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A CONFLICT OF DATES

June is beloved not only by the poets but by the delegates, and besides the two national political conventions a large number of technical associations have scheduled meetings for this month. Among those associations of electric railway interest which are to meet or have met during June are the Master Mechanics and Master Car Builders at Atlantic City, the Central Electric Railway Accountants Association, the Illinois Electric Railway Association, the Central Electric Railway Association, the New York Electric Railway Association, the American Society for Testing Materials and the American Institute of Electrical Engineers. In many respects June is a good month for conventions. The weather is nearly always propitious and it is not so hot that traveling is uncomfortable. The trouble is that the dates for these conventions have been set with little regard to question of overlapping. While there has been some conflict up to this week, the climax comes in the last three days in June, when no less than four of the associations mentioned above, namely, the last four in the list, bid for the attendance of electric railway men. This is regrettable. One cannot be at all, and there are a number of men, who, we know, would like to go to two or more of these meetings. As matters are arranged, they have to make a choice. We hope that before next June some working agreement will be reached by which at least the electric railway associations mentioned will select dates which will not coincide.

HOME RULE QUESTION AGAIN

While recognizing that very successful results have followed municipal regulation of city transportation facilities in Chicago, we believe that state regulation is usually preferable. Hence, the recent ruling by Judge Taylor denying the right of the Illinois Public Utilities Commission to issue orders affecting the service and the equipment of the Chicago street railways should not be considered a desirable precedent elsewhere for the substitution of city for state regulation. The Chicago situation is unique in many respects. In the first place, the entire surface railway situation had to be cared for, beginning with the franchises, continuing through the physical rehabilitation of the entire system and fundamental changes in transportation features and including a partnership agreement with the city by which the latter, so far as net earnings are concerned, is practically an equal partner with the companies. Another fundamental factor to be considered is that the plan was initiated long before the idea of state regulation of public utilities had gained much

ground and was in full operation long before there was any commission in Illinois with extensive powers to regulate service. Finally, the results at Chicago are undoubtedly attributable not so much to the method employed as to the men who were made responsible for the direction of the undertaking, and the success being due to men, it is not an argument in favor of municipal regulation, because the same men if acting for the state in that or any other case would undoubtedly have accomplished equally as satisfactory results. If the Board of Supervising Engineers in Chicago had state-wide powers as great as those which they exercise within the limits of that city, they could undoubtedly accomplish a great deal more for the benefit of the transportation facilities of that city than they could at present, because many of the lines extend beyond the city limits. This same situation is bound to be true in other cities, and this is one reason why state regulation is to be preferred to city regulation.

UNIT PRICES FOR ELECTRIC ENERGY

A newspaper report of one of the recent sessions in the interminable Thompson legislative investigation in New York City ended thus: "Frank Hedley, vice-president and general manager of the Interborough, has already testified that, without increasing its plant, the Interborough could generate enough surplus electricity to sell at 1 cent a kilowatt-hour and make a profit. The Edison company charges 8 cents a kilowatt-hour." While the statement is undoubtedly true, the inference which the casual reader would draw from it is that either there is a radical difference between the power plants of the two companies or that the difference between 1 cent and 8 cents represents "velvet" for the New York Edison Company. Such an inference would be decidedly unfair, for it is quite possible that the profit at the higher figure may be smaller than that at the lower. Energy is not a commodity like grain or apples for which there can be a fixed market price, regardless of the conditions of generation, distribution and utilization. As we have shown from time to time, peak-load energy may cost a dollar or more per kilowatt-hour to generate due to the investment of large sums in equipment used for but short periods. In the case cited in the above quotation a large part of the 8-cent charge is due to high distribution expense which, with the average small lighting customer, amounts to a large part of the income. The customer is supplied through transformers which absorb exciting current continuously although the average customer uses an almost negligible part of the all-day capacity of the

transformer. The cost of energy depends upon the load factor and the magnitude of the load. Either the Interborough or the Edison company could afford to sell energy at 1 cent per kilowatt-hour with proper values of these two elements. Fortunately power for electric railways can, in general, be produced cheaply because the load factor is fairly good and the load is reasonably large. This is one reason why so much transportation can be given for the nickel fare. Railway employees have a good talking point here in discussing transportation problems with the public.

"DAYLIGHT SAVING" AND ELECTRIC RAILWAY TRAFFIC

At the present moment it looks as though the daylight saving movement were a thing the probability of which in this country must be gravely considered. The scheme was proposed in England some eight or ten years ago and, according to the press dispatches, has now been officially adopted in that country, having gone into effect on the morning of May 21. According to the published reports, all public institutions in England, as well as the factories, shops, theaters and restaurants, will follow the new schedule until Sept. 20. But one exception is made. This is the public parks, which will stay open on the old schedule. The shift was made at 2 o'clock in the morning by shoving the clocks forward one hour. By a curious spontaneity, the plan has also been favorably considered by a number of other European countries this year and has taken so firm a grip on the popular imagination that it has actually been put into effect in Austria-Hungary, Germany and Holland, has been authorized for immediate adoption in Denmark, probably to be followed by Sweden and Norway. It has also just been adopted by France, according to newspaper report. Add to these European examples the fact that some Canadian towns have already tried the scheme and several cities in our own country are seriously considering it, and it will be realized that we are confronted by what is an accomplished fact elsewhere, and must be taken seriously here.

Of course, the plan is familiar to our readers through casual mention in the daily press, being merely to set the clocks forward, pursuant to legal enactment, somewhere about the first of May and to keep them running an hour fast of sun time until about the first of October, when they would be set back to assume the winter schedule. Germany and Austria-Hungary adopted the plan the first of last month, as also did Holland, where the clocks were set forward an hour at the midnight beginning May 1. Of course, it is a fact that the civilized world at large does not utilize the early hours of good daylight through the summer months. People get up at nearly the same time summer and winter, in winter near or before sunrise, in summer two or three hours after it.

On principle the scheme seems not an unreasonable adjustment of man to nature, although the economies to be effected look to be somewhat dubious. No artificial

light can be saved by getting up an hour earlier in the morning at the dictation of a manipulated clock or otherwise. If any saving can be made by the people at large in their electric light and gas bills it will have to be at the end of the day. If everybody went to bed an hour earlier than usual that much of the lighting bill would be cut off. As a rule, however, the people who sit up latest are those who are not doing long hours of hard work, but rather those who get up late and reach the evening hours tolerably fresh, so that it seems more than likely that the people who determine the time when the last lights are extinguished will take advantage of the blessed opportunity to lie in bed an alleged hour longer and sit up correspondingly later.

From the standpoint of the electric railway operator the situation is a rather singular one. It should not affect the total traffic to any perceptible extent, for about the same number of people will be carried, whether the day begins at one hour or another and whenever it officially ends, but it will tend to shift the distribution of the traffic and probably will require an hour longer active service on the part of the cars. The traffic of the early hours will begin earlier and very likely string out over a slightly longer period. The afternoon rush hour reckoned on sun time will be similarly affected. The results as regards evening traffic are not quite easy to foresee. It is possible that places of amusement would shift without change to the new time, letting out the theater crowds after the usual interval. But there is also a rather good chance that the existing tendency of theaters and the like to throw their beginning hour further into the evening would be increased, so that it is very doubtful whether the service, on which the late homecomers depend, could be suspended any earlier in actual time than it now is. In other words, it looks very much as though carrying out the daylight saving scheme might extend the active service period for about an hour, with a strong likelihood that the extension will come at or near what is now the evening rush period. If so, the effect should be to flatten at least somewhat the evening peak and so relieve the strain on the power station, car and car crew demand. Such a change ought to be reflected in operating economies.

There is also a possibility that the lengthened hours of daylight in the evening would result in more pleasure riding after the evening peak, the likelihood of this event being strengthened by the fact that the old schedule has been retained for the closing time of the English parks, as already mentioned. Such a plan ought to mean that all this additional pleasure and park traveling would take place to a large extent after the evening business rush-hour peak and hence at a time when it could easily be taken care of by the trolley systems. Details of this sort, however, can only be discovered when the thing is actually tried. All in all, therefore, the adoption of the daylight schedule would be of benefit to the electric railways.

There are certain grave inconveniences attending the proposition which will have a stronger effect in check-

ing its adoption here than in some of the foreign countries that are trying it. For example, standard time is worked in 15-deg. belts, each carrying throughout its extent the sun time of the center. At each edge the standard time is half an hour away from sun time, an amount which has been found sufficient to cause some little inconvenience when the days are not at their longest. Under the daylight-saving scheme the added hour where the clocks were already half an hour fast of sun time would aggravate the trouble rather seriously. Indeed this very objection has been raised against the adoption of the plan in France, which is in much the same condition as a single belt would be here. Small countries would not suffer this inconvenience to anything like the same extent as the big ones, especially our own. In Holland, for example, everything is reported as going on automatically with perfect smoothness. What will be the result of the agitation here no one can tell, yet if it should be generally adopted in Europe the possibility of assuming it here would be by no means remote.

PENNSYLVANIA-TYPE LOCOMOTIVE MAINTENANCE

The maintenance cost figures for the Pennsylvania Railroad's electric locomotives during the past year, as outlined on another page, are worthy of more than mere passing comment on the excellent record that they display. The low average cost of repairs, approximately 3.5 cents per locomotive-mile for engines weighing 156 tons, has been attained directly by application of the principle of making all repairs at inspections and practically eliminating the periodic overhauls customary with steam locomotives. The success that has attended the change in methods in this case, as well as that which has accompanied the use of the same plan on the New York Central Railroad for a number of years past, demonstrates its thorough practicability.

That the electric locomotive needs no periodic shopping for general repairs is due primarily to the fact that it has no boiler subject to progressive deterioration in service. In place of the boiler is electrical equipment which, when not overworked, remains in good condition for years, except for minor replacements and the possibility of accidental damage. Since running gears in general can be kept up by making light repairs from time to time as they are needed, there is really nothing in the normal course of events that requires a complete dismantling and rebuilding of the electric machine, and this cannot but make for economy. Stripping an engine and rebuilding it complete, as is practically done at a general overhauling in a steam locomotive repair shop, is bound to result in a lot of unnecessary work in the case of an electric locomotive, simply because of the removal and replacement of many parts that may be just as well inspected and repaired in place. Otherwise, much material would have to be dismantled and assembled at considerable cost even though obviously there was no need for repairs of any kind on the equipment.

On the Pennsylvania locomotives, for example, the

first operation, under the original plan of having general overhauls, was the removal of the cab. Yet this has been shown to be quite unnecessary except for repairs to the armature of the main motor which the cab incloses. Even then, the removal of the cab could be avoided by installing a hatchway in the cab roof, but since the protected location of the motor practically eliminates the possibility of mechanical injury, such a facility would be used too seldom to make it worth while.

Repair work for the Pennsylvania locomotives, therefore, is carried out almost in its entirety at an inspection shed, or engine house, that was originally provided only for light running repairs, with the result that, roughly, one-third has been cut from the expense of maintenance. What the resulting figure means may perhaps best be exemplified by comparing it with the maintenance costs for steam locomotives for the same railroad, as displayed in the I. C. C. reports. The steam machines average about 30,000 miles per annum at a cost of approximately 13 cents per locomotive-mile, the average steam locomotive weight being about 90 tons. As opposed to this the 156-ton electric locomotives are maintained for 3.5 cents per locomotive-mile, in a service which is in effect a combination of high-speed transfer movements and switching, with no long runs—conditions that make high annual mileages impossible and exaggerate the cost of repairs.

Since steam locomotive maintenance should vary roughly with the weight, the equivalent cost of an average steam locomotive equal in size to the electric machine would be something like 22 cents per engine-mile, giving a saving for the electric locomotive of 18.5 cents. The service in which the electric locomotives are working permits a mileage of about 36,000, and on this basis the saving in maintenance is equivalent to about 11 per cent on the cost of the electric engine. As twice this mileage would seem to be easily attainable in ordinary service, the saving in maintenance cost alone at this rate would pay for interest and depreciation as well as afford a profit on the cost of the electric machines that could be substituted for the steam locomotives.

There is still another point that might be touched upon in connection with the record of the Pennsylvania engines, and this is that the figures demonstrate the thorough practicability of the side-rod drive from a maintenance standpoint. There has been a very general impression that the additional parts introduced in this type through the necessity for coupling driving wheels with a jack-shaft, constituted an undesirable complication, but the present results seem to be ample evidence to the contrary. Of course, simplicity is and always will be the most important attainment in locomotive design, but at the same time real simplicity may be accomplished in other ways than by a reduction in the number of parts. If the parts in themselves are inherently simple and rugged in construction, they may in the end produce thoroughly satisfactory results, and this seems to have been the case with the Pennsylvania locomotive.

Electric Locomotive Maintenance on Pennsylvania Railroad

Elimination of Periodic Overhauls for These 156-Ton Engines, Which Are of the Side-Rod Type, Has Reduced the Maintenance Cost to Less Than 4 Cents per Locomotive-Mile

CHANGES in the maintenance practice of the Pennsylvania Railroad in connection with the locomotives on its electric zone in New York City have effected a remarkable reduction in the cost of repairs. The engines have been in service since 1910-1911, and each has made a total mileage averaging 155,000. Yet the maintenance cost for the year between May, 1915, and April, 1916, approximated 3.5 cents per locomotive-mile, and this seems to constitute a low record for engines of such large size, the total weight of the two units that form a complete locomotive being 156 tons. In brief, the change has consisted in the elimination of periodic overhauls such as were described in the *ELECTRIC RAILWAY JOURNAL* for March 15, 1913, and for the past fifteen months there has been adopted, instead, the practice of making repairs to worn parts whenever they are discovered at inspections. Thus practically all work is done at the

engines were inspected at both Sunnyside Yard and Manhattan Transfer, the western terminus of the electric zone, but no provision was made whereby the engines could be set out of service at definite times for the inspections, and these had to be made, therefore, whenever the inspector could find a locomotive that was idle for a few minutes. Under the present scheme the engines are inspected once each day over a pit located in the Sunnyside Yard, and they are sent to this point by the operating department as a regular part of the day's routine. Thus the locomotives are now given a daily inspection under conditions where ample time and facilities are provided to do such light work as replacement of brakeshoes, contact fingers, arc-chute slides, headlight resistances and the like.

In addition each engine is given a general inspection at intervals of 3000 miles, this distance being covered



P. R. R. LOCOMOTIVE MAINTENANCE—ELECTRIC LOCOMOTIVE AND TRAIN OF ALL-STEEL CARS

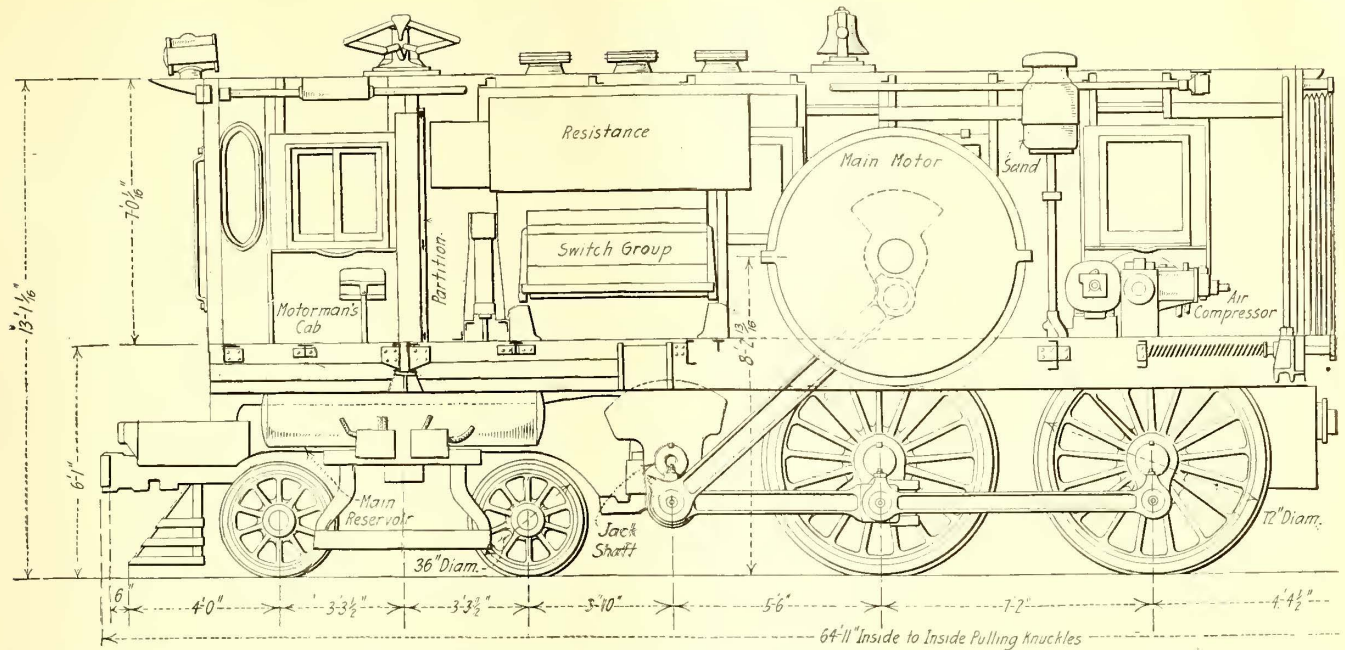
engine house located in the Sunnyside Yard, the main storage point for the passenger-coach equipment handled by the engines.

This building is equipped with a drop pit, and under the new plan of maintaining the engines, whenever tires become worn, the pit is used to drop out successive pairs of driving wheels, and the engine is then set outside of the house on dummy wheels while the tires are being turned and the rods and boxes are being repaired—the only heavy operations that are regularly needed. The driving wheels that are removed are sent to the nearest steam locomotive repair shop for turning, because the engine house is not equipped with a driving wheel lathe, and the same procedure is followed in case heavy repairs are required for the main motor armatures. Aside from this, however, all work can be more profitably done at the engine house, as it has been found that the repair force necessary to handle the running repairs can also handle the heavier repairs.

Changes also have been made in the method of handling the locomotive inspections. Originally the en-

usually during the course of about one month. At these general inspections the whole engine is given a very thorough examination, including especially the control, wiring and switch groups. Contact tips are renewed as necessary, together with switch shunts and main resistance grids if they are burned, while auxiliary circuits are tested for continuity and grounds. Also, the contact shoes on the engine trucks are gaged and readjusted, the motors are thoroughly blown out with compressed air, and the sequence of operation of the switches in the switch group is tested.

The mechanical part of the general inspection includes examination of all of the running gear, and practically all work that appears is done at this time. This includes reducing rod brasses in case the wear limit of 1/16 in. has been reached. The jackshaft brasses are tested for lost motion, and they are closed if this is required. The same thing is done with the main motor bearings, which are tested for lift, and if the limit of 1/16 in. is reached they are replaced, this operation being effected by removing the bearing caps and jacking



P. R. R. LOCOMOTIVE MAINTENANCE—DIAGRAMMATIC ELEVATION OF SINGLE UNIT OR HALF-LOCOMOTIVE SHOWING RELATIVE POSITION OF WHEELS, RODS AND ELECTRICAL EQUIPMENT

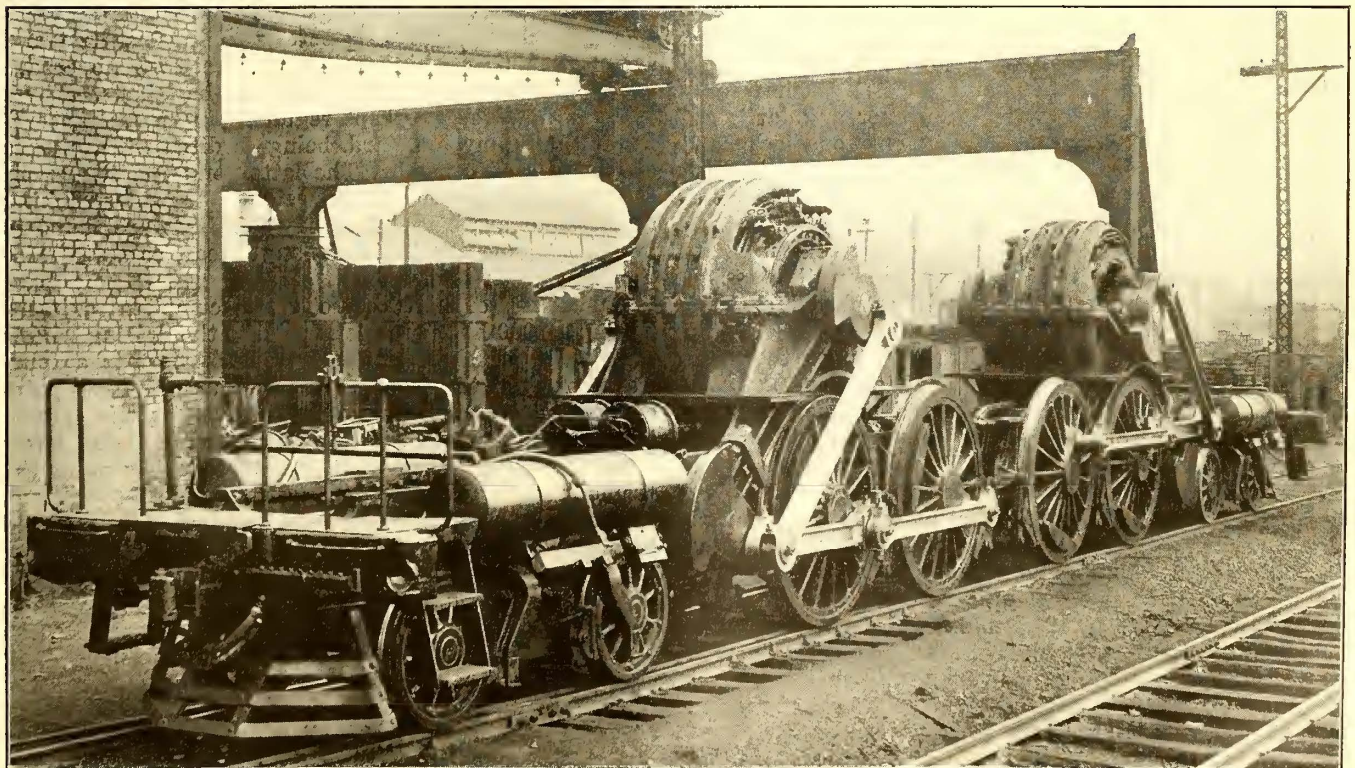
up the armature without removal of the motor from the engine. At the general inspections, also, the engine truck wheels are renewed if the flanges are sufficiently worn, and the engine-truck boxes are babbitted as required to take up any side play.

At 15,000-mile intervals there is made what is called a heavy inspection. As a matter of fact, this is really a duplication of the general inspection in so far as mechanical repairs are concerned, but electrical apparatus receives more elaborate tests and all classes of electrical repairs are made. The covers on the main motor armatures are removed, and the hand-hole plates at the bottom of the motor casing are taken off, so that the armature banding, as well as the condition of the arma-

ture coils at the back end of the armature, can be examined thoroughly. The compressor armatures are also inspected in greater detail than at the 3000-mile inspections, and the switch groups are gone over more carefully, the switch-group studs and straps being tightened and the magnet valve stems being replaced if worn. Junction box covers are removed and examination for loose terminals is made, while the same procedure is followed with the bus line and main fuse-box covers, as well as the receptacles for the jumpers between units.

