,000-volt insulated arc-lamp hanger.

Norton Company, Worcester, Mass.—This company has issued a folder entitled "Helps—Don'ts," intended for all who grind. In this order the following subjects are considered: Selection of wheel, mounting, truing and speed. General suggestions are made regarding the transferring of wheels and the economy of carefully studying the work in hand and applying the wheel best adapted to the needs on each occasion even though a few minutes may be lost in changing wheels.

H. W. Johns-Manville Company.—This company has issued interesting little folders entitled "In a Dripping Sweat" and "Ferro Compound." "In a Dripping Sweat" considers the condensation on cold-water pipes in warm weather and its effect upon stock and furnishing with which the "sweat" comes in contact. As an antidote it suggests its anti-sweat pipe covering. This covering is made in 3-ft. sections from $\frac{1}{2}$ in. to 1 in. in thickness to all pipe sizes and equalizes the temperature of the water in the pipes and that of the air, thus preventing trouble by removing the cause. "Ferro Compound" describes the company's ferro cement, a chemical iron compound for smoothing over and filling up blowholes, sandholes, etc., in iron and steel castings. It is easily applied with a wood paddle or a trowel and metallizes a few hours after application and becomes a part of the casting. After hardening it can be finished with a fine file or an emery wheel. It is especially adapted to covering countersunk bolt-heads.

ELECTRIC RAILWAY PATENTS

UNITED STATES PATENTS ISSUED JUNE 16, 1908.

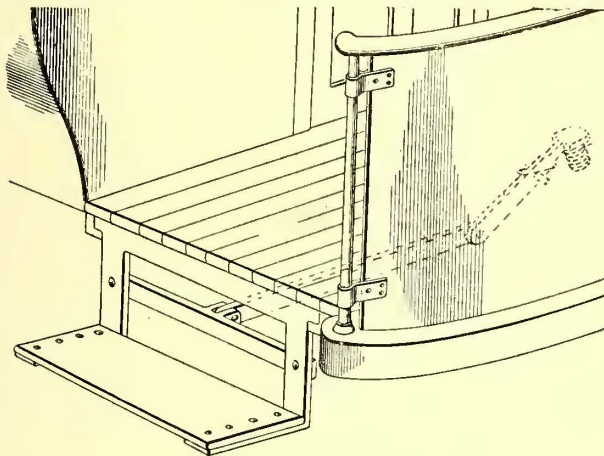
Railway Signal, 890,607; Arba G. Clark, Schenectady, N. Y. App. filed Oct. 14, 1907. A quick break switch for controlling the driving motor of a semaphore signal. Has a pair of spring blades which project into the path of a segment contact on the semaphore arm.

Movable Car-Step, 890,630; John Geppner, Chicago, Ill. App. filed Feb. 7, 1908. The step is normally held out of position by springs and can be placed in operative position by a depressible lever.

Tamping Machine, 890,659; Anton F. Kellner, Omaha, Neb. App. filed Sept. 10, 1907. A series of plungers each slidably and resiliently mounted in a casing or sleeve, each sleeve near its upper end being pivotally mounted upon a link to receive actuation from rotatable cranks, the bottom of the plungers adapted to have removably secured therein any desired cutting or tamping heads.

Trolley Wheel, 890,664; Thomas Langen, Brooklyn, N. Y. App. filed April 8, 1907. The wheel is so constructed that the tread may be removed when worn. It has a large oil chamber and means for continuously lubricating the axle of the wheel.

Circuit Closer for Automatic Train-Stops, 890,670; Joseph H. Lynch, Red Bank, N. J. App. filed May 2, 1907. A horizontally and vertically movable shoe on a vehicle and



Patent No. 890,639

a composite obstruction on the roadbed adapted to move the shoe sidewise while at the same time raising it.

Circuit Breaker, 890,718; Arthur Smith, Schenectady, N. Y. App. filed April 24, 1906. Relates to circuit-breaker switches of the type operated by solenoids and controlled at a point remote from the main switch. Provides an indicating device which is actuated under certain abnormal conditions.

Variable Resistance Coil, 890,737; Herbert A. Wallace, New York, N. Y. App. filed Aug. 9, 1907. A cylindrical winding engaged by a pair of sliding spring contacts which are adjusted upon the cylinder by a thumb screw.

Clutch Mechanism for Railway Car and Locomotive Wheels, 890,760; James D. Donovan, Kansas City, Mo. App. filed Sept. 6, 1907. A gear loosely held on the locomotive axle adjacent the wheel, co-operating clutch members, one fixed to said gear and the other movably mounted on the wheel and means for operating the movable clutch member.

Operating Device for Automatic Switches, 890,784; Royal R. Miller, Pueblo, Colo. App. filed Aug. 3, 1907. An air cylinder has a foot-operated piston with a flexible pipe to a switch-operating lever on the truck of the car. When the piston is depressed by the foot of the operator the switch-operating lever is thrown to operative position against the action of a spring.