CLASSIFIED REPAIRS

When it becomes necessary to turn tires, the heavy inspection at which the work falls due is considered



P. R. R. LOCOMOTIVE MAINTENANCE—RUNNING GEAR WITH CAB REMOVED

TABLE I—COST OF ELECTRIC LOCOMOTIVE MAINTENANCE, PENNSYLVANIA RAILROAD, 1915-1916

Month and Year	Mechanical	Electrical	Total	Total Locomotive Mileage	Cost per Locomotive Mile (Cents)
May, 1915.....	\$2,180.96	\$995.12	\$3,176.08	81,126	3.91
June, 1915.....	1,731.64	1,018.97	2,750.61	83,145	3.31
July, 1915.....	2,499.72	1,439.21	3,938.93	88,792	4.44
August, 1915...	2,268.33	737.13	3,005.46	88,433	3.40
September, 1915	1,808.85	999.23	2,808.08	85,054	3.30
October, 1915...	2,118.38	847.78	2,966.16	83,121	3.57
November, 1915.	1,630.41	855.07	2,485.48	82,438	3.02
December, 1915.	2,105.56	927.23	3,032.85	84,677	3.58
January, 1916...	1,919.19	610.42	2,529.61	83,797	3.02
February, 1916.	2,342.45	859.26	3,201.71	80,819	3.96
March, 1916...	2,091.34	1,127.42	3,218.76	85,299	3.77
April, 1916....	1,506.20	814.45	2,320.65	83,604	2.78
Totals	\$24,203.03	\$11,231.35	\$35,434.38	1,010,305	3.51

Note: Mileage figures made up with two locomotive-units considered as one locomotive.

Costs include all charges for inspection, repairs and superintendence in electric zone; for work done on the electric equipment by steam locomotive shops; for material either purchased direct or through purchasing agent; and for freight except over Pennsylvania Railroad.

equivalent to classified repairs, although the engine is not sent to the repair shop unless it is necessary to remove the cab, this being required in case the armature of the main motor has to be removed for any purpose. The engine house is equipped with a 25-ton traveling crane, but this is not high enough to permit the cab to be lifted off the engine, and therefore, in case an armature has to be rebanded or requires some other heavy work, the engine has to be sent to the nearest steam locomotive repair shop. Under ordinary circumstances, however, the procedure, as mentioned previously, is to drop out successive pairs of drivers in the engine house drop pit, replacing them with dummy wheels and setting the engine outside until the tires can be turned. At the same time the engine trucks are removed and completely overhauled, the shoes and wedges are squared up and relined and the driving boxes have the side play taken out, the driving-box brasses at the same time being overhauled if they have become loose in the box or large on the journal.

For the electrical repairs, the armatures of the main motors are jacked up and revarnished after being examined for defects which might require removal of the motor. Also, as the maintenance of the cranks in exact quarter is important, the motor shaft, jackshaft and driving wheels are all tested for proper angularity of the cranks, but as a matter of fact only one jackshaft and none of the motor shafts have actually had to be quartered during the past year. Classified repairs includes also painting the locomotive cabs, which are given a good finish because the engines are used in passenger service. This work is done in the engine house, one painter being regularly employed on this work for a large part of the time.

Classified repairs are made dependent upon the driving wheel wear under ordinary conditions, and as driving wheel tires are invariably turned because of worn flanges rather than tread wear, the intervals between turnings are extremely irregular, depending largely upon the class of service in which the engine happens to be. An interval of 50,000 miles between tire turnings is considered to be an average, but instances as low as 25,000 miles and as high as 100,000 miles have occurred not infrequently, and one unit actually made 142,000 miles between August, 1912, and November, 1915, without being shopped, this high mileage being ascribed to a particularly advantageous run on which the engine worked. Generally speaking, therefore, classified repairs are given at about every third heavy inspection.

Owing to the fact that the number of electric locomotives is ample to take care of the traffic under normal

conditions, the electric zone is never short of power except during rush days, such as brought about by Christmas travel, for example, or a football game at Princeton University. Under these circumstances, as many as thirty-one engines out of the total of thirty-three in operation have been in service, but under average circumstances only about twenty-four engines out of the thirty-three are required. In consequence it is the policy to hold engines out of service in the engine house for classified repairs preferably when their absence from service will not be felt and to do the work upon them when it can be handled to the best advantage in accordance with the demands of the regular work in the engine house. For the heavy inspections, or those at 15,000-mile intervals, the engines are held for two or three days, while at the general inspections they are usually held one day and sometimes two days.

MAINTENANCE COSTS AND PRACTICE

The costs of maintenance under the practice above outlined are shown in Table I by months from May, 1915, to April, 1916. These figures apply to complete locomotives, each of which is composed of two units weighing 78 tons apiece, so that the whole locomotive weighs 156 tons. The weights of the major items which make up each unit are as follows: Cab, control and compressor, 22 tons; motor, 21 tons; running gear, 18 tons; chassis, 17 tons. In brief, the service in which the locomotives operate is that of hauling passenger trains between Manhattan Transfer and the Pennsylvania Station in New York City, a distance of 8.8 miles. In addition, there are several trains hauled to Jamaica on the Long Island Railroad, a distance of 11.3 miles. The passenger-coach storage yards are at Sunnyside, some 4 miles east of the Pennsylvania Station, and reached by tunnels under the East River. Each engine, when it picks up a train either in the yard or at the zone terminals, hauls it through the under-river tunnels, so that the average run approximates 11 miles in length.

In case the engine bringing a draft from the yard should reach the New York station ahead of time, it may be called upon to do some switching in the station yard during the wait before pulling out its train, and for this switching mileage it receives no credit, except for periods of more than one-half hour. Three engines, however, are kept regularly in switching service at the Sunnyside Yard, being credited with mileage at the rate of 6 m.p.h. The latter engines, it may be said, are not permanently assigned to the switching service, but are placed in it if their tires are found to be approaching the limit of flange wear, so as to raise the average tire mileage.

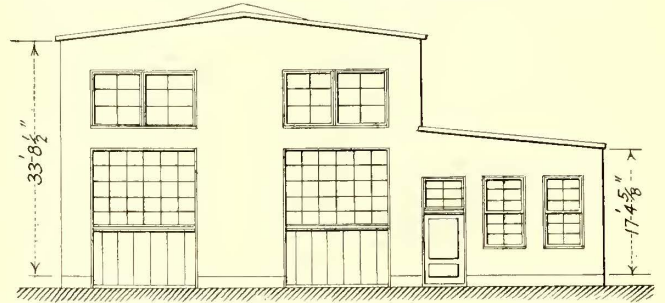
Each unit, or half-locomotive, is complete in itself, having a 2000-hp. motor connected to the driving wheels through a jackshaft and side rods. There is a four-wheel truck at the front end of each unit and two pairs of 72-in. drivers at the rear. The jackshaft is carried in a housing placed between the upper and the lower members of the locomotive frames. At this point the frame is made up with jaws having a binder below them, just as would be the case were the jackshaft replaced by a pair of drivers. Lost motion in the jackshaft bearing causes a serious pound if it is allowed to go beyond about 1/16 in., and as most of the wear takes place at the bottom half of the brass, it is the practice to take this up by loosening the lower part of the box, removing a liner, and then tightening the lower part of the box into place again. The intervals at which this work becomes necessary are variable, ranging anywhere between 2000 miles and 7000 miles. The average is about 3000 miles, which corresponds to the intervals between

general inspections. The two halves of the brass are originally left a full 1/32 in. open, and when the removal of liners brings them together, they are rebabbitted, thus separating the two halves again. This has to be done about once a year. These brasses run hot at long intervals, about four out of the 132 which are at present in service getting hot during one course of twelve months.

The diagonal motor rods which extend between the cranks on the motor shaft and those on the jackshaft, as well as the horizontal side rods, are provided with bushings at the ends, and these are renewed after 1/16 in. of wear has taken place, or, in general after 15,000 miles or 20,000 miles have been run, the side-rod bushings lasting about one-third longer than the motor-rod bushings. The main rods, or those extending between the jackshaft and the forward pair of drivers, are provided with brasses at one end and bushings at the other, the former requiring reducing about twice a year, or on a mileage basis, at intervals of approximately about 20,000 miles. All rods, brasses and bushings are left 1/64 in. large when applied, as no direct reciprocating motion takes place as it does on a steam locomotive, and on account of the gradual application of all forces, small amounts of lost motion are taken up without severe shock. But on the other hand, rod bushings cannot be allowed to run more than 1/16 in. loose, because they will then develop a severe pound. Wedges are set up by the inspectors as required, but they never require lining down between tire turnings, so that this needs to be done only when the engine is held out of service for tire work. Driving-box shoes tend to wear about as much as on a steam locomotive, so that these are refitted when the engine is held for classified repairs. Motor bearings are renewed after 1/16-in. wear or at 30,000-mile intervals. No springs have been replaced as yet, although a number have been reset. Only one of the sixty-six air compressors in service has had to be rebored on.

As shown by the table of maintenance costs, the charges for electrical repairs are very light. Since the engines were placed in service all armatures have been rebanded on account of coil shrinkage, but very few of them have been rebanded a second time. None of the main motor commutators have been turned on account of wear, and only two have had to be machined on account of accidental damage. Third-rail shoes, which

are of the over-running bracket type, run for about 15,000 miles in summer, and for about 3000 miles in winter before replacement. The main motor brushes have a very long life, or an average between two and three years. Some have even lasted for 150,000 miles, being removed then for side burning. Some chipping and breakage, however, has taken place, especially in winter weather, in which case mileages as low as 3000 have been made, this applying only to, say, three or



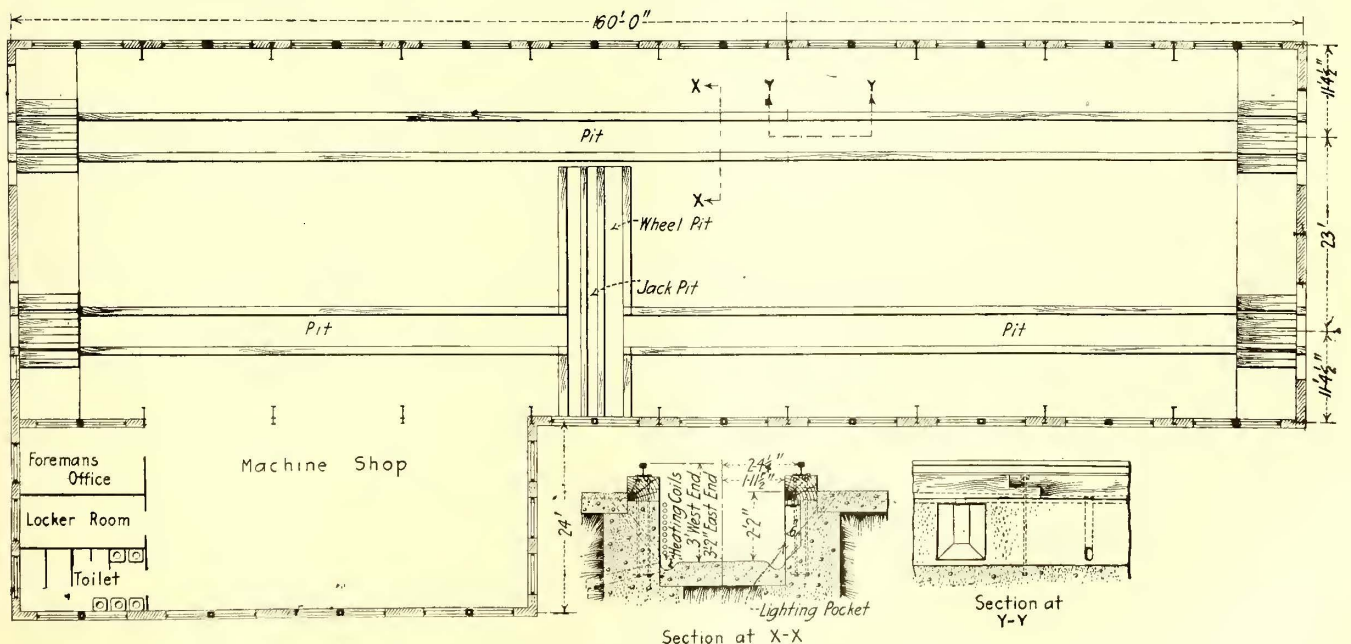
P. R. R. LOCOMOTIVE MAINTENANCE—ELEVATION OF ENGINE HOUSE

four brushes out of the forty with which each motor is equipped. Compressor brushes run about 3000 miles, being generally removed for side burning.

During the past year four flashovers occurred, the arc in one case going to the motor frame, and in the other three cases extending only between brushes. In no case was any damage done to the commutator which could not be cleaned up with a file, so that it was not necessary to remove the armature for any of these electrical disturbances. There were also two cases wherein circuit breakers burned up, the breaker having tripped upon an overload and grounded to the box which contains it, the arc being maintained by the ground from the circuit-breaker frame. One other unusual case of repairs was involved when a canopy switch terminal became grounded and thus burnt out a number of the auxiliary circuits. The direct cause was the disconnection of a terminal screw, which grounded the circuit on the cab frame.

In Table II on page 1124 are shown total figures for the year 1915 covering various operations at the Sunnyside engine houses.

In this the class 1 painting that is listed covers burn-



P. R. R. LOCOMOTIVE MAINTENANCE—PLAN OF SUNNYSIDE ENGINE HOUSE

TABLE II—1915 RECORD OF VARIOUS OPERATIONS AT SUNNYSIDE ENGINE HOUSE

Electric locomotives receiving classified repairs.....	9
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Electric locomotives receiving class 2 painting.....	4
Electric locomotives receiving class 3 painting.....	4
Locomotives held in shop for inspection and repairs.....	465
Driving-wheel tires shimmed.....	5
Engine truck-wheel tires shimmed.....	3
Engine truck wheels applied.....	64
Engine truck wheels removed for side play.....	3
Main motor armatures and fields painted.....	2
Main motor bearings renewed.....	18
Jackshaft bearings renewed.....	24
Jackshaft bearings reduced.....	631
Rod bushings renewed or reduced.....	123
Rod brasses reduced.....	143
Compressor armature commutators turned and slotted.....	16
Main motor resistances welded.....	53

ing is appended, and in connection with this note should be made of the absence of a driving-wheel lathe or an engine lathe large enough to swing the large armatures of the 2000-hp. motors, this being because the engine house was originally designed and equipped for running repair work rather than for overhauling operations.

60-in. horizontal boring machine.	5-ft. radial drill.
24-in. back-geared shaper.	Pneumatic pit jack.
30-in. x 8-ft. planer.	Grindstone.
60-ton vertical hydraulic press.	Power hack saw.
16-in. engine lathe.	Double spindle drill press.
36-in. engine lathe.	Two forges.
10-in. speed lathe.	250-lb. air hammer.

ing off complete and repainting and varnishing. Class 2 painting covers the application of a color coat and the necessary varnishing, while class 3 painting covers touching up and varnishing. The item covering the welding of main motor resistances refers to the rebuilding of grids by welding, as described in the ELECTRIC RAILWAY JOURNAL for Feb. 12, 1916.

USE OF ENGINE HOUSE FOR REPAIR WORK

All of the foregoing operations with the exceptions noted are now being done at the Sunnyside engine house. This building is rectangular in form, about 161 ft. long and 72 ft. wide, with a lean-to at one side to house machine tools. It has two tracks devoted to work on electric locomotives, and these hold four complete engines, or eight units out of the sixty-six available for service. This track space, with an inspection pit outside of the building, has been found to be ample for the requirements of the equipment, and as a matter of fact, eight multiple-unit cars, in addition to the electric locomotives, are maintained at this point. A drop-pit is provided for removing single pairs of driving wheels, the engines being moved across this while the drivers are dropped successively whenever it is necessary to remove wheels for tire turning. No attempt, therefore, is made to use the 25-ton overhead crane for any purpose other than lifting wheels out of the pit, or transporting rods or heavy pieces from one part of the engine house to another.

A list of the machine tools installed within the build-

TABLE III—NUMBER AND MINUTES DETENTION TO TRAINS DUE TO ELECTRIC LOCOMOTIVES FROM 1911 TO 1915, INCLUDING TOTAL MILEAGE AND MILEAGE PER DETENTION, PENNSYLVANIA RAILROAD

	1911		1912		1913		1914		1915	
	No.	utes	No.	utes	No.	utes	No.	utes	No.	utes
Failures.....	3	10	7	27	1	6	7	43	5	27
Mechanical.....	11	71	10	31	4	35	8	48	5	16
Electrical.....	2	19	4	13	4	37	3	11	3	39
Man.....										
Total.....	16	100	21	71	9	78	18	102	13	82
Total mileage..	909,238		994,592		1,046,613		1,016,044		995,141	
Mileage per detention.....	56,827		47,362		116,290		56,447		76,550	

NOTE: Figures apply to trains on which trouble occurred and do not include other trains delayed because of the failure.

TABLE IV—TRAIN DETENTIONS FOR CALENDAR YEAR 1915 DUE TO ELECTRIC LOCOMOTIVES, PENNSYLVANIA RAILROAD

Cause of Detention	Minutes Delay to Train	Class of Failure
Fuse blown in starting train.....	15	Man
Air hose.....	6	Mechanical
Air hose.....	7	Mechanical
Shunt-field resistance terminal broken.....	5	Electrical
Control wire broken.....	1	Electrical
Circuit breaker opened and not reset.....	2	Man
Air hose.....	3	Mechanical
Contact shoe broken.....	6	Electrical
Spring hanger and sand pipe broken.....	6	Mechanical
Coupler knuckle opened.....	6	Mechanical
Fuse failed.....	3	Electrical
Circuit breaker opened—overload.....	1	Man
Total.....	82	

Summary:
 Mechanical failures, 5.
 Electrical failures, 4.
 Total locomotive mileage, 995,141.
 Miles per locomotive failure, 110,570.

The force employed in the building for maintaining the electric locomotives, together with the previously mentioned eight multiple-unit cars, consists of four machinists and four machinists' helpers, who work on the shop floor. There are two general machine-tool hands, who spend their time at the machines, and one blacksmith and a helper. Only one general laborer is employed, but there are three engine cleaners or wipers, who are called upon, when the occasion arises, to help on other work. The electrical work is handled by one electrician, two electrical machinists and five electricians' helpers. During the day time two inspectors are stationed at the inspection pit outside of the engine house, no work being done at night and all employees working on a ten-hour day. Two air-brake machinists and one painter complete the force, the latter doing such odd jobs, in addition to his regular work, as putting in broken panes of glass and repairing doors and sashes.

TRAIN-DETENTION RECORD

A record of train detentions between the years 1911 and 1915, and a classified list of causes of detentions during 1915, are displayed in Tables III and IV. These show that, notwithstanding the reduced cost of maintenance, there has been no increase in the number of delays chargeable to the locomotive department. In fact, the record for reliability that was established for this installation in its early years of operation has been fully maintained during the past fifteen months, or since the maintenance methods have been changed to eliminate the periodical overhauls of the locomotives. During the past five years the average mileage per detention, including those due to man failures, is 64,437.

Fare Increase Sought in Germany

The street and suburban railways of Germany are agitating for permission to raise their minimum fare from 2½ to 3¾ cents, and a recommendation to that effect was made by their rate-making committee at a special meeting in Berlin of the management of the various companies. *Vorwärts* of April 18, in reporting this action, remarks that nobody was aware that the companies were in difficulties, as they had continued to show good balances even during the war. The Berlin Omnibus Company, however, seems to have good basis for its move toward an increase in rates, as the report presented to the shareholders by Director Kaufmann at a general meeting held in Berlin on April 17 showed that the rate of loss this year was higher than that of last year, when the deficit reached about \$190,000. The number of passengers carried in 1915 was only 79,000,000, against 104,000,000 in 1913. The Greater Berlin Street Railway is the largest stockholder in the Omnibus Company. The street railway's attempt to raise fares last year was a failure, but its net receipts increased about \$200,000, nevertheless, and it paid a dividend of 6 per cent.

Illinois Association Discusses Modern Motors and Anti-Friction Bearings

The Merits of Roller and Ball Bearings for Railway Service, the Comparative Efficiency of Old and Modern Motors and Safety Methods Were the Three Topics Discussed at the Recent Chicago Meeting

THE regular meeting of the Illinois Electric Railways Association was held in Chicago on June 9, 1916. J. R. Blackhall, general manager of the Chicago & Joliet Electric Railway, Joliet, Ill., and president of the association, presided, and sixty members and their guests were in attendance. H. A. Johnson, master mechanic Chicago Elevated Railways, read the first paper entitled "Results Obtained from Tests of Roller Journal Bearings on the Chicago Elevated Railroads," which is abstracted elsewhere in this issue. Before reading his paper he reminded the members of the various parts of the equipment to which the cost of electric current in car operation should be distributed. These included that necessary to overcome the inertia of the car, the internal motor losses, the gear and axle bearing losses, the rheostatic losses, the air resistance and journal friction and that for the air compressors and lights.

In connection with the tests, the results of which were outlined in his paper, Mr. Johnson said that the same crew was used on all test runs so that the human factor would be kept uniform, and the trains were the same except for the axles, bearings and journals. The control on all elevated trains is equipped with automatic acceleration through current limiting switches so that the rate of acceleration was practically the same as were all the other factors which are shown in one of the tables accompanying his paper. In connection with the tables showing the comparative energy consumption of the two typical trains, one equipped with roller bearings and the other with babbitted bearings, Mr. Johnson called attention to the significance of the four lines of figures. He said that the first line was the average of a large number of local runs, the second line was the average of all runs both local and express, the third line was for express runs exclusively, and the fourth line was for those portions of the express trips which were run at high speeds. The fourth line of results shows that whereas in the local runs the roller bearings made a saving over babbitted bearings, in the express or high-speed runs the roller bearings were not as efficient as the babbitted bearings.

Otto Bruenauer of the Gurney Ball Bearing Company then read a paper setting forth the merits of ball-bearing journals and the difficulties which have been overcome in connection with their adoption for electric railway service. This paper was abstracted in last week's issue of the ELECTRIC RAILWAY JOURNAL.

COSTS OF ANTI-FRICTION BEARINGS

R. H. Carhart, Railway Roller Bearing Company, Syracuse, N. Y., also read a paper, abstracted this week, describing the application of roller bearings to electric railway cars and the success which has attended the installations now in service. At the close of these papers President Blackhall asked about the comparative cost of anti-friction bearings and ordinary babbitted bearings and the approximate service life of anti-friction bearings. Mr. Bruenauer responded that

at the present market prices a 10-ton car could be fitted with eight ball-bearing journal boxes at \$55 per bearing. Under normal market conditions this cost would approximate \$50. As regards the life of ball bearings in service, he said that at the present time he did not have any definite information, but knew of instances where they had been in service for two years without showing any evidence of wear. He estimated, however, that ball-bearing equipment correctly selected for the service and loads it was to carry would last from four to five years. He said that both the manufacturers and the railway engineers had, in the beginning, made the mistake of selecting ball bearings of too small sizes for the service they were to perform. Experience has corrected this error and at the same time the bearings have been perfected. He said that their safety and economy had been demonstrated, but that tests, which were now under way, would have to be concluded before he would be able to give definite information concerning these claims.

Mr. Carhart, in response to an inquiry concerning the roller bearings used on the Philadelphia Rapid Transit Company's lines, said that the severe end thrust had made changes necessary in the design of these bearings. He said that roller bearings on cars in New York City had been in service five years without showing appreciable wear on the rollers or in the raceways. Improper adjustment of these bearings, perhaps, more than any other one factor was responsible for the difficulties experienced in initial installations.

Mr. Carhart also mentioned an instance which occurred in Rochester, N. Y., where the current was off the line for a short time. In this case the men were able to push an 80,000-lb. locomotive into the carhouse by hand, whereas a freight car weighing about half of this amount could not be moved except with pinch bars. He also mentioned the installation of roller bearings which had been in service on the Seattle, Renton & Southern Railway, Seattle, Wash., for about four years. These bearings were placed under 30-ton to 35-ton cars and have given excellent service. The exact condition of the bearings, however, was unknown, because it has never been necessary to open the boxes to inspect them. Mr. Carhart said the price for roller bearings for an eight-wheel, 10-ton car was approximately \$46 per bearing, and for a 40-ton car, approximately \$62. He also said that the Westinghouse Type-56 motor could be fitted with roller bearings for about \$75, an amount which included the cost of the bearings and the labor of installation. During the discussion it was also brought out that the cost of maintaining and lubricating ball bearings in so far as present experience went, amounted to practically nothing. The original difficulty was to keep out foreign matter, and this has been accomplished by the dirt seal. Although the cost of the bearing was increased, the increase was more than offset by the longer life which resulted.

F. W. Gurney, chief engineer Gurney Ball Bearing Company, Jamestown, N. Y., closed the discussion of

anti-friction bearings with the statement that the increased friction with roller bearings at high speeds did not hold with ball bearings. He said that roller bearings and ball bearings could not be compared in this respect. The friction in any bearing resulted from sliding surfaces, and perfect alignment was inherently difficult and practically impossible with roller bearings. With ball bearings, however, there was no question about alignment, because the balls cannot assume a position in the raceway which is out of alignment. In tests made in New York City it was also found that the friction with roller bearings increased with excessive loads and was even greater than plain bearings, a fact which was not true of ball bearings. He mentioned a recent installation of ball bearings in connection with a grinding machine operating at 4000 r.p.m. The ball bearings, at this speed and under the varying loads applied by the grinding machine, so adjusted themselves that friction was practically negligible.

Mr. Gurney said that the life of ball bearings, if dirt is kept out of the boxes and loads not in excess of the capacity of the balls are applied, would be indefinite and that wear would be negligible. In a test made on ball bearings applied to an automobile where the entire load of the machine was put on two wheels instead of on four, the car ran 108,000 miles. During this test the bearings were kept free from dirt and at the end of the test they were found tight and in perfect condition. The entrance of dirt or grit would have caused wear in this case, but the load would not have worn the bearings appreciably. Mr. Gurney said that the dirt seal which had been applied to ball bearings was of the grist-mill type, which made it practically impossible for dirt to enter the ball raceways. He closed his remarks with the statement that it was too soon to say how long ball bearings would last, because none had been worn out in electric-railway service.

DISCUSSION ON FIELD CONTROL

H. A. Johnson then read another paper, which will be abstracted later, entitled "The Results Obtained with Field Control Motors on the Chicago Elevated Railroads." At the close of his paper he said that the tests from which these results were taken were made in exactly the same service and with the same trainmen. The data shown are the averages of a large number of runs and, therefore, are quite typical of the results to be expected in a service such as that operated by the elevated railroads.

D. C. Hershberger, Westinghouse Electric & Manufacturing Company, read a paper outlining the "History and Performance of Railway Motor Field Control." W. A. Clough, engineer General Electric Company, followed with a paper entitled "Comparative Economies of Old and New Motors." Both of these papers will be abstracted in a later issue. At the close of this paper, H. A. Johnson called attention to the fact that his comparative results had shown a saving of 8½ per cent for field-control motors over non-field control, whereas Mr. Clough's paper had shown savings up to 17½ per cent. He said this was probably due to the fact that his results were obtained under specific conditions, whereas Mr. Clough's paper, perhaps, dealt with conditions other than these. Mr. Clough in continuing the discussion said that he knew of a certain railway that had its cars equipped with GE-1000 motors. These had given considerable trouble and replacement had been considered for about eight or nine years. Modern motors had not been purchased, however, because this railway kept the cars equipped with the old motors in rush-hour service where the mileage was

small. If it had been necessary to use these motors in regular service they would have been replaced a number of years ago.

President Blackhall then said that a little more than three years ago his cars were equipped with a number of different types of motors, but these were all replaced by modern motors. At that time he had fifteen cross-seat, open, summer cars and the demands of the service required all of the equipment available. These cars were scrapped and ten new cars with modern motors were substituted, but notwithstanding this reduction in equipment and in the face of an increase in traffic, it was possible to give better service with fewer cars. This also reduced the primary charge for energy 15 per cent, and at the same time heavier cars were put into the interurban service without affecting the amount of energy saved. He closed with a statement that from his experience the savings made possible by modern motors over the older types would pay for the new motors in two or three years.

H. B. Adams, safety supervisor Aurora, Elgin & Chicago Railroad, concluded the regular program with a talk on safety methods. In connection with his address he had on exhibit a large amount of safety literature and a number of posters which he used in his safety work. He opened with the statement that co-operation was invaluable to the success of the safety movement. The electric railway employees as a rule are high-grade men, and he was of the opinion that more good could be accomplished by talking with them rather than to them. A personal talk with the men will go farther toward gaining their confidence and assistance than written instructions in the form of bulletins. Mr. Adams also urged the safety habit in all purchases, not only in the purchase of cars, but in equipment of all kinds. He said that it was generally accepted that 80 per cent of the accidents were due to the public. Education appeared to be the only way in which the public could be brought to understand or realize this condition, and he endeavored to reach them through the schools and through exhibits of safety literature. Mr. Adams said he had also been successful in interesting commercial clubs in the work, with the result that safety zones had been established at street intersections. He reminded the members that 282 persons were killed in Chicago during the year 1915, and of that number 156 were killed at points between the street intersections.

Mr. Adams also called attention to the great and increasing menace of automobile traffic. Automobile traffic was responsible for more injuries than the cars of street railways, because their line of travel was not fixed. He said that not long ago his company had sent out 3000 letters to automobile owners calling their attention to the hazards accompanying careless driving and the importance of more care along the streets over which the street railway company's cars operated. The company received 118 written replies and a great many verbal responses to these letters. After these letters were sent out the car crews were instructed to report all carelessness on the part of automobile drivers and wherever possible the owners were warned by letter. He concluded with a statement that every electric railway should become a member of the National Safety Council so that it could partake of the tremendous fund of information and helpful suggestions that were available to the members. He said that eighty-two electric railways were now members of the National Safety Council and that a special section had been created which devoted its entire program to the interests of electric railways.

Energy Savings with Roller Bearings

BY H. A. JOHNSON

Master Mechanic Chicago Elevated Railroads

At the last meeting of the association a paper was presented showing the distribution of the costs of electrical energy in car operation. The discussion covered possible economies which can be obtained by means of proper train operation, including efficient handling of the cars by the transportation department.* At this succeeding meeting it was thought opportune to present for discussion the economies which can be brought about by the mechanical and electrical departments, including the use of roller or ball bearings and field control motors.

TESTS OF ROLLER AND BARBITTED BEARINGS

To begin with, let us consider the part which journal friction plays in the waste of electrical energy. Journal friction and air resistance together account for 6.6 per cent to 11 per cent of the total electrical energy losses, the exact amount depending upon the class of service. If the elimination of journal friction is to effect any substantial saving it must be brought about by allowing a higher rate of acceleration and therefore increased coasting. But the rates of acceleration in common use to-day are the maximum allowable from considerations of wheel slippage and comfort of passengers. Accordingly the economy in electrical energy possible by the entire elimination of journal friction appears to be limited to a rather small percentage of the total power consumed.

Various forms of ball bearings and roller bearings have been in common use on automobiles and other vehicles for a number of years, and their more extensive application to electric railway cars and even ordinary freight cars has been advocated. A number of railways, both in this country and in Europe, have adopted these types of axle and armature bearings for storage-battery cars, but as yet they have not been applied extensively on electric cars in the average city and inter-urban service.

More or less careful comparative tests have been made by users of ball and roller bearings, but the published results in many cases do not agree. It was, therefore, deemed advisable to make a few independent tests under known conditions to determine how much economy, in energy consumption, if any, would result from the use of such bearings in service on the Chicago Elevated Railroads.

For the purposes of the tests two cars were equipped with one of the commercial forms of roller journal bearings designed by the manufacturers for the service requirements. One was a double-truck motor car, weighing about 65,000 lb., equipped with two GE-55 motors of 175-hp. capacity each and GE-Type M automatic control. The other car was a double-truck trailer, weighing 33,000 lb.

Tests were made on this typical train in both local and express services. The roller journal bearings were then replaced with the ordinary babbitted bearings on the same two cars, and the tests were repeated under otherwise identical conditions.

The motor car was equipped with a calibrated Sangamo watt-hour meter, and automatic, calibrated time recorders to obtain a complete time record of every run, including the length of the power-on, coasting and braking periods. The duration of station stops was taken with a stop watch. With these records it was possible to compare series of runs having the same braking and station-stop periods, and differing only in the

TABLE I.—AVERAGE RESULTS OF TESTS WITH ROLLER AND BARBITTED JOURNAL BEARINGS IN TYPICAL MIDDAY EXPRESS SERVICE

Journal Bearings	Running Time	Kw.-Hr., 12.73 Miles	Coasting, Per Cent	Station Stops, Seconds	Power on per Station, Seconds	Braking per Station, Seconds
Roller . . . . .	.43 min., 38 sec.	49.6	27.4	9.6	5.2	20.1
Babbitted . . . . .	.43 min., 53 sec.	49.6	27.2	9.6	5.4	21.2

TABLE II.—COMPARATIVE ENERGY CONSUMPTION OF TYPICAL TWO-CAR TRAIN

Kind of Runs	Schedule Speed, M.p.h.	Station Stops Per Mile	Kw.-Hr. per Ton-Mile		Saving by Roller Bearings, Per Cent
			Roller Bearings	Babbitted Bearings	
Local runs	12.7	3.79	0.115	0.120	4.2
Average of all runs	15.2	3.07	0.135	0.136	0.8
Express runs	17.4	1.73	0.079	0.079	0.0
High-speed portion of express run	21.9	0.61	0.060	0.067	-5.2*

*Loss.

time of "power on" and coasting required to make the same running time. Instruments and accelerating current limit switch settings were rechecked after the tests and found to be correct.

The observations were taken in three classes of service, with different schedule speeds and frequency of stops. Typical results are given in Tables I and II. Where the stops are frequent and the schedule speed is not high the roller bearings show a saving in energy. This result should be expected from the commonly observed fact, also noted in this test, that the frictional resistance of babbitted bearings is greater just at starting than that of the roller bearings. With increased schedule speed this advantage is lost, and with less frequent stops the roller bearings tested showed appreciably more frictional resistance than ordinary babbitted bearings.

It must be remembered that these tests covered a certain stated range of schedule speeds, frequency of stops, and weight of equipment such as obtain on the Chicago Elevated Railroads. They determined only the possible saving in power and did not touch upon the difference in first cost and maintenance of the various types of bearings. In low-speed street car service, especially where the cost of electrical energy is high, conditions should be more favorable to the ball or roller bearing.

Roller Bearings for Railway Use

BY RAYMOND H. CARHART

Railway Roller Bearing Company, Syracuse, N. Y.

In discussing anti-friction bearings, I shall confine myself to roller bearings suitable for heavy duty, such as journal boxes and motor bearings for railway cars and motors. The Railway Roller Bearing Company is the pioneer in the commercial manufacture of roller bearings for railway use. After considerable time had been spent by this company in development, "Rollway" bearings were installed on street cars of the Philadelphia Rapid Transit Company. These bearings were similar to our present bearings except that a single-end thrust was used instead of the double-roller end thrust, and the boxes were not as completely oil and dust-tight as at present.

These original bearings, as those of present commercial construction, embodied a double line of short rollers of large diameter, one at each side of the pedestal. Then as now no cages or separators were used, allowing a full line of rollers, increasing the carrying capacity of the bearing and decreasing the number of parts liable to cause trouble. We have found separators un-

*See issue of ELECTRIC RAILWAY JOURNAL for April 8, 1916, page 635.

necessary save in high-speed motor bearings, where we have used them to eliminate the noise produced by the rollers clicking together.

The Philadelphia Rapid Transit Company made an elaborate test of "Rollway" bearings which extended over a period of eleven months, beginning in November, 1909. The power saving thus determined was from 17 per cent to 22 per cent. Although this saving is in strict accordance with later tests, it is somewhat greater than will be obtained by the ordinary motorman, owing to the fact that these Philadelphia tests were made by skilled operators, who took advantage of all coasting possibilities of the car. The average saving of power by the ordinary motorman is from 12 per cent to 15 per cent.

After the completion of the test the car tested and twelve others equipped with the same make of bearings were used in general service by the Philadelphia Rapid Transit Company. Then for the first time it developed that the single-thrust bearing was a source of trouble, particularly in that the springing of the truck frame permitted the journal to slide lengthwise in the bearing and to carry the rollers into the end walls of the box, setting up a scouring action. This did not develop during the test as the test car contained new rigid trucks and the end thrust was properly adjusted. If the other cars had received the constant attention of a skilled mechanic so that the end thrust was kept properly adjusted they would have given satisfactory results.

However, the bearing company realized that its bearings must be foolproof, and has since made all bearings with the double-end thrust, which prevents any longitudinal movement of the journal in relation to its bearing. Most of the bearings previously installed with a single-end thrust have also been equipped with the double-end thrust.

A number of "Rollway" bearings originally having a single-end thrust when installed, and subsequently equipped with the double-end thrust, have been in use continuously since installed. Since about five years ago all "Rollway" bearings sold have been equipped with double-end thrust, but not of the latest type. The first "Rollway" double-end thrust consisted of two lines of balls, traveling on opposite sides of a grooved plate. The inner line thrusts against the end of the journal sleeve and the outer against an adjustable nut on the end of the journal. This nut required adjustment by the carhouse men when installing the bearing. In some cases these adjustments were not made so as to preclude all endwise movement of the journal, and trouble resulted. There was also some trouble from broken balls. Hence the double-end thrust was redesigned to eliminate all adjustable members. The parts of the double-end thrust are now completely assembled at the factory, and do not require or permit adjustment by the carhouse men. This non-adjustable, cone-disc-roller double-end thrust is now standard. We have had no trouble from endwise movement of the journals in the bearings, and none of the cone-disc rollers have ever given out.

In the "Rollway" bearing approximately one-third of the rollers are under load at one time, and the others of the line have a chance while free to square or align themselves between the flat end walls of their raceways. The rollers are made of chrome tool steel, and are accurately machined and ground to size. The outer and inner raceways are made of high-grade steel alloy, tempered and accurately ground. They are so constructed that they can be renewed, although they are practically indestructible and renewals are exceptional.

The last test, demonstrating the saving of power due to the use of these bearings, was made by the Empire

United Railways, Inc. The results are shown in a recently-published article by Messrs. Voth and Metcalfe, respectively chief engineer and master mechanic of this company.* These tests showed a net annual saving of \$481.45 per car, or 12.8 per cent saving of the total cost of power, lubrication and maintenance of bearings. The car tested weighed 70,000 lb. It ran between Syracuse and Rochester, and made more than 100,000 miles per year, at a running speed between stations of between 62 and 65 m.p.h. If this car had been running at a lower speed, or had made more frequent stops, the saving would have been greater. There was practically no wear between the rollers and their raceways. After making a mileage of over 100,000, the rollers had worn in diameter but 0.001 in. and the raceways of but three-fourths of this amount. A wear of 1/64 in. would not materially reduce the efficiency of the bearing.

A later type of cone-disc roller was used on this car. The bearing consists of two lines of rollers traveling on opposite sides of a flat steel ring. The inner thrust rollers bear against a flat steel plate forming the end guide for the outer line of journal rollers, and the outer thrust rollers bear against a flat steel plate carried by the end cover of the box. The end-thrust bearing is completely assembled on the nut and is screwed onto the end of the journal.

As the end thrust prevents movement of the journal in either direction, the bearings when installed tend to stiffen the truck frame and positively prevent either pedestal from springing relatively to the other. The bearing is assembled in the standard pedestal and does not require a skilled mechanic to install it.

Perjury Confessed in Portland Cases

Three persons appeared before District Attorney Evans of Portland, Ore., in the course of a month and confessed to lying testimony that won damage verdicts against the Portland Railway, Light & Power Company. As a result of volunteer confessions, Edson K. Carr was indicted by the Multnomah County Grand Jury for perjury on June 3 and Thomas S. Molesworth, Mrs. Selma L. Wallace and Clyde E. Wallace were indicted for subornation of perjury in connection with the suit of Mrs. Wallace against the Portland Railway, Light & Power Company, in which a \$5,000 verdict was won. The indictment of several persons connected with a similar damage suit against the railway will be considered by the Grand Jury. Edson Carr, who swore on the witness stand to a set of incidents which he said came under his observation, in connection with injuries to Mrs. Selma L. Wallace on May 8, 1915, in a fall from a street car on Eleventh Street between Hall and Montgomery Streets, has confessed, it is said by the District Attorney's office, he was not near the scene at the time of the accident he described as an eye-witness. Mrs. Wallace sued the Portland Railway, Light & Power for \$25,600. She said a car from which she was alighting had started before she had stepped to the ground, throwing her and inflicting severe injuries. The case went to trial before Circuit Judge Kavanaugh on Sept. 15, 1915, and two days later a verdict of \$5,000 for the plaintiff was returned. Carr testified, it is reported, that he saw a Chinaman leave the car, and then the car started just as Mrs. Wallace was going down the steps. He told of picking her up and helping her to the sidewalk. Molesworth is another man who is said to have told the Grand Jury all he knew about this affair, and to have admitted an agreement by which he was to secure perjured testimony from Carr with the promise that they would receive a share of the judgment money in the case.

*See issue of the ELECTRIC RAILWAY JOURNAL for May 6, 1916., page 865.

Water Works Association Considers Electrolysis

Report of A. W. W. A. Committee on Electrolysis Presented at Annual Meeting Is Received but Not Approved

AT the convention of the American Water Works Association held in New York last week the report of the committee on electrolysis was presented by Prof. A. F. Ganz, Stevens Institute of Technology, Hoboken, N. J., chairman. The report caused a lively debate which occupied the greater part of two sessions. The report and the association's action are of interest to electric railways as showing the attitude of this utility to the subject. It must be remembered, however, that the report as received aroused considerable opposition and does not represent the official sentiment of the association. The report as presented by Professor Ganz is as follows:

"Your committee on electrolysis begs leave to submit the following report:

"Your association has affiliated itself during the past year with the joint national committee on electrolysis and appointed three members on this joint committee. In view of the fact that the joint national committee has in preparation a preliminary report reviewing the status of the electrolysis situation, your committee will confine its report to the following brief statements of fact and of the stand which it believes this association may properly take:

"1. An increasing amount of damage from stray electric currents is occurring on the underground water-piping systems in many localities throughout the country where adequate measures have not been taken to reduce this damage.

"2. The principal and generally the sole sources of stray electric currents causing this damage are single-trolley direct-current electric railways employing the running tracks in contact with earth as part of the return circuit.

"3. Inasmuch as such electric railways are the chief and generally the sole sources of stray currents causing the damage, and as the owners of such railways have no right to so operate their railway systems as to cause serious damage to the property of others, it is the duty of the owners of these railways to provide measures for reducing this trouble by removing its cause as far as this is practicable.

"4. Experience extending over many years in foreign countries and over ten years in this country has shown that methods which are practicable and economical can be applied to electric railway systems which will remove acute dangers from stray currents and which will very greatly reduce the danger in all cases where bad electrolysis conditions exist, and in most cases will reduce this danger to negligible amounts.

"5. Your committee finds that mitigating methods applied to underground water pipes fail to attack the real cause of the trouble, and when used as the sole mitigating means fail to give adequate and permanent relief. Your committee further believes that mitigating methods should be applied to underground pipes, if at all, only in special cases and only after adequate methods of minimizing the production of stray currents have been applied to the railway system.

"6. Your committee disapproves as not only inadequate but frequently, also, as dangerous, such metallic connections from underground water pipes to the railway return circuit as cause these pipes to become a substantial part of the railway return circuit. Such connections greatly increase current flow on pipes; and, while they may afford local protection, they generally distribute electrolysis troubles to other localities where these are more difficult to find, and thus frequently give a false impression of immunity. Your committee therefore believes that metallic connections from water pipes to the railway return circuit should never be applied as the principal means for electrolysis mitigation.

"7. Your committee believes, in view of the fact that the railway companies in common with the pipe-owning companies are public utilities operating under public franchises and utilizing city streets, that it is the duty of both of these utilities to co-operate in order that the causes and extent of any danger from stray current can be more readily ascertained and the problem can be attacked along broad engineering lines."

Chicago Electric Roads Use Outdoor Advertising

THE Chicago Surface Lines and the Chicago Elevated System have had prepared some very attractive traffic posters and will engage this summer in an outdoor publicity campaign for more passenger business. The posters of the Surface Lines are being furnished by the Thomas Cusack Company and a series of twenty-one will be supplied during the year. Most of the displays are already in place and are showing a series of seven advertisements announcing the "Seven Wonders of Chicago." The seven subjects are the Chicago Stockyards, the Art Institute, the Lincoln Park Zoo, the Field Museum, the Garfield Park Conservatory, the Municipal Pier, and Clarendon Beach. Each is being advertised away from its own neighborhood. The bulletins are samples of the very best in outdoor advertising art, and make the trips suggested appear very attractive.

The Elevated System has purchased five display locations outright for its permanent use and will use the space to advertise that travel on the elevated is safe and speedy and that employees are courteous and to call attention to the golf courses, amusement places and bathing beaches that can be reached by the elevated.



CHICAGO POSTER ADVERTISING ART INSTITUTE



CHICAGO POSTER ADVERTISING CLARENDON BEACH

Electric Operation on the St. Paul

In a Collection of Notes on This Electrification the Author Points Out the Simplicity of Construction of the Locomotives, the High Current Collecting Capacity of the Twin Trolley Wires and the Economy of Having Engine Divisions 220 Miles Long

By A. H. ARMSTRONG

Chairman Electrification Committee, General Electric Company

DURING the past six months electricity has replaced steam on 220 miles of track on the Chicago, Milwaukee & St. Paul Railway. This mileage comprises two steam-engine divisions, and, in war terms, the new facilities thus introduced have been "consolidated" since the territory was occupied.