Triple Valve for Graduating Release, 890,823; Walter V. Turner, Wilkesburg, Pa. App. filed Oct. 13, 1905. An improved triple valve device adapted to graduate the release of the brake, whereby the brake cylinder pressure may be graded down to any desired degree without entirely releasing the same or may be completely released at any time.

Graduating Triple Valve, 890,824; Walter V. Turner, Wilkesburg, Pa. App. filed Oct. 20, 1905. Relates to modifications of the above.

Automatic Train-Pipe Coupling, 890,831; Robert E.

Adreon, St. Louis, Mo. App. filed Oct. 31, 1906. Comprises a coupler head having a lateral opening, a curved spring for clamping the head with a counterpart coupling head, guide flanges and a buffing flange for engaging the spring of a counterpart coupling head.

Contact-Box for Electric Railways, 890,866; George H. McFeaters, Johnstown, Pa. App. filed June 6, 1905. Means for increasing the current-carrying capacity of a contact-box for surface-contact electric railways.

Railway Rail Chair, 890,914; John F. Lewis, Kansas City, Kan. App. filed May 17, 1907. A combined chair and brace for use upon rails at curves or wherever the rails are subjected to side pressure.

Air-Brake System, 890,930; Harold Rowntree, Chicago, Ill. App. filed March 30, 1907. An air-brake system wherein the position of the engineer's control handle determines absolutely the pressure supplied to the brake cylinders.

Air-Brake Equipment for Cars, 890,932; Harold Rowntree, Chicago, Ill. App. filed March 30, 1907. An air-brake equipment for cars wherein each car is supplied with its own equipment and wherein equalization of pressure takes place throughout the train in case any one or more of the pumps on different cars should become disabled or thrown out of commission.

Electric Switch-Throwing Mechanism, 890,942; William H. Turner, Leeds, England. App. filed April 18, 1907. Relates to apparatus for automatically controlling and operating the points of overhead, cable and electric railways and tramways. Includes an automatically closed iron casing with a chamber having a solenoid and cam mechanism of such a type as to throw the switch point alternately by successive actuations of the solenoid.

Metallic Tie and Rail Fastener, 891,010; Martin L. Sager, Braddock, Pa. App. filed Dec. 6, 1907. Details.

Car-Fender and Attachment, 891,057; Emil Gerwig, Pittsburg, Pa. App. filed Feb. 26, 1908. The fenders at each end of the car are connected to each other by means of longitudinal rods mounted outside of the trucks that act as side guards.

Rail-Joint, 891,081; Sebastian Kuhnle, Braddock, Pa. App. filed Jan. 28, 1908. Consists of yokes mounted upon the base flanges of the rails at the sides of the tie, C-shaped clamping members trunnioned between the yokes and adapted to engage the splice bars, said C-shaped clamping members having longitudinally disposed grooves for the reception of a suitable opening instrument.

Trolley, 891,123; John C. Wilkins, Swissvale, Pa. App. filed Oct. 27, 1906. The harp is provided with a pair of pivoted, hook-shaped arms which close over the wire by spring pressure, and which are opened to permit disengagement of wire by a downward pull on the controlling cord.

Railway Tie, 891,164; William I. F. Harden, Washington, D. C. App. filed Aug. 27, 1907. A channel-shaped tie having a staple arranged astride and secured to said tie, the prongs of the staple comprising broad plates adapted to be driven into the roadbed to prevent the tie from rocking.

Railway Signal System, 891,200; August Wilhelm, St. Johns, Ore. App. filed July 10, 1907. A block-signal system for single-track roads. Employs pneumatically operated semaphores.

Brake Shoe, 891,209; Seth A. Crone, New York, N. Y. App. filed March 28, 1908. A cast-metal body adapted to engage the tread and flange of a car wheel and a steel or forged metal back plate, the two parts connected by the casting of the metal of the body upon portions of the metal of the back.

The fortieth commencement of Cornell University, Ithaca, N. Y., occurred on June 18. Ninety-nine students in Sibley College completed the course in electrical engineering, a number somewhat smaller than that of last year, when 107 were graduated. The curriculum in electrical engineering for next year has been modified. In accordance with the plan which has been followed for several years, more time and attention will be devoted to the theory of the characteristic performance of electrical circuits and machines. To provide this time in part the mechanical laboratory practice will cease at the middle of the senior year. The instruction in electrical engineering in the junior year is intended to acquaint the students with engineering practice and to indicate the main divisions of the field. During the senior year a theoretical foundation is laid for future practice. During the second half of the year the students are provided with optional courses of a more practical nature, with a view to showing them how the theory is applied in particular lines of work, such as electric railways, transmission of intelligence, design of electrical machines and power generation and transmission.