Naturally, any such radical change as the substitution of electricity for steam gives rise to equally great operating changes just as soon as the capabilities of the new type of motive power become understood and fully appreciated. Not until a complete change in motive power is made can it be realized how many of the previous rules and regulations are, in effect, only the traditions handed down from generations of steam-engine practice. Very many such rules reflect dearly-bought operating experience and apply equally to the operation of any type of motive power, but with the electric locomotive, the greater tractive power at higher speeds, the independence from the individual efficiency of the operating crew, the freedom from any restrictions of coal and water supply, the higher speeds on down grades made possible by the use of electric brakes, and the many other operating advantages must result in radical changes from previous steam operating methods. An often-used phrase best describes the original method of operation as "steam railroading subject to all the limitations of the steam engine," and in the future, railroad transportation will undoubtedly be

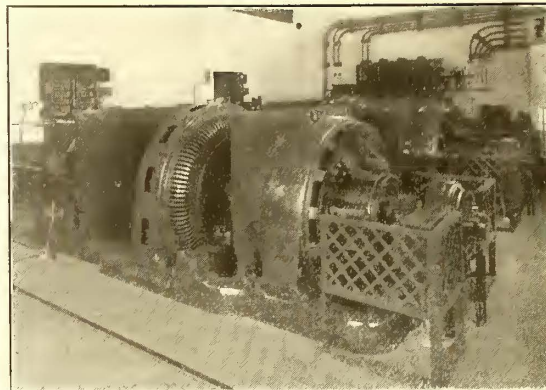
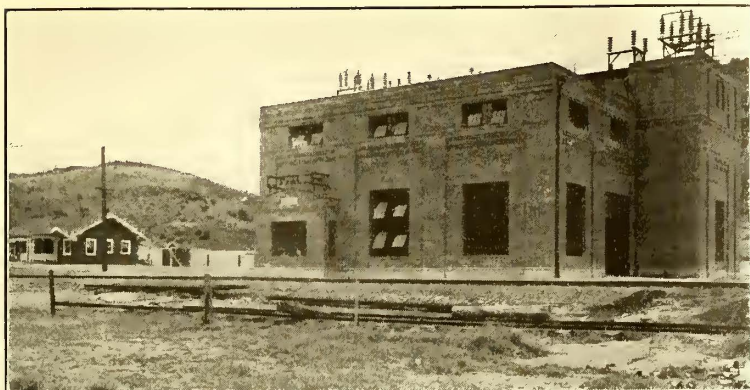
conducted on a broader basis with the greater facilities and flexibility provided by electric locomotives.

A story is told of an engineer making his first trip on a St. Paul electric locomotive run between Deer Lodge and Three Forks. He had full charge of the running of the locomotive, under the direction of an instructor, and he handled his train over the Rocky Mountain Divide without giving any outward expression to his thoughts until reaching the tunnel at the summit, when he exclaimed: "This is the first time I ever saw the inside of this tunnel." Having ridden through tunnels in the cab of a steam engine, the writer can fully appreciate how it affected an old steam engineer to ride on an electric locomotive for the first time and to be free from the gases, steam and smoke that make tunnel operation with the steam engine hazardous, as well as most uncomfortable for the crew.

On the Chicago, Milwaukee & St. Paul the operation of the electric locomotives has been taken over by the regular steam engine crews after proper instructions, and it is interesting to note how smoothly the change from steam to electricity has been accomplished. Of course, the handling of the air brakes is identical with steam-engine practice, although in this matter of braking the use of the air brakes is restricted to the stopping of trains, as the electric brakes are used exclusively to hold the trains at constant speed on the down grades.



ST. PAUL ELECTRIFICATION—EIGHTY-TWO-CAR FREIGHT TRAIN HAULED BY SINGLE ELECTRIC LOCOMOTIVE

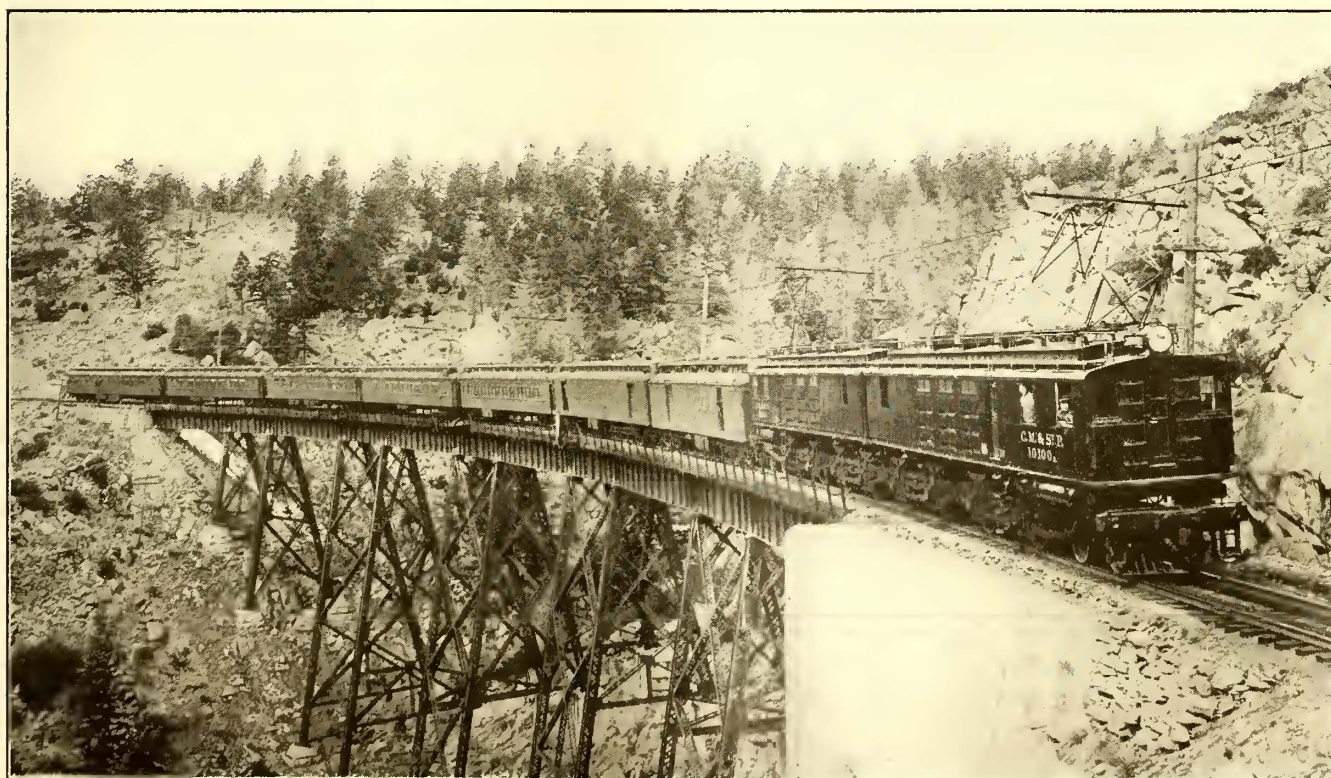


ST. PAUL ELECTRIFICATION—EXTERIOR AND INTERIOR OF EUSTIS SUBSTATION ON EASTERN ENGINE DIVISION

Perhaps there is no feature of the St. Paul electrification that is more impressive than the operation of this regenerative electric braking. In the early consideration of plans for the electrification, electric brakes were considered, and they were finally insisted upon by the railway officials when their full advantages became apparent. The perfection of regenerative electric braking with series direct-current motors called for considerable development work, as nothing of the kind had ever been done on a scale approaching the magnitude of 282-ton locomotives equipped with motors aggregating 3400 hp. The direct-current locomotive, however, offered so many advantages for main line service in this instance that it was considered of the greatest importance to adhere to this type, especially if electric braking could be made operative with the series-wound direct-current motors operating from a fluctuating trolley voltage. Fulfilling the promise of early experiments made at Schenectady, direct-current motor regenerative braking was successfully developed and put into service without losing the ruggedness in operation of the series-motor characteristics. The result has been a locomotive of remarkable flexibility, with speed and trac-

tive power admirably suited to train haulage over a broken profile and, withal, of an extremely simple mechanical and electrical construction that has been patterned closely after well-known designs of proven superiority and reliability.

On these locomotives, the motors are of practically standard design and they present no features of special interest except the large continuous capacity of 375 hp. and the fact that each has a potential of 1500 volts across its brushes, operating two in series on 3000 volts. The motors are geared to the axles through twin gears, an arrangement that has proved so successful on the Butte, Anaconda & Pacific, Detroit Tunnel, Baltimore & Ohio, Cascade Tunnel, and other electrifications having operating records of several years with this method of drive. In the St. Paul locomotive construction, the motors are spring suspended on the bolster and also drive through springs in the twin gears, thus providing great flexibility, cushioning all shocks and eliminating all noise of grinding gears. The high efficiency, simple construction and low cost of twin-gear drive were fundamental facts of importance influencing its adoption on the St. Paul locomotive, and the results of six



ST. PAUL ELECTRIFICATION—PASSENGER TRAIN DESCENDING A 2 PER CENT GRADE

months' operation fully justify the preference for this design.

The efficiency from trolley to the rim of driving wheels approximates 89 per cent, including all motor and gear losses when delivering full rated tractive effort. The construction is simple, rugged and well able to withstand the strains incident to heavy train haulage over mountain grades of 2 per cent, one such grade on the St. Paul extending unbroken for 21 miles over the main divide of the Rocky Mountains. During six months of operation no failure or delay of any kind has been due to the twin gear drive, and all indications are that in this item cost of upkeep will be small.

The St. Paul freight locomotives are rated at 2500 tons trailing load on a 1 per cent grade, and this calls for a tractive effort of 72,500 lb. and a current input to the motors of 860 amp. at 3000 volts, the speed being 15.75 m.p.h. Such a large current could readily be collected from a third-rail, but the problem of current collection presented some difficulties with existing forms of overhead construction and pantograph collector. Elaborate experiments were made at Schenectady with different methods of trolley suspension and roller and pan collectors and these formed the basis for the adoption of the current-collecting facilities on the St. Paul. In this case the trolley consists of two No. 0000 wires side by side and alternately suspended from the same catenary by the usual loop hangers. The construction offers great flexibility in the overhead conductor, provides for contact with at least one wire at all times with consequent elimination of flashing, and permits the collection of heavy currents at high speeds. Pan collectors with copper contact surfaces are used and lubrication is successfully depended upon to reduce wear. This construction has already been described in previous publications, but it is worthy of additional comment as it has solved the question of collection of large currents at high speed. Tests made at Schenectady and Erie have demonstrated that it is perfectly feasible to collect 2000 amp. at speeds as high as 60 m.p.h. with this construction, and subsequent operation on the St. Paul has resulted in no flashing or even sparking under the conditions of daily service.

The electrification of the Butte, Anaconda & Pacific Railway provided valuable experience upon which to base plans for the larger work on the St. Paul. The increase from 2400-volt to 3000-volt direct current was found to be possible without sacrificing anything in the simplicity and ruggedness of the twin-gear drive on the locomotive and it offered certain advantages in reducing feeder copper and providing for greater substation spacing. Taken in connection with the improvements in overhead construction and pan collection, 3000 volts was sufficiently high to insure the satisfactory collection of current under all possible conditions of service operation. At the same time this voltage did not involve anything beyond conservative design in the case of single-conductor, 1500-volt motors operating two in series on 3000-volt supply, thus permitting the use of the simple twin-gear drive. Experiments with direct-current apparatus with potentials as high as 6000 volts demonstrated the possibility of higher voltages, but also indicated the necessity of adopting some form of freak mechanical drive of doubtful reliability and poorer efficiency. Hence the adoption of 3000-volt direct current for the St. Paul electrification offered reasonable advantages in the distribution and conversion system, and yet the voltage was not so high as to demand any departure from the understood principles of sound and conservative engineering which should govern in such a huge undertaking as the immediate electrification of 440 miles of trunk line railway.

The electrified divisions of the St. Paul are all single track, but nevertheless the 3000-volt direct-current supply is obtained from only fourteen substations feeding 440 miles of route, making an average substation spacing of 31 miles. Maximum trolley drops of 20 per cent are obtained with 2500-ton trains midway between substations, but the average voltage drop with the variable tonnage of passenger and freight trains of all classes will be less than 10 per cent. This reasonable distribution loss is obtained with trolley feeders of 500,000 circ. mil. cross-section extending over 85 per cent of the entire route mileage, or where the ruling grade is 1 per cent or less. Heavier feeders up to 1,400,000 circ. mil. section are used on higher gradients up to the 2 per cent ruling grade. The entire cost of this feeder copper, figured on a 20-cent basis, amounts to less than 8 per cent of the total cost of electrification.

It is as yet too early to expect any operating figures as to economies effected by the electrification. Full electrical operation of all freight trains, and all passenger trains except one on a local run, is now in effect on two steam engine divisions totaling 220 miles of track. These two steam engine divisions have been consolidated into one electric locomotive run, crews being changed midway at the old division point. An additional 220 miles of track will be in operation by the end of this year, and here also two steam engine runs will be combined into one electric division.

Partial operation for six months has proved the physical success of the undertaking and the general fitness of the locomotives and distribution system for this very severe mountain service. The high-voltage direct-current system offers special advantages for the conditions obtaining in the Northwest with its abundant supply of 60-cycle power and the broken profiles of the railroads. In the substations, synchronous motor generator sets, which have a combined efficiency at full load of approximately 92 per cent, and automatically providing a power factor of 100 per cent or a slightly leading current at practically all loads, permits feeding the St. Paul substations from the general transmission networks of the Montana Power Company without causing interference with the industrial and lighting loads supplied from the same lines. In fact, this ability of utilizing any frequency of power supply without interfering with the commercial load connected to the same transmission circuit, constitutes one of the chief advantages of the high-voltage direct-current system. In other respects, also, direct-current construction is well adapted to the work in view. The profile calls for crossing three mountain ranges with long stretches of level and low-grade track intervening. Freight trains mount the ruling grades at approximately 15 m.p.h. with two locomotives, and run on level track at double this speed with one locomotive, an accomplishment readily achieved with the flexible characteristics of the direct-current motor. Moreover, the locomotive speed is automatically proportioned to all intermediate gradients, thus resulting as nearly as possible in a constant-output locomotive and minimizing the load fluctuations due to the very broken profile. As a matter of fact, a variable speed characteristic for the locomotive is pre-eminently adapted to general railroad operating conditions, as questions of alignment of tracks and peak-load power supply place limits on the speeds up grades while it is desirable to operate on level track and on the lesser grades at as high a speed as the track alignment and condition of rolling stock will permit.

Much of the engineering success of the St. Paul installation is the result of the gradual development of a direct-current motor for locomotive construction and the advance in the art of generation, transmission and

conversion of alternating-current power. Two novel features, however, stand out conspicuously as being introduced for the first time and completing the development of the 3000-volt direct-current system. These are, first, the twin conductor flexible overhead construction with lubricated, copper-pan collectors, and, second, the regenerative braking control of the series-wound, direct-current locomotive motors. The first has made possible the collection of current far in excess of operating requirements and has settled for all time any claims for higher trolley voltage based upon the question of current collection. Thus, it is perfectly feasible with the St. Paul construction to collect 2000 amp. at practically any speed and this makes it possible to receive 6000 kw. at 3000 volts through one pan collector, more than enough to slip the wheels of the 282-ton locomotive at 30 per cent coefficient of adhesion. Then, too, the introduction of regenerative braking control with direct-current, series motors greatly broadens the field of the locomotive and permits placing a proper value upon this one feature of electric operation, because it is not secured at the expense of sound and conservative engineering in other respects. Regenerative electric braking undoubtedly has an important value in electric railroading by adding to the safety and economy of operation, and it is a welcome addition to the other advantages of the direct-current-motor locomotive.

In general, the St. Paul electrification extends over such a length of track, 440 miles, that no restrictions need be placed upon the free operation of the electric locomotives. The Mallet locomotives previously used over the mountains are being transferred to the adjoining non-electrified division as fast as they are released, with a view to handling the heavier tonnage trains delivered to that division by the electric locomotives, thus resulting in raising the weight of trains moved over the road and effecting material economies.

Progress of Car Building Industry

A PRELIMINARY summary of the general results of the 1914 census of manufactures with reference to the construction of steam and electric railway cars was issued this week by Director S. L. Rogers, of the Bureau of the Census, Department of Commerce. It consists of a detailed statement of the quantities and values of the various products manufactured, prepared under the direction of William M. Steuart, chief statistician for manufactures.

Returns for 1914 were received from 242 establishments which manufactured 138,178 steam and electric cars, valued at \$165,071,427. These totals include figures for 118 railroad repair shops which reported the construction of 11,049 new cars, valued at \$12,811,087, and seven establishments engaged primarily in other lines of manufacture but which produced 4481 railway cars, valued at \$3,178,677, as subsidiary products. For 1909 there were reported 280 establishments which manufactured 101,243 cars, valued at \$102,147,396. Of these 280 establishments, 140 were railroad repair shops which constructed 14,792 cars, valued at \$13,952,923, and sixteen were establishments engaged primarily in other industries but which built 8981 cars, valued at \$5,934,871, as subsidiary products. The number of establishments engaged in this industry thus decreased by thirty-eight, or 13.6 per cent, during the five-year period, but the number of cars built increased by 36.5 per cent, while their value increased by 61.6 per cent.

The number of electric cars manufactured in 1914 was 2821, and their value was \$10,041,888. In 1909 there were built 2772 electric cars, valued at \$7,263,109. The number of cars constructed was thus only 1.8 per

cent greater in the later year than in the earlier, but during the five-year period their value increased by 38.3 per cent. The output of electric cars in 1914 comprised 2583 passenger cars, 110 freight cars and 128 other cars. The statistics for 1914 and 1909 are summarized in the following table:

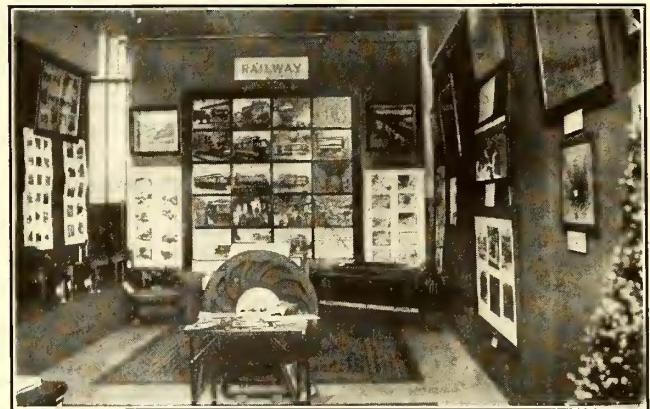
CONSTRUCTION OF CARS FOR USE ON STEAM AND ELECTRIC RAILROADS—COMPARATIVE SUMMARY: 1914 AND 1909

	1914	1909	Per Cent of Increase, 1909-1914
Number of establishments..	242	280	13.6*
Total cars built:			
Number	138,178	101,243	36.5
Value	\$165,071,427	\$102,147,396	61.6
Steam:			
Number	135,357	98,471	37.5
Value	\$155,029,539	\$94,884,287	63.4
Passenger:			
Number	3,558	1,819	95.6
Value	\$45,027,083	\$15,120,961	197.8
Freight and others:			
Number	131,799	96,652	36.4
Value	\$110,002,456	\$79,763,326	37.9
Electric:			
Number	2,821	2,772	1.8
Value	\$10,041,888	\$7,263,109	38.3

*Decrease.

Boston Elevated Exhibit at Technology Dedication

IN connection with the dedication of the new \$7,000,000 plant of the Massachusetts Institute of Technology at Cambridge on June 14, the Boston Elevated Railway had an interesting exhibit of transportation progress in the past half century. With electrical and water-power displays, the exhibit was housed in one of the wings of the immense new establishment on the border of the Charles River Basin, and was visited by a vast crowd of appreciative guests. A working model of a rapid transit car was shown, equipped with third-rail



BOSTON ELEVATED RAILWAY EXHIBIT

shoes and operating automatically on a track provided with complete miniature signals of the automatic illuminated type, governed by a standard installation of track relays. Colored photographs illustrated the evolution of street conveyances from the omnibus of 1856 to the latest type of semi-convertible, prepayment car in use on the system to-day, and other views illustrated the company's methods of track maintenance, subway shelter designs in America and Europe, cross-sections of rapid transit subways, the South Boston generating station of 125,000-kw. ultimate capacity, and the high-tension distribution system of the road. Elevation drawings of the latest subway rolling stock were shown for Boston and other cities, and graphic charts of the company's financial development and of its traffic and transfer growth were exhibited.

C. E. R. A. A. Holds Mid-Year Meeting

Delegates Consider Subjects of Departmental Expense, Statements, Storeroom Systems and Relation of Accounting Officer to Other Members of Official Family

THE twenty-ninth meeting of the Central Electric Railway Accountants' Association was held in Toledo, Ohio, on June 13 and 14, at the Hotel Secor. The morning session on June 13 was devoted mostly to business and committee reports, while in the afternoon the committee reports were concluded and papers were presented on the relation of the accounting officer to other members of the official family, and also on departmental expense statements. The concluding session was given over to a paper on storeroom systems and to a discussion thereon.

OPENING SESSION

The opening session was called to order at 10 a. m. with President F. T. Loftus, auditor Indianapolis & Cincinnati Traction Company, Rushville, Ind., in the chair. F. R. Coates, president Toledo Railways & Light Company, welcomed the delegates in a few well-chosen words, after which A. L. Neereamer, secretary of the association, read the minutes of the last meeting and also the report of the executive committee. According to the latter three new members had been elected, and a request had been authorized to the Central Electric Railway Association for an additional annual appropriation of \$100 (making the annual amount \$250) to cover the increased expenses due to the joint secretaryship with the central association instead of a member secretaryship. Moreover, the executive committee announced that the next meeting would be held in Cincinnati on Dec. 8 and 9.

President Loftus presented a set of memorial resolutions drawn up by a special committee for E. J. Davis, formerly auditor Terre Haute division of the Terre Haute, Indianapolis & Eastern Traction Company. The report of the standing committee on passenger and freight accounting was then read by the chairman, Walter Shroyer, auditor Union Traction Company of Indiana, Anderson, Ind.

The report recommended that the "Decisions and Recommendations" of the association in regard to handling interline accounts be changed so as to provide for the printing of a unit waybill, the sending of waybill corrections direct to the agents interested, and the adoption of junction interchange reports substantially like those used by steam lines. The committee also suggested that as a general proposition a time limit of six months be fixed for the issuing of corrections, except that in isolated cases where the reasonableness of the delay could be established, this rule would not apply. Furthermore, it was recommended that the association adopt the draft plan of settlement of interline balances as the only recognized method on and after Sept. 1, 1916, special attention to be called to this change. Lastly, as a result of the recent elimination of voucher minimums for the settlement of interline freight claims, the committee proposed that settlement be made along the lines of established steam railroad practice, through the use of a standard form of authorization and a standard form of monthly summary of such authorizations, the latter to be the basis of monthly settlement by voucher or preferably by draft. After a discussion of various details the report was accepted as submitted.

In connection with the section of the report dealing with the settlement of interline balances by draft, E. L.

Kasemeier, auditor Ohio Electric Railway, Springfield, Ohio, suggested that a clearing house be established for offsetting company balances and reducing the number of drafts needed. B. H. Jacobs, assistant auditor Cleveland (Ohio) Railway, mentioned the fact that one bank in his city had taken up the clearing house method for settling personal accounts, and it was quite likely that some banks might desire to aid the railways along the same line. A. E. Dedrick, auditor Mahoning Valley Railway, Youngstown, Ohio, advanced the idea that each member in a clearing house plan should make a deposit with the bank in order to establish a fund, the interest on which would go to the bank in return for its clerical work, collections and payments. He thought that on this basis some small progressive banks would be glad to get the business. Mr. Kasemeier thought that it would be advisable for the association to do the work and secure the interest instead of a bank, but Mr. Neereamer thought a bank could handle collections more quickly and effectively. At the end of the discussion, however, it was decided that for the present it would be better to adopt only the general draft settlement plan outlined in the committee report, and that the question of establishing a clearing house for drafts could be taken up at the next meeting. It was observed that some people still disfavor drafts, and a campaign of education for some companies along even this line may be necessary.

AFTERNOON SESSION

The first business at the afternoon session on June 13 was the report of the committee on electric light and power accounts. Mr. Dedrick, chairman of the committee, stated that it had no written report to make, but that in its opinion it could not well devise methods of accounting on account of official commission classifications, and its work properly was that of answering questions regarding the apportionment of items, etc., and detailed procedure under commission rulings. President Loftus urged members to send inquiries to the Question Box to be answered by this committee. Mr. Dedrick said that at the recent convention of the National Electric Light Association in Chicago the accountants of eight state commissions expressed themselves as being in favor of the N. E. L. A. classification, either in total or as a standard basis. In his opinion, therefore, if the classification of the state having jurisdiction over a railway company with a lighting and power addition should not be complete, the company could very well adopt the N. E. L. A. classification and use its own account numbers without arousing any objection.

Oren A. Small, auditor Benton Harbor & St. Joseph Railway & Light Company, Benton Harbor, Mich., stated that in Michigan the companies must keep the commission classification, although the commission is lenient in regard to the adaption of the accounts to suit the needs of different properties. Mr. Shroyer observed that the use of the official classification is also mandatory in Indiana, while President Loftus explained that the rules of the Indiana commission had been somewhat vague, and he had made up a pamphlet of rules for his company's use. Mr. Dedrick remarked that a correct division of power on a combined property was a hard

problem, but that it was easily solved by the use of meters. In the case of meters for customers, 15 per cent should be added for transformer and transmission loss.

Owing to the absence of all members of the Question Box committee, and the apparent lack of questions, this item of the program was passed over and a paper on "The Relation of the Accounting Officer to Other Members of the Official Family" was then read by R. R. Bruster, associate editor *ELECTRIC RAILWAY JOURNAL*, New York. This appears elsewhere in abstract form. President Loftus reiterated Mr. Bruster's plea for a wider vision on the part of the accountant, a looking beyond the mere figures to an interpretation of their meaning, as a means of strengthening his position and prestige. According to President Loftus there is still a feeling in some companies that the accounting department is a sort of necessary evil, and it is looked upon as a "knocker" when the reports only show the true conditions in certain departments. C. E. Murray, secretary and treasurer Toledo & Western Railroad, Toledo, Ohio, said that some electric railway accountants undoubtedly do not bring out all the things that they might, for they wait for orders from the men higher up, when by taking the initiative they could better their position.

To Mr. Dedrick's mind one of the most distinguishing marks of present business organization is the increased prestige of the accounting officer. In this connection he noted a statement made before the recent N. E. L. A. convention by John R. Wildman, professor of accounting New York University School of Commerce, Accounts and Finance, to the effect that sixty-three universities and colleges now have high-class courses in accountancy. Besides the advantages that have resulted from this constantly increasing educational work, the accounting profession has received an uplift as a result of commission regulation. Under the regulatory system the operating end of the business has not been greatly changed, but the question of proper accounting has been much raised and the acts of the commissions show that they consider the advancement of utility accounting a matter of prime importance. The electric railway accountant of to-day must look into the future, and the trend of thought is decidedly toward a broader conception of his work and his views.

Mr. Bruster's paper is to be reprinted, with the compliments of the *ELECTRIC RAILWAY JOURNAL*, for distribution among member companies. Copies may be secured in a short time through Mr. Neereamer.

Owing to the absence of Robert H. Lindsey, who was scheduled to read a paper on "Office Organization," the paper by L. T. Hixson on "Departmental Expense Statements" was advanced from the next session and read by Mr. Neereamer. This will be published later in abstract. In connection with this paper F. K. Young, auditor Scioto Valley Traction Company, Columbus, Ohio, stated that he did not make any departmental charges for general expenses, he being held responsible for the showing made in this group.

In reply to a question regarding the permissible use of loose-leaf journals, it was said that the Interstate Commerce Commission and others do not specify forms or devices, and a loose-leaf journal may be used if desired. It would be advisable, however, to have it bound for permanency at the end of the year. Mention was also made of the usefulness of journal vouchers and the placing of only totals in the general ledger, as well as the advisability of preserving all working papers.

At the conclusion of this session the delegates were taken on a very enjoyable pleasure tour under the guidance of Mr. Murray; A. C. Van Driesen, chief

accountant Toledo Railways & Light Company; C. B. Kleinhans, auditor Toledo & Indiana Railway, and E. H. Rechberger, auditor Northwestern Ohio Railway & Power Company. This tour included a trip to Toledo Beach in the special car "Toledo," dinner at the Toledo Club, and a theater party thereafter.

CONCLUDING SESSION

The final session on June 14 was opened at 9.30 a. m. with a vote of thanks to the local officials for the entertainment the preceding day. Then, in the absence of A. Swartz, vice-president Toledo & Western Railroad, Toledo, Ohio, Mr. Van Driesen read the former's paper on "Storeroom Systems," which will be abstracted in a later issue. In commenting upon this paper, Mr. Dedrick said that he was a firm believer in the theory that the stores department should not report to the purchasing department but to the auditor, for the handling of stores was an accounting and not an engineering or purchasing matter. If the auditor did not have control over the stores department, it would be impossible to get good records, and it would also stir up interdepartmental differences. In Mr. Dedrick's company the purchase order and invoice are sent to the storeroom to be checked for the receipt of the goods, and are then returned to the accounting office to be vouchered and paid.

Mr. Dedrick averred that the idea of a perpetual inventory was good, but he pointed out that it was not necessary to average prices. His company charges out articles at the old prices pertaining thereto until the old quantities are exhausted. A new bin tag is used for each new shipment, the old tag being placed on the top. Thus the new prices are not visible until the old supply is used up. In Mr. Dedrick's opinion the bin-tag system is preferable to any other. The bin tag is really a ledger sheet, and the keeping of a stores ledger simply involves superfluous work. By the use of a semi-annual inventory it is possible to check the perpetual inventory and the bin tags, and in actual practice only a very few discrepancies have been found. The check is made according to number, but in the case of small articles a dozen are taken together. For 5000 different sizes and articles it is possible to get an accurate check on all but about twenty-five.

Mr. Jacobs was of the opinion that Mr. Dedrick's bin-tag plan was theoretically good, but in his company's experience the tags became dirty and almost useless. Mr. Dedrick said that he had had no trouble from such a cause. Mr. Van Driesen explained that for his companies the stores department were really under the auditor. The storekeeper makes a requisition on the purchasing agent, who places the order, making four copies. One goes to the dealer and two to the storekeeper, and one is retained by the purchasing agent. When delivery is made the storekeeper O.K.'s one of his copies to the purchasing agent, who attaches the original requisition to this receipt and forwards it to the auditor for payment.

Mr. Young believed in averaging the price of materials, for he figured that it was easier to do this than to attempt to keep the old balances as such on the tags. Moreover, difficulties might arise with requisitions at two prices and in connection with miscouunts of stock if the price were not averaged. In regard to returning material to stock, Mr. Young stated that instead of using an ordinary debit entry he makes an entry in red ink on the debit side, thus reducing the issues without increasing the receipts, and allowing the latter to be totaled directly from the black figures.

Mr. Pantel agreed that the storekeeper should be master of the situation in the storeroom, but he emphasized the fact that the \$50-a-month store clerk on a

small property cannot be made into a bookkeeper. On his property, for example, the books are kept by a clerk in the auditor's office, an annual inventory being made to check the storeroom with the ledger. With storeroom material annually amounting to \$300,000 there has not been a discrepancy of more than \$50 or \$60. Mr. Dedrick maintained, however, that it would be better to have a competent man in the storeroom than a poor one there and another clerk in the accounting office. Furthermore, through the proper establishment of maximum and minimum store limits and other things that a competent store clerk would handle, there would be considerable saving to the company that should be remembered in fixing the store clerk's salary. In general Mr. Dedrick believed that the small companies are the very ones that cannot afford not to have good men in the storerooms. Mr. Young said that he had a \$60-a-month clerk to keep the cards and make out a material-issued sheet at the storeroom outside Columbus, the remainder of the work being handled in the auditor's office.

The discussion on taxation was postponed until a later meeting, and the association thereupon adjourned until next December. After the meeting the remaining delegates were taken on an inspection trip through the plant of the Willys-Overland Company.

Relation of Accounting Officer to Other Members of Official Family

BY R. R. BRUSTER

Associate Editor ELECTRIC RAILWAY JOURNAL

The relationship of the electric railway accounting officer to other officers has, since the early days of the industry, been in a state of transition toward one of equality. As far as one can judge from the reported infantile experiences of electric railways, it is evident that the accounting department, though accepted as a necessary separate unit, was looked upon as an appendage of relatively minor importance. The function of the accounting officer, except on the larger railways, was simply that of making the necessary bookkeeping entries for receipts and disbursements and tabulating the results when required to do so by the chief operating officials. In the later years of the industry, however, the opportunities for and benefits of specialized work by the accounting department have become so great that both the actual and the relative importance of this branch of the organization has been undoubtedly increased many fold. As the matter stands now, accounting methods and mechanical aids for accounting have been so perfected that the internal organization of the accounting department has attained a high state of development, but less attention, it seems, has been paid to what might be termed the outside relations of the accounting department to the other departments.

GENERAL ORGANIZATION

For electric railways there are certain grand divisions of organization pertaining to the operation and management of the property—such as roadway and track, equipment, conducting transportation, traffic, legal, accounting, financial and purchasing. These are simply convenient groupings of individual factors that still maintain their relationship to the whole and are thus divided simply that the executive head may be enabled better to understand and more effectively to direct the work of the forces at his command. Under the purely departmental form of management, all these sections of the organization would not meet short of the executive head and the board of directors, there being

a responsible head for each section to carry on his share of the work, observing the requirements of fellow officials but not under their jurisdiction. The advisability of this procedure has, especially in the case of steam railroads, invoked extended discussion as to the relative merits of departmental organization, under which the work is divided according to functions, and divisional organization, under which for certain physical divisions of the property operating managers have control over all or most of the functions concerned.

This question of departmental versus divisional organization, however, has never been discussed in a clear-cut wholesale fashion in connection with electric railways, because by the very nature of the operation in this industry the organization in its earliest stages assumed the fundamentals of the divisional form and has tended to persist therein. With the beginning of electric transportation, the general manager as operating head was undoubtedly held responsible for the work of the office as well as the operation of the road, thus exhibiting the divisional type in its pure form for a one-division line. As the size of the company increased, it naturally followed that the manager relieved himself of some of his supervision over details, though still retaining his control over the specialized subdivisions of his former activity. Eventually, however, the divisional powers of the manager came in many cases to concern only the divisions or groups of so-called departments relating to the operation and maintenance of the property, for the accounting department gradually joined the financial or treasury department and sometimes others as a form of specialized work outside the immediate control of the general manager.

The structure of electric railway operation to-day, either for the single company or for those under holding company control, distinctly warrants divisional control over the operating side of the properties, for it is evident that every approach to a general departmental system for most electric railways would seriously weaken the general manager without strengthening the president or executive head. On the other hand, on the non-operating side, it is highly essential that there be a departmental development along functional lines so as to reap the greatest benefit from specialized skill. This particularly refers to the accounting department, and the problem to-day is how to bring the operating manager to a complete forgetfulness of a bygone almost monarchical control over the accounting department and to a full realization of the value of its functions as an independent corporate unit.

ACCOUNTING DEPARTMENT SHOULD BE INDEPENDENT

The best form of organization is that which produces the best results, and best results can be obtained from the accounting department only if it is entirely independent of other sections of the management and under the direct supervision of the president or other chief executive head of the company. That this view is fundamentally correct is shown by the fact that in some progressive companies in other fields, the accounting officer goes even further and reports directly to the chairman of the board of directors or even to the board itself. This independent position is demanded by the very nature of the accounting department, for it touches in a peculiar way the activities of all other units of organization and must act as an impartial recorder of their deeds. Both in theory and in practice, it is the supervisor of the enterprise, standing forth as a representative of the owners charged with the truthful ascertainment of results and the conservation of their interests.

The fact that the accounting officer reports directly

to the executive official accomplishes the meritorious end of placing the latter in immediate contact with the accounts and statistics of the company instead of at second hand through other officers, particularly the operating head. Years ago it was said that the first thing about which the general manager wanted to know was the loyalty of the accounting officer and his belief in the policy of operation. This statement, however, involves a big misconception of the function of the accounting officer, for while it is fortunate if the accounting officer is thoroughly in accord with the policy and the acts of the general manager, such agreement cannot justly be demanded by the general manager by virtue of his position, but should come solely as a result of the free and discriminating judgment of the accounting head. The accounting department is the safety check on the enterprise, and when the general manager presumes to attempt to control the records or the presentation of data so as to make special or record showings, a reorganization in the operating and not the accounting side of the business is needed. It should be clearly understood by all that the accounting of a corporation must constitute an impersonal and impartial transcription of results as they actually occur, and only by the separation of the accounting and operating divisions can the responsibility of the former and the faithfulness of the latter be maintained.

RANKING THE ACCOUNTING OFFICER

As a matter of fact, the advisability of relieving the accounting department from all restraint by making it report to the executive officer is quite widely recognized now in theory at least, and the accounting officer in most cases is, along with the secretary, treasurer, general manager and general counsel, under the direct control of the president. This plan is usually followed by the large companies, but in a number of small companies the method of control seems to vary and often the duties of the accounting officer are combined with those of the treasurer or secretary or perhaps both.

The difficulty that arises in this connection is that it seems almost impossible to adopt any set form of organization for all railways, particularly the small ones. With frequent changes in the control of companies and the personnel of the management, there have been numerous changes in the form of the accounting department organization to fit the views of different directors or the qualifications of different men. Too often the position of accounting officer is used simply as a stepping stone to the secretaryship or treasurer'ship, with the result that the new accounting officer may be required to report to the new secretary or treasurer. The accounting officer may even be compelled to report to several officials at once, in spite of the fact that many masters are not at all conducive of good results. The fact is that some executives are careless about their organization, or simply follow their individual tastes without a sufficiently clear conception of the organization theories involved, and of the probability of ultimate disorder unless some consistent plan is followed.

Efficient management must, of course, give careful attention to the human factor and the best utilization of its energies, but in arranging his organization the executive should be guided by the points of permanency and the importance of the functions concerned rather than merely by the present volume of work involved. In other words, the executive of the small company, for he is most concerned in this connection, should in the dividing of the organization see to it that the functions of the accounting officer are not restricted or depreciated by other work placed upon him or by an imprudent or decentralized method of control.

In regard to combining the accounting office and the treasurer'ship, as is frequently done in small companies, the old objection may be recalled that this removes the check against a dishonest treasurer. In the present state of commission regulation over accounting procedure, however, this objection has practically ceased to hold, and the union of the two offices is quite permissible if the size of the company necessitates it. Yet purely from the point of view of functional organization, if only two men are available for the three positions of accounting officer, secretary and treasurer, the best results would in most cases be secured by combining the treasurer'ship and secretaryship and leaving the accounting officer by himself.

One other point in regard to the concentration of supervision over both accounts and cash may be mentioned, *i.e.*, the not extinct belief that the joint officer receives a prestige and power not otherwise obtainable. Perhaps there is still a popular belief that the treasurer is usually a man of larger responsibilities and more power in the corporate world than the accountant. This, however, is nothing but a relic of the moth-eaten idea that the accountant is only a somewhat automatic recorder of figures, without initiative and without general training. An accounting officer of to-day, so equipped by training and experience as to overcome successfully the intricacies of modern utility accounting, is fully the peer of the man in charge of the company's finances, and if the two offices are to be combined it should be solely because of expediency in organization work and not because the position of the accounting officer needs to be strengthened. In a few cases a combination of local circumstances may make it impossible for the accounting officer to cope with the other officers, but in such an event it is very doubtful whether any permanent good will be accomplished unless the accounting officer forsakes a borrowed prestige and enforces respect through his own ability, courage and personality.

But whether the position of the accounting officer be single, double or otherwise; whether he be called vice-president, treasurer, comptroller, secretary or auditor, it is very essential for the well-being of the organization that his duties and powers be clearly defined for the benefit of all parties. The head accounting official should not only be regarded as an officer of the company but should be such by virtue of method of selection and powers. He should be elected by the board of directors, like the other officers, and not merely appointed by the president with or without the board's consent. Furthermore, his duties and powers should be carefully defined in the by-laws of the company, so as to indicate to all that his actions are circumscribed by real organization rules and not merely by the dictates of custom or by the concessions enforced from other members of the official family. Lastly, he should be made openly responsible for handling all accounts in his department and for maintaining their accuracy, and he should receive all necessary authority to meet this responsibility, whether the showing made be favorable or unfavorable to any particular interests. Naturally, the accounting officer must follow the orders of the directors on moot points like depreciation, etc., but in the daily work he should be so certain of his powers as to be able to keep a homogeneous and thoroughly truthful record of his company's activities.

WORKING WITH THE OPERATING DIVISION

While, as stated before, the accounting department should be placed in a position dependent upon only the executive head of the company, the attainment of such a position does not mean that it is severed from all

working relations with the various so-called operating departments or organization units. Indeed, even with all the accounts being kept in the accounting department, a great part of the information used in the office of the accounting officer originates in outside sources and comes from men connected with other sections over which the accounting officer has no control. In large companies the accounting officer can employ his own clerks in the operating sections, but for small railways this is probably not a practicable plan. In such a case, however, the local clerks in the operating division used by the accounting officer should be under the latter's jurisdiction in all matters relating to work for the accounting department. The necessity for this control is readily apparent, for if the accounting officer can obtain desired information only when it is convenient or pleasing to the operating men, the whole systematic procedure of the accounting department in getting out its statements and data is likely to be seriously deranged. The successful accounting officer, it has been said, desires no authority, but this does not well express the point. Such an officer is the very one who needs authority to be successful, but who through the mere known possession of authority is less likely to be called upon to use it often.

The accounting officer, therefore, should have a definite authority to reach directly the sources from which information for the accounts is obtained, and to secure it when and as asked for, but in his relations with the various operating groups there are a few points for both sides to bear in mind. In the first place, the operating men should remember that to a certain degree the accuracy and efficiency of the accounting department's records depend upon the operating reports submitted. For this reason the operating clerks, who are likely to be more familiar with attendant conditions, should exercise more than ordinary care to see that their reports are complete, uncolored by wishes. But, in the second place, the accounting officer owes it to himself and to his company to have a general knowledge concerning the physical operation of the utility's property, so that he will have all proper appreciation of the causes when insistent demands for immediate operating information are met with temporizing replies.

In general, the relationship between the accounting officer and the operating division heads should be one of mutual cordiality and sympathy. Fundamentally, the work of the accounting officer often puts the general manager and the operating heads on the defensive, and unless the matter is handled by the accounting officer with much tact and without a suspicion of superior integrity or efficiency, the operating men are likely to acquire an attitude of indifference or even opposition. The operating men know that their activities are being checked, and the accounting officer should have enough knowledge of human nature to give them the presumption of fairness and industry in their work.

The needs of the accounting officer, expressed even after a proper study of operating conditions, are sometimes disturbing to the operating officials, on account of the seeming increase in their burdens, and a clash, while to be regretted, proves unavoidable. Such instances are rendered less frequent if there are periodical conferences between the accounting officer and the operating chiefs, entered into with the right spirit of mutual helpfulness. When a real clash does occur, however, the only thing to do is to have the dispute adjusted as soon as possible by the executive head. If there is any doubt as to the authority exercised by the accounting officer, it can be removed with more har-

monious results by the executive substantiating the authority than by the accounting officer continuing to assert it himself. Inter-departmental and personal jealousies ought to be guarded against by the executive, for none should know better than he that friction prevents a successful organization and none is in a better position than he to bring about amicable settlements on disputed points. Upon him, therefore, really rests the duty of handling the whole organization so as to keep all its parts in a proper understanding of one another's functions and powers and in cordial and reciprocal co-operation.

HELPING THE EXECUTIVE

Once upon a time the accounting officer was probably looked upon as a sort of dilapidated inhuman creature who periodically retired into some hole in the wall and at the end of a certain period announced with loud cacklings the hatching of a new balance sheet. To-day, however, the accounting officer is no longer the joke of the organization, but a vital and serious part of it. To paraphrase a saying by Goethe—if the accounting officers do not rule the railways, they at least show how the railways are governed. This rise in position has been attained not merely by deducing results but by studying methods, not by being hemmed in by figures but by making fearless investigations of unusual showings, not by being bookkeeping clerks but by trying to become real students of engineering, transportation, law, finance and accounting—in other words, the only all-around men besides the executives.

If the future is to bring like improvement, however, the acquisition of a general training must be more nearly completed, and the lesson must also be more thoroughly learned that the value of accounting lies in the application of compiled data to future operation. To ferret out excesses, defects and irregularities is truly the work of the accounting officer, but this work must not be done merely to discover what might have been remedied, but rather to cause actual prevention if possible. Here the accounting officer shows up as the true right hand of the executive. Indeed, the accounting officer's reports, ordinary and otherwise, play a most important part in administrative work when they are properly compiled, compared and analyzed. The accountant and the executive, however, are inclined to look at financial and operating statistics from two widely differing points of view. The accountant, it has been said, primarily wants a bird's-eye view of the status of the corporation at a particular moment, or the general results at the end of a particular period. The mind of the executive, however, works differently, for he wants a "cross-index" of the accountant's information at all points and for all periods, so that he can study the entire or partial history of all or any portion of the corporation's activities. The difference is inclusiveness of vision, and it is only by acquiring as far as possible the executive's breadth of view and the executive's general understanding of the company's problems, that the accountant can intelligently and thoroughly furnish the executive with all of the data required and arrange the figures so that the executive can immediately grasp their significance.

In this connection, it may be said that the mass of statistical work carried on by the operating division in calculating economies would better be handled to a large extent by the accounting department. Aside from the fact that the resulting figures would probably be unbiased and more reliable by virtue of being compiled in a department having no axes to grind, this plan would by actual practice give the accounting department the

desired wider view of the executive's problems and his needed information. Similarly, the accounting department should act on its own initiative in ascertaining the data that are required for successful operation as the industry continues to develop, instead of passively awaiting executive instructions. In other words, what the A. E. R. A. committee on passenger-accounting did last year in hunting down old daily reports now valueless to the traffic and schedule offices, the ideal accountant will correspondingly do for all information, old and new, that the executive is using or can use. Instead of being simply a machine for gathering data, therefore, the live accounting officer will study the data from his intelligent knowledge of the property and call

to the attention of the executive the interesting and instructive points.

Cost accounting and general statistics are becoming more and more a guidance to those concerned in administrative work, and if the electric railway accounting officer is to be freed from all restraints on his activities and powers, the readiest way of escape is apparent. Gradually he has been drawing closer to the executive officer, until the derogatory name of mere bookkeeper is no longer applicable. If he is, however, to continue his progress, he must develop a broader vision and a greater ease in interpreting his own results, for only in this way can he acquire that unassailable prestige which his position merits.

Master Car Builders' Association

Reports on Draft Gear, Car Wheels and Welding of Cast-Steel Trucks Were Among Those Presented at the Atlantic City Convention

AT the convention of the Master Car Builders' Association, which was held in Atlantic City on June 14-16, several of the reports that were presented by the various committees were of special interest to electric railways, and these are abstracted in the following paragraphs.

The committee on draft gear submitted a preliminary report on the work that it had in hand, stating that it had arrived at a partial solution of the problem of determining the maximum end force that could be put on the underframes of freight cars without overstrain. This had been accomplished through the use of a 15,000-lb. testing hammer of the pendulum type so arranged that it could be raised to any desired height and allowed to drop against a 30,000-lb. car that rolled on a straight, level track. The method of testing was to mount some form of draft gear on the car and to record graphically the movement of the car subsequent to a blow from the hammer. Readings from a strain gage were also taken at ten points on the channels which inclosed the draft gear to determine when permanent set had taken place.

Seven sets of channels, or draft sills, were tested, all being 12 in. deep. Five had a cross-section of 7.35 sq. in. per channel, or 14.7 sq. in. for both members, while the two others had a cross-section of 11.76 sq. in. per channel, or 23.52 sq. in. for each pair. Four different draft gears were used, these being of various capacities. The procedure in testing each set of sills with the different draft gears was to strike successive blows with constantly increasing drop until the gear went solid, then striking two blows at each height until the distortion of the channels was apparent to the eye. Readings were taken only after the gears had gone solid because it was found that until such a height of drop was reached no distortion took place with any of the draft gears. The force applied to the sills was calculated from the acceleration imparted to the known weight of the car.

From the tests it was found that a force of 450,000 lb. caused the lighter channels to be overstrained, and that a force of 600,000 lb. was about the maximum that could be applied, failure taking place in all cases by the bulging of the web behind the lugs supporting the draft gear, and by the bending out of the flange at the tie plate between the two members. On the heavier channels tested, the maximum capacity was not reached, for the lugs sheared off at about 850,000 lb., and if these members had a strength proportional to the lighter ones that were tested, they would withstand

about 960,000 lb. However, the point of overstrain for the heavier channels was obtained, this being somewhat beyond 700,000 lb.

In all cases the point of overstrain for the light channels, 450,000 lb., came with a blow 2 in. or 4 in. higher than that which made the draft gear go solid. In other words, if the draft gear goes solid before all the energy is absorbed or transmitted to the next car, the pressure is going to test the strength of the underframe immediately. This is shown in the tests of the heavy channels, in which an increase in the drop of only 6 in. above that required to close the draft gear sent the force up to 700,000 lb., while the pressure before the draft gear went solid was in no case more than 200,000 lb. From this it follows that a draft gear is needed that will absorb enough of the energy to keep the pressure down below the elastic limit of the draft sills.

The report of the committee on car wheels presented results of an exhaustive investigation into the question of the desirability for thicker flanges for cast-iron car wheels, data on wheel failures from a large number of railroads being presented and analyzed. These displayed the fact that failures were by no means confined to wheels having thinner flanges, in practically all cases fractures at flanges, or at the throats of the flanges, approximated the vertical and were not in a horizontal plane. In many instances such fractures, or seams, began at a considerable distance inside of the flange or in the tread of the wheel. Special tests also were cited, the figures indicated that thicker flanges did not improve conditions but rather the reverse. Two railroads which had experimented with thicker flanges reported that in almost every case the backs of the flanges were grooved by contact with guard rails and frogs.

In general, the committee stated that failures of flanges under fair usage, other than those caused by circumferential seams, were almost unknown. The seams frequently reached a length of 24 in., before failure occurs, and the location and direction are such that the addition of metal to the back of the flange, within limits of rail clearances, gives no promise whatever of affording any relief from the so-called flange failures. The committee considered, therefore, that nothing in the way of safety or economy will be gained by adding metal to the flange. Whether the addition of metal to the back of the tread (so as to increase throat thickness) will afford relief is a question on which no opinion can be expressed at this time.

A report on welding cast-steel truck side frames and bolsters was made with a division of opinion in the committee, the majority advocating the practice for truck side frames except where cracks extend more than 1 in. from the edge of any rib or flange, and for bolsters except where cracks are more than 1½ in. deep unless the bolster is reinforced by the addition of plates either welded or riveted at the point of failure. The minority report expressed the opinion that fractures primarily indicated weakness in design, and that welding in no way strengthened the design but rather introduced another chance for failure.

In the report of the committee on couplers, which represented the final result of four consecutive years of work, a single universal standard coupler was recommended for adoption. This was one of the two types of experimental coupler which had been subjected to elaborate static and operating tests during the past year as well as to tests in actual service through orders for about 3000 of each form of coupler which had been placed during the year by various railroads. The contour, it may be said, will remain in two styles for another year pending a final decision as to the better, but this will not involve any changes in parts so that the establishment of a single standard coupler has really been at last accomplished. In brief, the new design weighs approximately 410 lb., of which the knuckle comprises 100 lb. It has a strength of 175,000 lb. within the elastic limit with an ultimate strength of the order of 500,000 lb. A large part of the experimental work, however, was devoted to the development of an operating mechanism of highest reliability, the type of coupler finally selected, for example, having thirteen samples withstand a total of 30,000 cycles in a locking and unlocking, or service test without any failures. It also had four samples that withstood successfully an elaborate lock-creeping test under which three out of four samples of another experimental type of coupler had failed.

THE EXHIBITS

In the exhibits that were made at the convention there was a very definite impression of the increasing use of cast steel for parts subject to heavy service. The cast-steel truck frames that have characterized the last few exhibits were much in evidence, as well as cast-steel draft arms, in which single castings took the place of the built-up housings normally provided for the coupler shank and draft gear. In addition, the coupler exhibits were especially elaborate, all of them tending toward emphasis upon the great increase in strength called for by the ultra-heavy rolling stock of the past year or two. In one of them were displayed knuckles and locks of so-called "Naco" steel, for which pulling tests of 150,000 lb. developed a permanent set of only 0.04 in. in the dimension measured longitudinally between the inside of the knuckle and the face of the coupler body, and a pull of 250,000 lb. increased this set only to 0.12 in., the ultimate strength being 511,000 lb. In strike tests the permanent set for the same dimension was 0.06 in. for three 5-ft. blows from a 1640-lb. tup, and 0.18 in. for three 10-ft. blows, the knuckle withstanding thirty-one blows before fracture developed.

The feature of the truck exhibit was one of the 90-ton, six-wheeled trucks used by the Norfolk & Western Railway in the tidewater coal traffic criginating in the electrified zone, as described in past issues of the *ELECTRIC RAILWAY JOURNAL*. About 900 of these cars are in service, and 1000 more are said to be on order. They are, of course, not used in interchange traffic with other roads, being kept definitely in the service between the Pocahontas coal fields and the docks at Norfolk, Va. A conception of the carloads involved may be well attained

by casting back four years when the use of cars of 40 per cent less capacity was viewed with something of amazement. Nevertheless, still another increase in coal-car size appears to be imminent because of the recent construction of several sample cars of no less than 120 tons capacity for the Virginian railway. The latter car has been made possible by the six-wheel truck developed for the Norfolk & Western through its reduction of the load per wheel. Here, in brief, the extra pair of wheels has been introduced by making, in effect, each truck side into two equalizer bars that carry the journal boxes at their ends, while a large central casting with four extended arms rests upon coil springs housed in the truck sides. Since the truck sides are hinged vertically at the middle, or over the middle pair of wheels, ample flexibility is provided in a vertical plane.

CAST-STEEL CAR WHEELS

Another feature of the steel casting exhibits, which is, perhaps, generally new only in so far as it applies to the electric railway field, consists in a cast-steel car wheel. This, undoubtedly, will go far to solve the old, and apparently unanswerable, problem of the relative desirability of the thin-flanged, one-wear, rolled-steel wheel as opposed to the design that has a thick flange so as to provide metal for two or three turnings to renew the contour before the wheel is scrapped. This apparent impossibility has been accomplished by making the wheel with an ultra-hard tread and flange, although the plate and hub are left relatively soft and ductile.

In brief, the procedure in manufacture is to cast the wheel in a rotating mold, and to squirt powdered manganese into the first metal that is poured, stopping the supply of manganese after enough metal to make the tread and flange has entered the mold. Naturally, the rotary motion of the mold sets up a strong centrifugal force, which makes the molten metal seek the extreme outside position so that the first metal to flow forms the wheel tread, and as this contains high manganese, the result is an extraordinarily tough material, which when subjected to a tempering process becomes an extremely hard wearing surface. The hardness, in fact, is said to be so great that flange wear is almost unknown, the wheels in general wearing out only because the flanges become too high to run through frogs, and thus making mileages in interurban service between 175,000 and 200,000. The cost is stated to be approximately the same as that for rolled-steel wheels, while the weight is of the order of 20 per cent less because of the thin tread as well as the thin plate and hub that are permitted by the ductility of the metal in that portion of the wheel.

NEW SLACK ADJUSTER AND OTHER FEATURES

Still another important innovation displayed among the exhibits was a new type of automatic slack adjuster which, by its simplicity and ruggedness, is especially suitable for electric railway cars. In this device the brake-lever coupling bar, or bottom truck connection, between the brake levers on each truck is constructed in two parts, one a plain rod made of knuckle-pin steel and the other a sleeve into which the former slides. The sleeve carries at the end a box, inside of which are a few "dogs," or pieces of flat, hardened steel, in each of which is bored a hole about 1/16 in. larger than the rod. When the dog sets square on the rod the latter slides easily through the hole, but if the dog is held at one side it is canted over and the edges of the hole grip the rod on two sides just as a monkey-wrench does when it is put over a bar and pulled by the handle longitudinally with the bar. In consequence, the dogs are pinned loosely at one side only of the box, and when the brakes are applied the canting of the dogs holds the

rod firmly in the box. When the brakes are released the dogs come square against the end of the box and the rod is withdrawn as far as the existing slack at the brake shoes permits, a simple friction device being inserted between the sleeve and the brake lever to which the rod is connected, and thus resisting slightly the withdrawal of the shoes from the wheel. When air is again applied the dogs grip at once in the new position and the slack is taken out. Lost motion amounting to about $\frac{1}{4}$ in. is provided in the friction device to prevent the shoes from being kept absolutely tight against the wheels when the brakes are released.

Among the other exhibits of special interest in the electric railway field was a belt-lacing machine which makes use of a series of wire hooks or clips instead of the customary rawhide belt lacing. The clips are pressed into the belt and turned over at the ends in a single operation, thus saving materially in time and providing a flush surface at the point where the belt ends are brought together. The device, in fact, makes the time of lacing such a negligible quantity that it is customary normally to introduce a short piece in every belt and to substitute shorter or longer pieces for this when it is desired to shorten or lengthen the belt. Another shop device that was exhibited was a portable electric crane with a capacity of 1000 lb. at the end of a relatively long jib. This gave a radius outboard of about 6 ft., the overhanging weight being counterbalanced by mounting the storage batteries at the opposite end of the truck.

As if opposed to the prevalence of cast-steel devices, the Southern Pine Association had an attractive exhibit consisting in the main of a full-sized half box car, that was sheathed, roofed and floored with pine, the government's statement being quoted that the supply of this wood now standing, instead of being exhausted,

amounted to 393,000,000,000 board feet. Wood sheathing, it may be said, also appeared in the case of the only complete box car that was exhibited, this having all-steel framing, including side posts and braces, but a wooden floor and sides. One complete end, however, was of corrugated steel. In a nearby booth, nevertheless, a car roof of all-agasote construction was in evidence.

Among the smaller devices was one designed to keep the brake shoe parallel to the wheel circumference at all times by extensions of the bottom brake rod and the brake-beam strut, so as to make a third point of support for the brake beam and giving it a parallel motion. There was also an automatic die-sinking machine which operated like a cotter drill with a universally-guided head. The cutting tool, in the form of a small milling cutter, is mounted in a head that makes vertical passes of any desired length with a given transverse feed. The head moves in and out from the work, thus changing the depth of cut, in accordance with the in and out movements of a round-nosed guiding tool above it, this guiding tool making vertical passes over a model die, which has been sunk in accordance with any desired mold, and duplicating the outline of the model in the cuts that are taken over the work below it. Still another exceedingly ingenious and valuable device was a new and inexpensive form of optical pyrometer for furnaces or heat treatments of any kind, in which the operation consists in passing a wedge embodying the different shades of color taken on by a heated body over a diffused light. By looking through a lens at the heated object and adjusting the color appearing in the instrument to agree with that of the heated object, the temperature may be read directly from printed figures within the line of vision, and a remarkable degree of accuracy is obtainable.

1916 CONVENTION
ATLANTIC CITY
OCTOBER 9 TO 13

ASSOCIATION NEWS

1916 CONVENTION
ATLANTIC CITY
OCTOBER 9 TO 13

Equipment Committee Devotes Two-Day Session Particularly to Wheel and Axle Design— Power Distribution Committee Discusses Concrete Poles, High-Voltage Lines, Etc.

COMMITTEE ON EQUIPMENT

This committee met in New York on June 6 with the following members in attendance: W. G. Gove, Brooklyn Rapid Transit System, chairman; W. W. Brown, Brooklyn Rapid Transit System; R. H. Dalgleish, Capitol Traction Company; E. W. Holst, Bay State Street Railway; H. A. Johnson, Chicago Elevated Railroads; W. E. Johnson, Brooklyn Rapid Transit System; J. S. McWhirter, Third Avenue Railway, New York. F. W. Sargent, American Brakeshoe & Foundry Company, was also present by invitation.

W. E. Johnson submitted drawings showing proposed designs of brakeshoes, heads and keys for $2\frac{1}{2}$ -in. tread wheels 28 in. to 37 in. diameters inclusive, 3 in. to $3\frac{1}{2}$ in. tread wheels 28 in. to 37 in. diameters inclusive, and $2\frac{1}{2}$ in. tread wheels 26 in. and under in diameter. He stated that these drawings were prepared in accordance with the recommendations approved by the committee on equipment at its meeting of Jan. 26, 1916, with minor exceptions. A letter from F. W. Sargent, chief engineer American Brake Shoe & Foundry Company, criticising the proposed changes, was read and acted upon in detail.

R. H. Dalgleish submitted drawings showing proposed

dimensions of rolled-steel wheels with $2\frac{1}{2}$ -in. tread, proposed dimensions of rolled-steel wheels with 3-in. and $3\frac{1}{2}$ -in. treads, and proposed standard tread and flange-contours. In submitting these drawings, Mr. Dalgleish called attention to the omission of 35-in. and 37-in. diameter wheels from the proposed standards, stating that investigation developed that these sizes are seldom called for and are obtained by increasing rim thickness of 34-in. or 36-in. diameter wheels.

In discussing the steel wheel designs the sub-committee on this subject reported that at a meeting held on June 5 it was decided to include hub diameters in their recommendations as follows: For narrow-tread wheels, 21 in. to 26-in. diameter, hub diameter $7\frac{1}{4}$ in.; for narrow-tread wheels, 28 in. to 34 in. diameter inclusive, hub diameter $8\frac{1}{4}$ in.; for broad-tread wheels, 34 in. and 36 in. diameter, hub diameters of $8\frac{1}{4}$ in., $10\frac{1}{4}$ in. and $11\frac{1}{4}$ in. It was also proposed and approved that the length of hub for 21-in., 22-in. and 24-in. diameter wheels be made $4\frac{1}{2}$ in.

The proposed standard tread and flange contours, as submitted by the sub-committee, were considered and minor changes made.

In connection with the proposed steel wheel designs

and contours of flange and tread of wheel, Mr. Holst suggested that the committee take into consideration and recommend extension of investigation to include chilled-iron and cast-steel wheels. This matter will be referred to the subjects committee.

W. E. Johnson called attention to certain suggestions and recommendations received from the manufacturers on the subject of steel axle design. A communication from W. S. Adams, J. G. Brill Company, was read wherein he suggested that the diameter of collar and dust-guard fit of the $3\frac{1}{4}$ -in. x 6-in. axle be changed from $3\frac{3}{4}$ in. to $3\frac{7}{8}$ in. and this change was approved. Mr. Adams also suggested that the fillet between the journal and the collar be decreased from $\frac{1}{4}$ in. to $\frac{1}{8}$ in., and that the fillet between journal and dust guard seat be decreased $\frac{1}{4}$ in. to $3/16$ in., and called attention to possibility of complication arising from the proposed system of numbering. He suggested that the designations be revised to a simpler form. Such as E-1, E-2, E-3, etc.

A. L. Broomall, Westinghouse Electric & Manufacturing Company, addressed the chairman of the sub-committee recommending that the solid collar, which is to be shrunk on the smaller axles when used with split gears, be shown on the axle design; also that the radius between the motor fit and the gear fit on the small axles be made $\frac{5}{8}$ in., as on the larger axles. Both of these recommendations were approved. Mr. Broomall also suggested that in the table accompanying the axle design, the gear pitch and width of face be omitted and that the diameter of gear hub and motor bearing flange for the $3\frac{3}{4}$ -in. x 7-in. axle be decreased from 8 in. to 7 in.

The sub-committee also called attention to the undesirability of retaining the proposed 4-in. motor bearing fit for the $3\frac{3}{4}$ -in. x 7-in. axle.

On the subject of the lighting of electric street cars it was decided that W. W. Brown should review the development in car lighting during the last two years, and amplify the report of the committee on equipment as printed in the Proceedings for 1914, giving a brief outline of the development made since this report was rendered. Mr. Brown will also communicate with L. M. Clark relative to a paper proposed for presentation by the committee on reciprocal relations with other societies of the Illumination Engineering Society.

Regarding standard sizes of carbon brushes for street railway motors, W. W. Brown reported that he found it impossible at this time to bring the electrical equipment companies to any agreement on the standardization of sizes of carbon brushes for street railway motors, in view of which it was deemed inadvisable to take any action. It was believed by some of the members of the committee, however, that a tolerance specification could be adopted that will be satisfactory to the motor manufacturers, and would afford protection to the purchaser in purchasing brushes from carbon brush manufacturers.

As L. M. Clark was not present at the meeting, a communication addressed by him to the chairman, relative to M. C. B. brasses for heavy electric traction was read. In this he referred to blue prints showing journal bearings for the $3\frac{3}{4}$ -in. x 7-in., $4\frac{1}{4}$ -in. x 8-in., 5-in. x 9-in. and $5\frac{1}{2}$ -in. x 10-in. journals, and also to prints showing the general application of these bearings each to a standard M. C. B. journal box with standard wedge, hooded wedge, and with standard wedge where the journal and liner is attached to the journal box by means of suitable ledge formation cast integral with the interior of box. It was decided to forward these prints, which had not arrived, to the members for their criticisms and recommendations.

R. H. Dalglish submitted blue prints showing pro-

posed limit of wear gages for 1-in. and $1\frac{3}{16}$ -in. flanges. These were approved with certain minor changes.

E. W. Holst submitted six drawings showing trolley catcher sockets as used by different manufacturers at the present time, also a design combining such manufacturers' standards, as well an adapter to take the majority of the trolley catchers now on the market. It was decided that the committee would recommend one design, providing that this does not contain any patented features.

H. A. Johnson referred to report of sub-committee on painting cars, calling attention to the wide variation in the methods of car painting employed by the various companies and the difficulty of formulating any set specifications that would be generally applicable to the conditions met with or acceptable to the users. Recognizing the inadvisability of recommending practices where the final determination cannot be conscientiously lived up to or advocated by the individual members, it was decided that no specification for painting could be recommended at this time.

J. S. McWhirter submitted a written report with copies to all members, giving the result of the sub-committee's investigation relative to the relation between rail corrugation and the use of rolled steel or forged steel wheels versus chilled cast iron wheels.

In addition to the above the committee considered reports on A.I.E. standardization rules, car ventilation, and the U. S. Bureau of Standard's safety rules.

POWER DISTRIBUTION COMMITTEE

At a meeting of the Engineering Association committee on power distribution held in New York on June 12 and 13 detailed technical reports from several sub-committees were discussed. Those present were C. L. Cadle, New York State Railways, chairman; E. J. Blair, Chicago Elevated Railroads; E. S. Gillette, Aurora, Elgin & Chicago Railroad; C. R. Harte, Connecticut Company; C. R. Phenicie, Wisconsin Public Service Company; R. H. Rice, Chicago Board of Supervising Engineers, and C. F. Woods, Arthur D. Little, Inc.

Among the actions taken by the committee the following are given to indicate the status of the year's work. No revision of the specifications for overhead line crossings was attempted in view of the fact that the joint national committee has not completed its revision. A revision of the standard specifications for rubber-covered wire and cable was approved subject to revision to conform with the association's standard form for revising specifications.

A clearance diagram for semaphore signals was approved subject to modification to cover curves as suggested by the heavy traction committee. A report of progress on a standard thread for insulator pins was accepted. The settlement of this matter awaits a final conference with other interested organizations. Certain amendments to the overhead line material specification were approved and a collection of data on steel cross arms was referred to next year's committee with a request that the specification be broadened to include all metal arms. The collection of data on high-voltage catenary line construction was considered on the basis of a preliminary sub-committee report and it was decided to send out a data sheet this summer for the benefit of next year's committee.

An elaborate sub-committee report on tapered concrete poles was discussed and accepted subject to the addition of sample calculations and a description of steel forms for concrete pole construction.

The other conclusions of the power distribution committee related to details of wording, etc., designed to harmonize its findings with the standards of the American Association and of organizations in related fields.

EQUIPMENT AND ITS MAINTENANCE

Short Descriptions of Labor, Mechanical and Electrical Practices
in Every Department of Electric Railroading

Contributions from the Men in the Field Are Solicited and Will Be Paid for at Special Rates.

New Route Signs for Denver

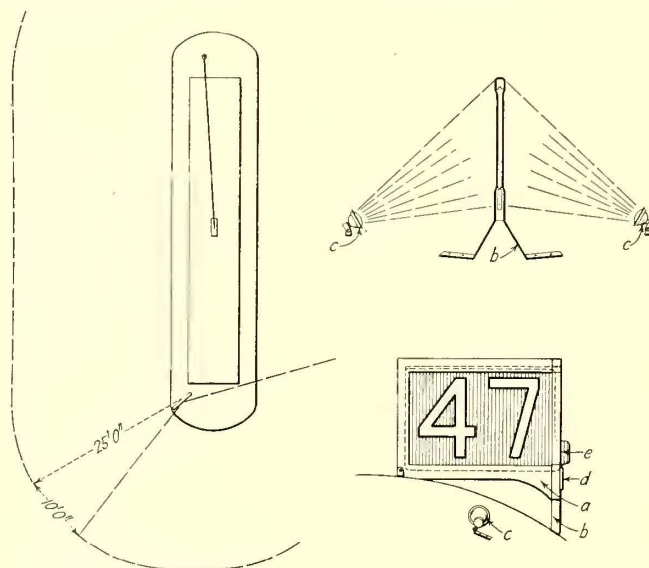
The Denver Tramway recently equipped all of its motor passenger cars with route signs, as illustrated in the accompanying sketches and photographs, the type shown being developed in the shops of the company under the direction of W. H. McAloney, superintendent of rolling stock Denver Tramway. After considering the prevailing types of route signs, including transparencies both of glass and of cloth curtain, the opaque sign comprising a double-faced sheet-metal disk with a dark background was selected. Figures 12 in. high are used and the signs are illuminated by "flood lighting," using two parabolic reflectors. Back of the bull's-eye lenses are concentrated-filament, 14-volt to 16-volt lamps. These are connected in series with two series circuits of 23-watt lamps connected in parallel and they receive, therefore, about 0.44 amp.

A wooden frame (a in an accompanying diagram) with a strap iron end, b, forming both supporting legs and a slot for inserting the sign, is mounted at an angle of 48 deg. with the axis of the car on the front right-hand corner of the roof, with a lamp, c, mounted on each side. The legs are shaped to fit the average roof contour and are bent cold to fit the specific roof. The sign slides in grooves in the top member and in strap iron inserts in the bottom member, finally dropping back of a catch, d, each sign being shaped with a projecting handle e.

The sign is visible through two arcs totaling 260 deg., being very plain as the car approaches until nearly opposite a person standing on the curb. It is then hidden through the small angle projected by the frame end, and the side and back are clearly visible to any one approaching the car from the right-hand side or rear. Extra signs are stored in sectional cabinets at the car-houses.

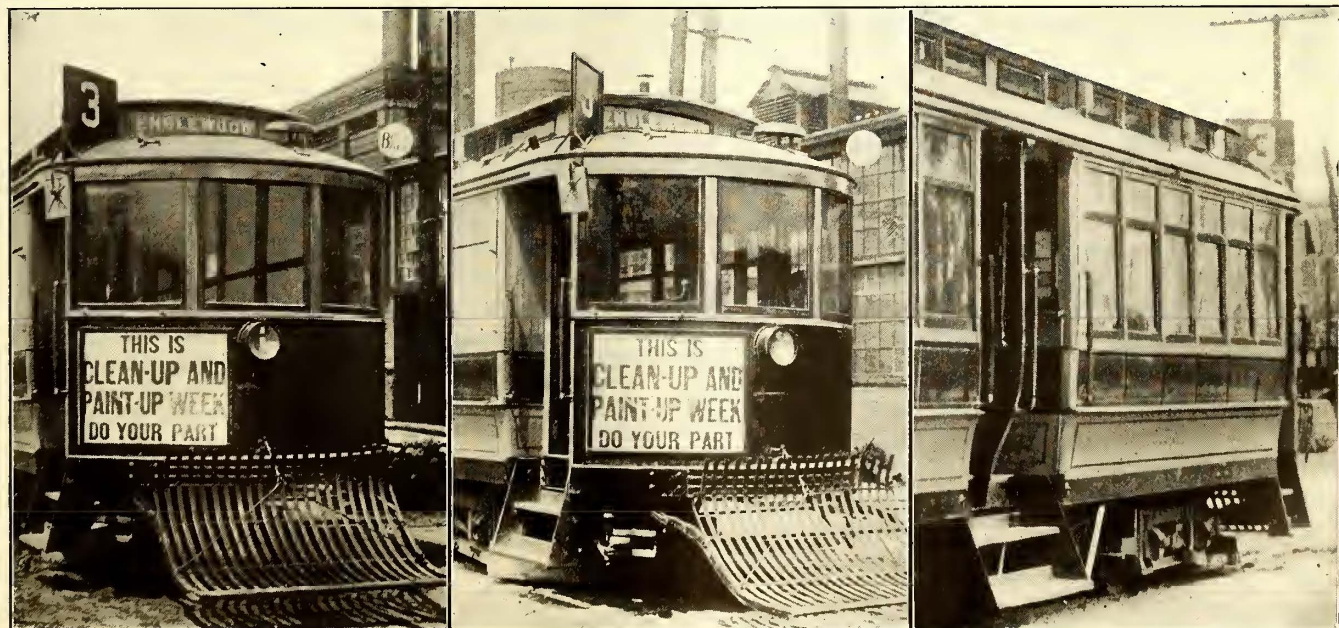
A list of the route number groupings and background color combinations is printed on a card of con-

venient size for distribution to the public. Its dimensions are 2 3/8 in. x 5 1/4 in. This explains in detail the routes to the baseball park, the city park, the Union Station, etc. On one side of the card there is a list containing the route numbers corresponding to the street



DIAGRAMS SHOWING VISIBILITY ANGLES AND STRUCTURAL DETAILS OF NEW DENVER TRAMWAY ROUTE SIGN

names of the routes. The other side gives the numbers that correspond to certain lines or localities as follows: Routes 1 to 9 all serve the baseball park. Routes ending in 0 serve the city park. Red route signs signify cars which serve Union Station. All Fifteenth Street lines are numbered 1 to 19. Sixteenth Street lines have the 20 to 39 numbers. Seventeenth Street lines have



VIEWS OF NEW DENVER TRAMWAY ROUTE SIGNS FROM THREE ANGLES

the 40 numbers. Eighteenth Street lines have the 50 numbers. East and west lines have the 60 numbers. Barnum, Cherokee and Globeville lines have the 70 numbers. Interurban lines have the 80 numbers. Wherever possible the route numbers of such lines as Fourth and Eleventh Avenues have been made the same as at present. Fourth Avenue cars are designated as Route 4; Sixth Avenue cars, Route 6; Eleventh Avenue cars, Route 11; Twenty-eighth Avenue cars, Route 28; West Thirty-eighth Avenue cars, Route 38, etc. Routes Nos. 2 to 15, 29, 37, 38, 62 and 66 go to central loop. Routes Nos. 10, 63, 64, 71, 72, 73, 81, 82, 83 and 84 go past the loop or within one-half block of it.

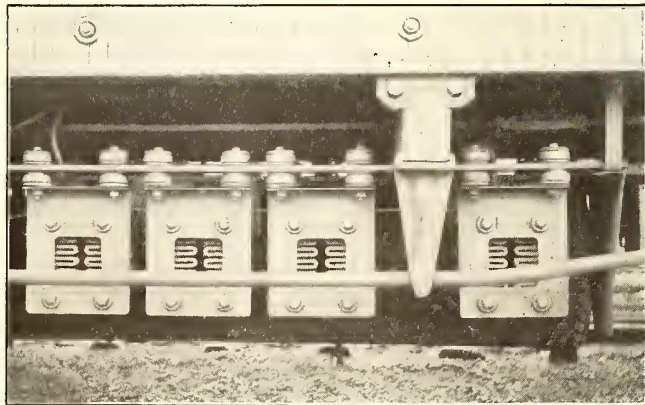
Porcelain Insulators for Grid Suspension

BY JAMES W. BROWN,

Superintendent of Shops Wilkes-Barre & Hazleton Railway and Lehigh Traction Company

In view of the difference of opinion among master mechanics as to the desirability of using porcelain insulators for grid suspension, the practice of the Wilkes-Barre & Hazleton Railway, Hazleton, Pa., may be of interest. This is a typical third-rail, high-speed, interurban road, and was one of the first in this country.

The illustration reproduced herewith shows the mounting of the grids used by this company. The grids are suspended from a frame of rectangular form about 1½ ft. in width and 10 ft. long, made of ¾ in. x 3 in flat iron, and suspended from the car floor by wrought-iron hangers. The holes for the bolts and projections for the steel washers with which the grids are attached



ARRANGEMENT OF INSULATORS, FRAME AND GRIDS ON W.-B. & H. RAILWAY

are laid out and drilled by use of a master jig. The frames, therefore, are interchangeable.

Porcelain insulators of the flat, round type are placed above and below the iron frame. The grids are attached to the frame with ½-in. x 9½-in. bolts with standard nuts and lock washers. Each bolt is insulated from the frame by two round porcelain insulators, one above and one below. On both sides of the insulator are thin fiber washers for protection of the porcelain against mechanical injury. Outside of each fiber washer is a protecting washer made of galvanized pressed steel. Of these pressed steel washers, the ones on either side of the steel frame have a projecting collar which is 1¼ in. in diameter and ⅛ in. deep. This collar fits down into a hole in the rectangular frame. As the holes in the insulators are 1 in. in diameter, and there is only 1/32-in. play between the washers and the ½-in. bolt which extends through the insulators, there is no possible chance for the bolt to come in contact with the frame.

These insulators have been in continuous service on six cars of this company for more than five years without a single failure. None of the insulators have been broken, and no parts have been renewed. During this period each car has averaged 61,000 miles per year. No indication of leakage has ever been found and the grid suspension requires very little or no attention, being inspected only at shopping periods, which occur about every 80,000 car-miles. During the above period only three grids have been renewed and these were broken by pieces of flying brakeshoes. This condition was remedied by placing a steel shield in front of the first grid as shown.

Manganese Steel Welding

BY P. A. E. ARMSTRONG

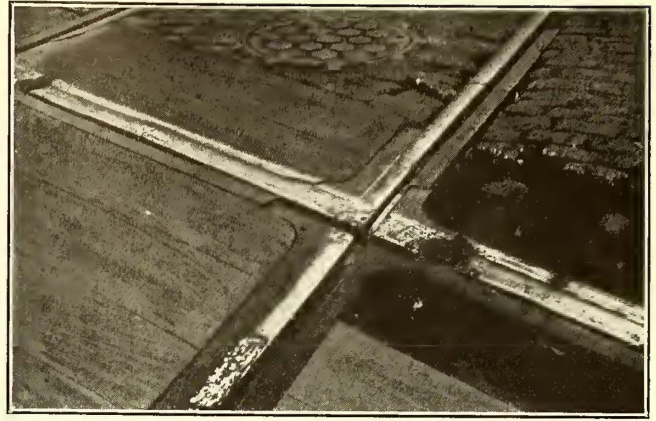
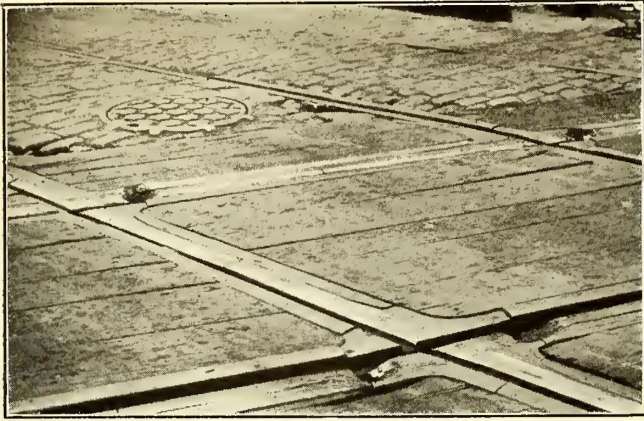
Quasi-Arc Weldtrode Company, New York, N. Y.

The art of welding and reinforcing manganese special work and manganese rails is not in a very satisfactory state, but this is due to the processes employed and not in any way to the possibilities. The general system employed is the electric-arc, bare-wire process, in which high or low-carbon steel is deposited upon the manganese steel. The result is that within a short time the deposit separates from the original manganese steel. The results with oxy-acetylene welding are still more unsatisfactory and need not be considered.

When depositing metal by the means of the bare-wire electrode and using high-carbon steel, a deposit is made with a metal that is totally unlike the surface to which it is to be fused, therefore there is a diffusion of the original metal and the deposit, and both lose their original characteristics. Manganese steel is very readily oxidized, and for that reason it is impossible to maintain the original manganese content when the metal is molten and in contact with the atmosphere. Further, the electric arc is one of the strongest reducing agents known, and has the effect of lowering the percentage of all alloying metals. Any percentage of manganese in steel carries with it the characteristics of that percentage. For example, a manganese content of greater than 2 per cent and less than 5 per cent produces a metal which is extremely brittle and has no strength, either to withstand crushing or tensile loads. The correct percentage to yield these characteristics lies between 8 and 14 per cent.

When an electric arc is produced, with a high-carbon steel wire used as an electrode, the surface of the manganese steel on which this electrode is being deposited is immediately brought to fusion and begins to lose its manganese content. The great reducing action of the arc lowers the carbon content of the electrode and, when the deposit is thus made, there is a partial diffusion of the remaining manganese in the molten bath and the steel deposited thereon. There is formed an interposing layer of a material which is approximately 3 per cent manganese. This is quite useless, as it is hard and brittle, and entirely unable to withstand any form of load without crumbling and fracturing.

The molten manganese steel is extremely fluid, resulting in the fusion penetrating to a depth of at least ⅛ in. The carbon which is present in the steel of the electrode has little effect in reducing the fluidity, even perhaps augmenting it slightly. There is, therefore, a tendency, due to this fluidity, for the edges of the deposit not to be fused, there being a layer of oxide at the edges between the deposit and the work. This is particularly noticeable when the work is not level, and when the angle is very steep it is practically impossible to get the deposit to stay at all. Between successive deposits of this kind there are areas of oxidized and, therefore unwelded, metal. The deposit, if fairly



FIGS. 1 AND 2—TWO VIEWS OF A MANGANESE STEEL CROSSING SHOWING EXCESSIVE CRUMBLING EFFECT

thin, begins immediately to pound out in service. The surface crumbles or, if the deposit is thick enough, its top surface is of low medium carbon having a very small manganese content and this, of course, is subjected to the great rolling action of the trolley car wheels. As indicated in Fig. 5, the deposit is of two classes of metal, a soft layer on top and underneath the portion which is fused to the manganese steel. The latter is hard and brittle, and of approximately 3 per cent manganese content. The soft material, under the action of the wheels, begins to cold-roll over the hard portion of the deposit, crumbling and fracturing the hard material, and producing the well-known peeling action.

Figs. 1 and 2 of the accompanying illustration very clearly show this action fully started, the crossing shown having been repaired in many places with the bare-wire electrodes.

In the event of a low-carbon steel electrode being used there is a greater tendency to produce the soft layer of material on the top, but the 3 per cent manganese area is still present, as previously explained. The results are identical with those produced with the carbon electrode. If a 13 per cent manganese electrode is employed it is found that the same difficulties are present in depositing, and the deposit is then a more uniformly distributed 3 per cent manganese content which, as explained, will stand no form of load.

The application of the above types of electrode to a damaged portion of a manganese rail makes such damage increasingly larger as the welded surface breaks away, carrying with it the area of the reduced manganese content. In depositing the bare wire, as described above, the heat disturbance in the rail is a very serious matter, and where a very large deposit has to be made, such as the photographic illustrations depict, the heat will be sufficient to remove locally the effect of the previous heat treatment and will quickly cause cracks to form in the rails adjacent to the weld. These cracks will begin to open up in direct relation to the expansion of the metal due to the dissipation of such heat.

As manganese steel is cast in the desired shapes, it is obvious that it could be reinforced and repaired if the conditions under which the castings were originally made could be duplicated. The bare-wire method of fusion does not in any way duplicate steel-bath conditions as no steel manufacturer in his sane senses would make his melts when their surfaces were continually exposed to the harmful action of the atmosphere. In fact, the progress of modern metallurgy relative to the manufacture of steel may be summarized as comprising: "The greater knowledge of the art in its application to slags protecting the surface of the metal while molten, and the ability to depend upon the content of the steel containing the alloys desired, the slags being

so constituted that these alloys will remain." Most of the so-called modern alloying elements have been known for many years, but the ability to keep them in the melt when once they were placed there has been the result of the improvement in the art.

The electric steel furnace is one of the best methods of manufacturing alloyed steels. In furnaces of the arc-resistance type, *i.e.*, those in which the electrode is immersed in slag and adjacent to the molten metal, the arc is formed between the end of the electrode and the slag, which is thus heated to a very high temperature. The molten metal offers resistance to the current, and thereby adds to the heat generation. If an electrode could be made of the metal to be deposited and a slag covering the metal at all times could be provided, an ideal condition would result. This condition in miniature would be the solution of all welding troubles.

After much research Mr. Strohmenger, a well-known metallurgist of England, has been able to incorporate the ideal steel-bath condition in an electrode suitable for welding. This consists of a steel core containing the alloys desired in the deposit, and the exterior of the core is wrapped with braided acid slag, such slag being an insulator when solid. This new electrode can be kept in actual and physical contact with the work during the entire period of fusion. In welding an inverted crucible-like crater is formed at the end of the fusion electrode, known as a "weldtrode." The weldtrode can be used in either a.c. or d.c. circuits, preferably of 100 volts.

The slag exterior of this weldtrode is brought to a fusing point by the agency of the electric arc, and the slag immediately forms a secondary conductor taking the place of the usual vapor. The arc is maintained by means of the vaporized and highly incandescent slag, and it is quite submerged under the deposited molten

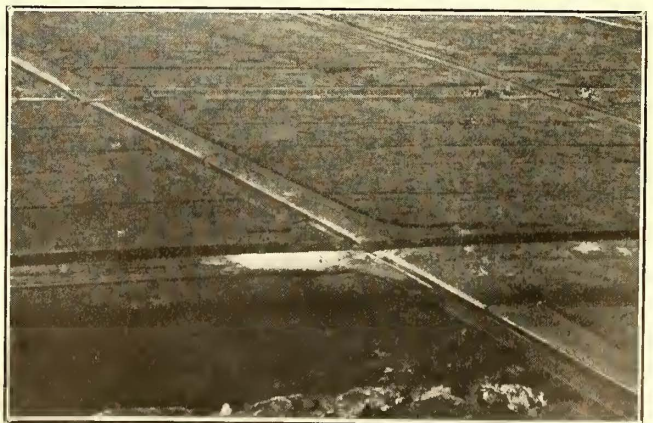
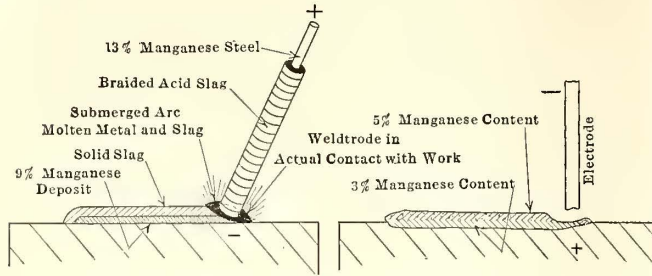


FIG. 3—CROSSING SHOWN IN FIGS. 1 AND 2 WITH ONE HOLE FILLED

slag. As the molten metal core is heavier than the slag, it runs underneath and intimately mixes with the metal on which it is deposited, causing a complete and absolute fusion. The metal thus deposited and the fused original metal are at all times protected from atmos-



FIGS. 4 AND 5—DIAGRAMS SHOWING EFFECTS OF USE OF SLAG-COVERED AND BARE-WIRE ELECTRODES

pheric influences, and oxidization is to a very large degree prevented.

Fig. 4 shows the condition described. As indicated in the illustration, the weldtrode is held in contact with the work and is forced down upon it during the entire period of fusion. The braided acid slag now molten flows from the end of the weldtrode upon the deposit, covering the latter with a thick layer. As this slag melts at a higher temperature than the deposit it must obviously cool earlier and thus effectually prevents any flowing away of the deposit or the original fused metal.

It is possible also to make a deposit upon manganese steel held at any angle, and the manganese steel deposited is of at least 9 per cent content. There is some loss which is due to the reducing effect of the electric arc and to the passing off of the manganese into the slag in form of gas. On cooling the slag readily falls off.

As the fusing core of this weldtrode is kept very close to the work, the slag being in actual contact with the work, an arc voltage of approximately 30 is consistently maintained. This process can, therefore, be used in conjunction with any electric arc system of welding. The crucible-like effect at the fusing end of the weldtrode directs and controls the heating effect of the electric arc localizing it much more than is possible with the bare wire, even if this electrode could be maintained at a distance of, say, 1/16 in.

In practice the heat driven into the work by this weldtrode is so small that the surface of the metal adjacent to the weld is not colored in any way, and when the operation is concluded a deposit one layer thick laid down on the running face of a rail is cool enough for the hand to be placed upon it without fear of unpleasant results. For example, the hole shown in Figs. 1 and 2 was filled up by this process and on completion the temperature in the weld or the surrounding metal was not high enough to cause the ignition of an ordinary match.

There is produced by the fusion of the original manganese steel and the deposited manganese steel a grading effect of, say, 12 to 9 per cent in the manganese content, but this decreasing content does not in any way reach the danger zone, hence the manganese steel deposited is not subjected to disintegration by pounding and the surface does not crumble. In fact, under running conditions a deposit thus made will stand a considerable amount of cold working and will flow slightly, allowing the surface to become very flat and highly burnished, due to the rolling action of the car wheels.

The illustrations depict a triple-T, 90-lb. rail steam and electric crossing. This crossing is in an extremely bad condition, great holes being present in the steam track. This track has been repaired many times by the bare-wire process. The deposits are peeling off or

crumbling away. The angle braces have also been welded by the bare-wire process and cracks are present between the under side of the rail head and these braces, showing that the welds have absolutely no strength. The reason is that the manganese content of these deposits, owing to the weld being on manganese steel, is roughly of the order of 3 per cent.

Fig. 2 depicts one of the holes prior to being welded by the new type of weldtrode. To bridge the holes and stop the waste of metal the gap was filled with sand to the bottom of the hole and manganese metal was deposited over this. In this work much difficulty was experienced, due to the freight train and trolley car traffic, which shook down the sand and spoiled the bottom.

Fig. 3 shows the weld complete ready for grinding. The crossing, with the remainder of holes filled, has been in use for some time and is still in good condition, although the deposits by the usual bare-wire welds would sometimes last but a few hours, failure being augmented by the extremely flexible state of the crossing. This job, of course, calls for a new crossing, and is only referred to here as showing what can be done with electric welding.

In regard to the repair of carbon rails, it may be stated that this new form of miniature steel-bath welding is entirely adaptable to the reinforcing of carbon rail heads. For that purpose a carbon-steel core is employed in the weldtrode, thus depositing a metal of the same composition as the original carbon rail.

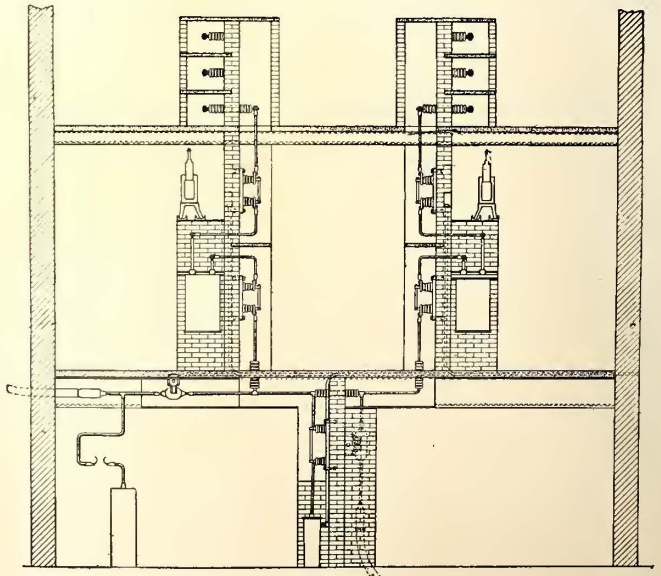
A Recent Railway Substation—II—Switchboard and Distribution Feature

BY C. A. HECKER

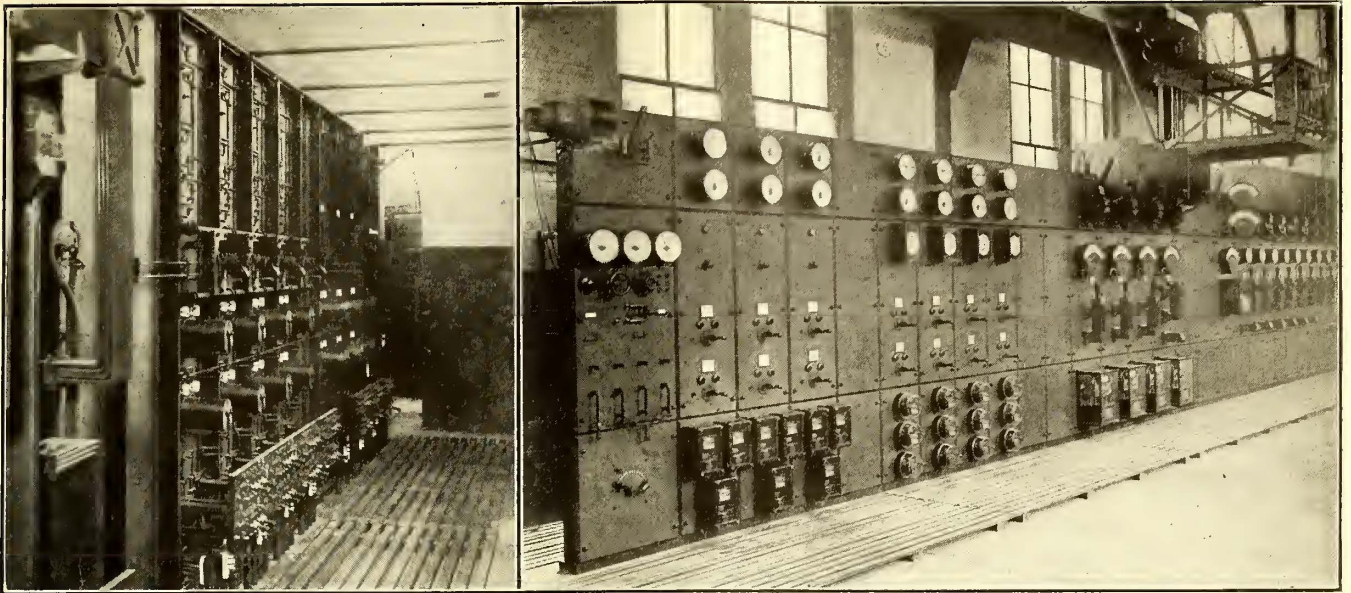
Chief Electrician Pittsburgh Railways

In last week's issue of the *ELECTRIC RAILWAY JOURNAL* the writer described the general layout of the new Taggart Street substation of the Pittsburgh Railways, which is now serving the northeast district, formerly the city of Allegheny. Of particular interest in this as in other substations were the problems connected with switching and protection of apparatus, of which some detail is given in this article and the accompanying illustrations.

The main switchboard consists of thirty-four Monson slate panels with angle-iron frames and a channel-iron base, supported on a treated hardwood baseboard. The switchboard braces are secured to a similar piece



CROSS-SECTION OF HIGH-TENSION STRUCTURE SHOWING SERIES TRANSFORMERS AND ELECTROLYTIC LIGHTNING ARRESTERS



REAR AND FRONT OF A. C. SWITCHBOARD PANELS

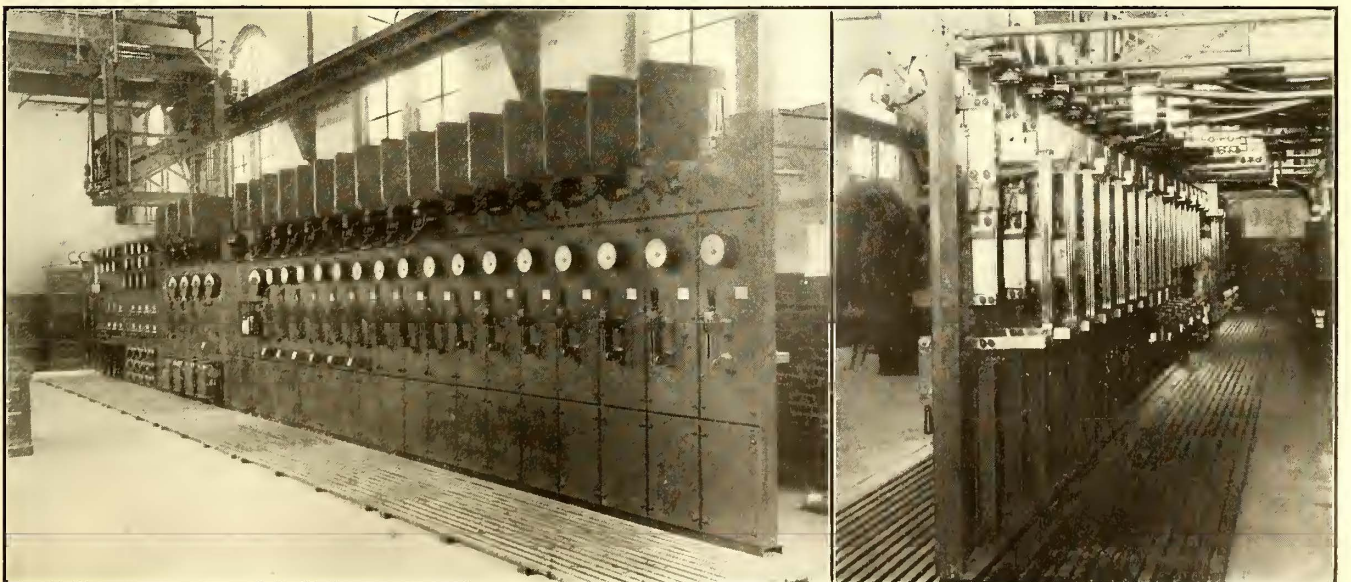
of hardwood, mounted on the wall and extending the length of the switchboard, thus entirely insulating the framework from ground. The panels are arranged in the following sequence, from left to right: one battery control panel, four high-tension cable panels, six transformer panels, six converter panels, one station totalizing panel, and sixteen feeder panels. One converter panel and six feeder panels are equipped with an auxiliary bus and double-throw switches, to permit supplying certain feeders at increased voltage, in case of trouble at other stations. All series and potential transformer leads are brought to terminal boards at the rear of the a.c. panels, where switches and testing terminals permit short-circuiting and opening instrument transformer leads and attaching calibrating leads to the instruments. The switchboards as well as the other equipment in the substation were furnished by the Westinghouse Electric & Manufacturing Company.

Relays of the reverse-power type only are provided on the incoming cables, as these circuits are equipped with definite time-element overload relays at the generating stations. The control wiring of the circuit breakers on the cables is arranged so that it is necessary to insert a synchronizing plug in a receptacle before the circuit

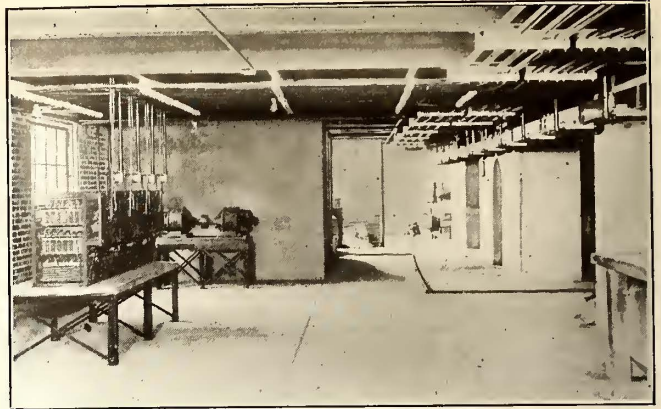
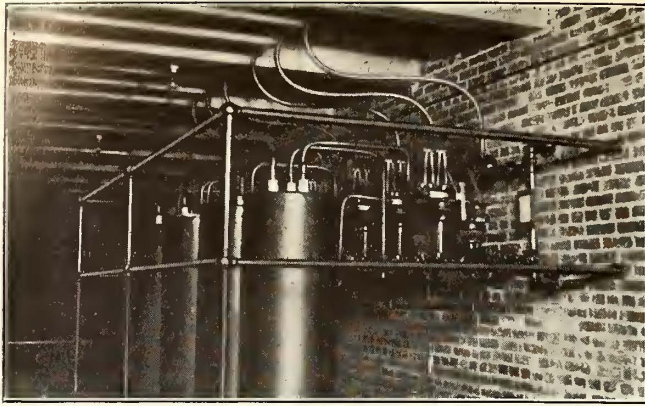
breaker on the panel can be closed. This is done as a reminder to an operator that cables should not be paralleled without synchronizing. Should the synchroscope indicate lack of synchronism in an incoming circuit with reference to a cable already in service, the incoming cable can be operated on a separate bus.

Definite time-element, overload relays and low-voltage relays are installed for the protection of the transformers and to disconnect the converters from the source of supply of alternating current in case of trouble. The tripping circuits of the two circuit breakers on each transformer bank are interlocked, so that the circuit will be opened should a relay operate while load is being transferred from one bus to another, as is often the case.

The d.c. circuit breakers are equipped with shunt tripping coils, which are used in connection with reverse-current relays in the d.c. converter leads, to trip the circuit breakers in case of a reversal of power through the converter. The d.c. circuit breakers and the transformer circuit breakers of each unit are electrically interlocked so that a d.c. breaker will open instantly should a corresponding oil circuit breaker open. The converters are equipped with overspeed devices



FRONT AND REAR OF D. C. SWITCHBOARD PANELS



ELECTROLYTIC LIGHTNING ARRESTERS IN OUTGOING D. C. FEEDERS; INCOMING FEEDERS, NEGATIVE BUS, BATTERY ROOM, M.-G. SET AND RHEOSTATS

which close the circuit through the shunt trip coils on the d.c. circuit breakers, thus disconnecting any converter from the d.c. bus in case of overspeed.

The converter field rheostats are mounted on slate panels on the first floor directly under the converter panels. The operating mechanism is thoroughly guarded to prevent accidental contact between the chains and any live parts on the switchboard. Insulating mats of hardwood are placed on the floor in front and rear of the main switchboard and in front of the converter starting panels.

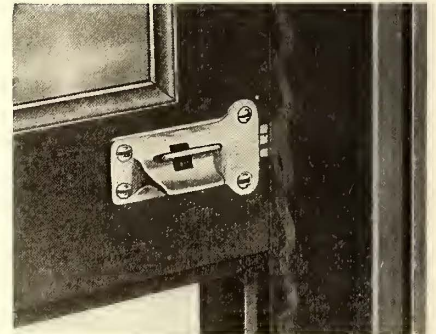
Each outgoing d.c. feeder is equipped with an aluminum cell lightning arrester, and six similar arresters are connected across the d.c. buses. The lightning arrester ground consists of four copper plates, each 4 ft. square, buried in rich, moist earth, and a number of 3/4-in. galvanized-iron pipes 8 ft. long, all connected together with No. 0000 copper wire. The steel structure of the building and all piping is connected to the lightning arrester grounds.

An interesting feature of the distribution system is the use of insulated negative cables, which are distributed over the district in the same manner as the positive feeders. One-half of the negative cables enter the building from Taggart Street and the other half from Brighton Road, each cable connecting to the negative bus through a switchboard-type ammeter shunt. When the distribution system is completed and the entire load

transferred to this substation, the resistance of the negative feeders will be adjusted so as to equalize their loads as nearly as possible.

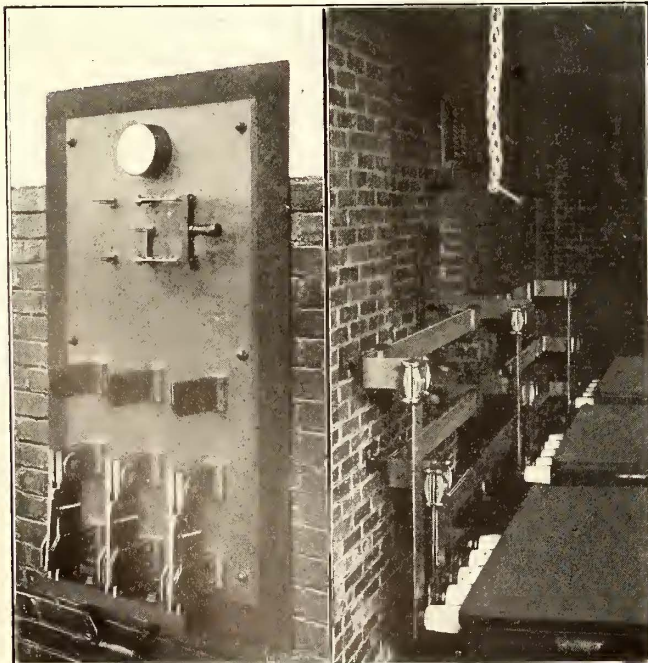
Safety in Brooklyn Rolling Stock

A striking feature of the seventh quarterly report of the safety committee, mechanical department, Brooklyn Rapid Transit System, covering the quarter ended April 1, 1916, is the presentation of a number of pictures showing what accident-making features of car equipment have been removed and what improvements have been installed in their places. A number of illustrations showing some of the safe apparatus adopted are reproduced.

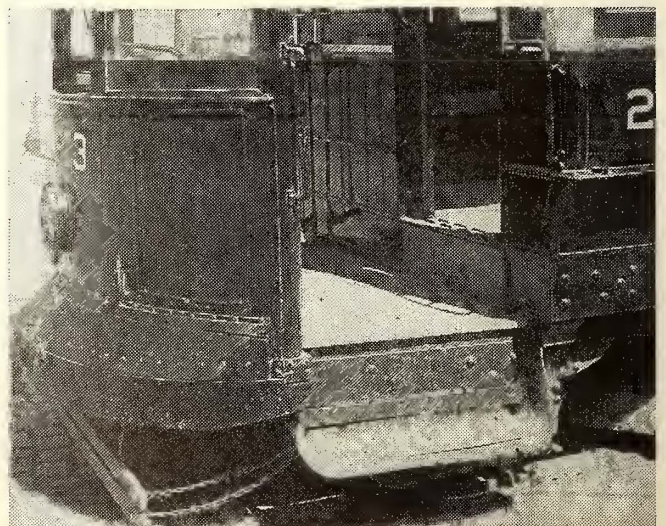


SASH LOCK ALWAYS LATCHED, REGARDLESS OF POSITION

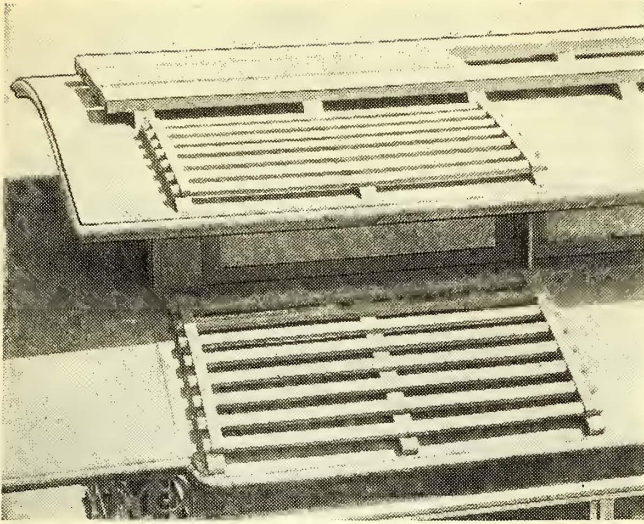
As an example the combination of flat bumper and projecting fender has been replaced by bumpers fitted with oblique shields on which standing is impossible. Again, the dangerous practice of riding on projecting fenders, when folded at the rear, is eliminated by the use of H-B automatic life guards with safety chains.



FRONT AND REAR OF ROTARY STARTING PANEL



BUMPER SHIELD, AUTOMATIC WHEEL GUARD AND SAFETY CHAINS



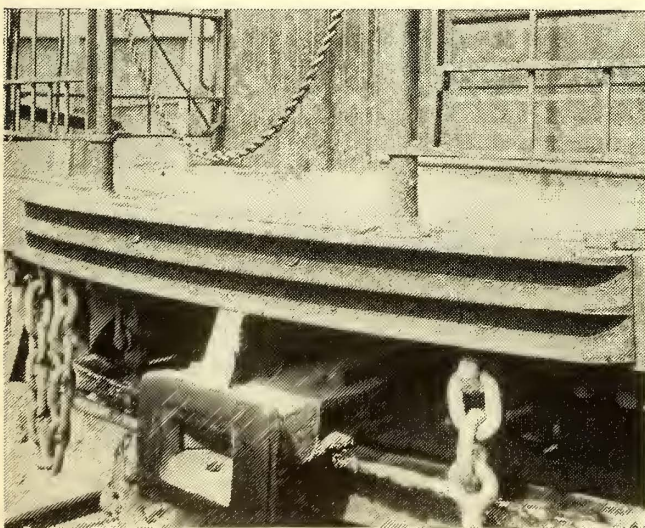
SAFETY STRAPS ON ROOF RACK

A third safety feature is the provision of Rico anti-climbers on all rapid-transit equipment, to prevent the over-riding of platforms in collisions and to assist in distributing any shocks due to impact.

A fourth improvement is in the car roof-rack. Formerly a carman in climbing the roof was liable to injury because each rack had to bear his entire weight in turn. Now these racks are tied together with a metal safety strap so that no one rack takes all of a man's weight.

A fifth safety feature illustrated is the use of O. M. Edwards No. 13 type of sash locks. Unless the sash equipped with the old-style locks was opened fully and the locks properly latched, the sash would jar loose and cause the bruising of arms and fingers and even more serious injuries. The Edwards lock prevents the sash from dropping, regardless of the height to which it may have been raised. This lock is in use on 300 New York Municipal Subway cars in operation, on 200 additional New York Municipal cars on order, and on 324 elevated cars. The report also quotes many other equipment improvements, particularly on the latest center-entrance and subway cars.

Among the data presented on shop safety are such pertinent items as the purchase in April, 1915, of 574 pairs of safety goggles for shop men, followed by 177 more in the first quarter of 1916. It is also stated that a total of \$14,179.81 was spent up to April 1, 1916, for



ANTI-CLIMBER TO PREVENT TELESCOPING IN COLLISIONS

various safety measures, many of them suggested by the employees themselves. Each safety measure and its cost is fully described in each issue of these quarterlies, as distributed among the men of the department.

The conclusion of this report states that during the last three years the Brooklyn Rapid Transit System has expended about \$50,000 for approximately 100,000 special General Electric locking lamp-socket receptacles, not only to avoid fires where improper contact is made by the lamp base but also to prevent the lamp from jarring loose.

Decision of Commission on Dead Man's Button

The Public Service Commission for the Second District of New York has settled the controversy raised by the Brotherhood of Locomotive Firemen and Enginemen over the "dead man's button" on the Erie Railroad's electric trains between Rochester and Avon by ordering the Erie to make changes in operation in the interest of public safety. The order of the commission requires that when electric cars are operated as the motive power for equipment designed for steam passenger use the dead man's button be so arranged by locks, seals, etc., that it cannot be readily put out of use and that when trains are thus operated they must be so made up as to enable the train crew to get from the coaches into the motor cars while the train is in motion. If it is not possible to make up trains in this manner, the commission orders that a spare trainman ride in the motor cars for the sole purpose of assisting the motorman in emergency.

The Brotherhood of Locomotive Firemen and Enginemen, through Thomas E. Ryan, chairman of its legislative board, complained to the commission that the dead man's button was so arranged that the air valve could be removed, thus permitting the motorman to ride without holding the controller, and making the automatic stopping of the train impossible in case anything should happen to the motorman. Mr. Ryan alleged this condition was particularly dangerous when electric cars were coupled onto steam trains, for baggage cars without end doors, or baggage cars so piled with goods that the doors could not be used, were frequently placed between the motor cars and the rest of the train, so that the motorman was all alone in his cab and beyond reach of aid in case anything should happen to him. The order of the commission is designed to meet this condition. It states that the only motorman examined testified that the presence of an extra motorman in the cab with him would be more a source of danger than an aid to safety.

New Electric Railways Proposed for Holland

An electric railway is proposed from Amsterdam to and through the "Zaanstreek," a district traversed by the River Zaan, which flows into the North Sea Canal a few miles northwest of Amsterdam. The Zaan is lined by villages and sawmills, and passes through rich polders (low farm lands drained of water). Fourteen towns will be joined by this new electric road. Its length and other particulars are not yet definitely settled. Another new electric railway is projected in the Provinces of Groningen and Drenthe, extending from the city of Groningen some 20 miles southward and touching several prosperous towns. As at present planned, the project will cost about \$500,000. Both freight and passenger cars will be operated.

NEWS OF ELECTRIC RAILWAYS

CITY'S EXPERT REPORTS VALUATION FIGURES

Comparison of Cincinnati Traction Company Valuation Figures as Reported by the Company and Commission and the City's Expert

The value of the property of the Cincinnati (Ohio) Traction Company, according to the report recently filed by Ward Baldwin, employed by the city of Cincinnati, is \$11,969,284, as of April 1, 1914. The valuation made by the company's engineers is \$35,837,044 and that made by the Public Utilities Commission is \$24,333,947. Mr. Baldwin's figures will be used as the basis of the city's objections to the valuation made by the commission at the hearing which will take place on July 20.

In making his valuation Mr. Baldwin omitted the following items entirely: frontage consents, contributions imposed by ordinance, fire insurance, property damage, expense on account of incorrect plans, taxes during construction, interest, discount and hidden costs, horse cars, dummy lines, incline planes, cable lines, track destroyed, paving destroyed, rerouting cars, cost of paving laid by the city and company together. City Solicitor Groom will argue that these are not items to be taken into consideration for rate-making purposes. If the commission holds against him, then he will insist that the allowances are excessive.

The difference in the value of real estate is due to the fact that Mr. Baldwin has not included land owned but not used for transportation purposes and land under lease with or without the privilege of purchase. For rate-making valuations he thought that the latter's annual cost should be included in the operating cost. Mr. Baldwin added that he had included tracks, buildings and equipment not in use in the operation of cars, because of their potential value in case of floods, storms or accidents. In the item on buildings he excluded the building occupied exclusively by the Cincinnati Car Company, while the buildings occupied in common by the car company and the railway were apportioned between them. The report comprises 4039 typewritten pages, exclusive of the index pages, and the work cost the city approximately \$23,000.

Below are given the itemized valuations made by the company, the commission and the city's engineer, with the cents eliminated, so arranged that the various items may be compared:

	Company	Commission	City's Expert
Grading	\$84,395	\$95,991	} \$3,430,611
Track	5,286,046	5,374,194	
Bridges	53,342	49,242	
Inclines	246,492	229,025	167,791
Paving	595,554	605,311	9,941
Electrical distribution	1,575,984	1,476,643	1,301,075
Rolling stock	3,886,117	3,615,175	3,081,866
Power plant equipment	1,668,372	1,718,622	1,291,974
Substation equipment	243,944	265,758	219,863
Shop equipment	172,859	166,093	109,759
Buildings	1,744,245	1,611,018	1,310,486
Furniture	49,263	44,940	39,410
Stores and tools	628,503	613,924	380,103
Frontage consents	609,609	117,486	.....
Real estate	783,179	630,698	313,226
Profits of general contractor .....	.....	989,528	.....
Contributions imposed by ordi- nances	192,876	85,236	.....
Administration	533,550	452,050	235,000
Fire insurance, property dam- age, expense incorrect plans .....	.....	649,569	.....
Taxes during construction	288,000	534,224	.....
Interest, discount and hidden costs	3,812,481	2,252,775	.....
Horse cars, dummy line, incline plane and cable lines	4,781,046	2,000,000	.....
Track destroyed, 1901-13	615,365	576,138	.....
Paving destroyed, 1901-13	142,404	136,740	.....
Rerouting cars	19,262	19,262	.....
Cost paving laid in city	1,488,493	.....	.....
Cost paving laid by city and company	660,421	.....	.....
Franchise value	5,675,236	.....	31,824
Incorporation fees .....	.....	24,309	9,841
Totals	\$35,837,044	\$24,333,947	\$11,969,284

The Cincinnati Traction Company and the Cincinnati Street Railway on June 9 protested to the Ohio Public Utilities Commission against the valuation of their properties

as found by the engineers of the commission. The protest of the city had been filed before and a hearing on all three protests will be held on July 20.

The companies, in their protest, give seven reasons for the unjustness of the commission's valuation, which was made public on May 15 and published in the *ELECTRIC RAILWAY JOURNAL* of May 20, page 470. Chief of these is the inadequacy of the allowances in a number of instances. They also argue that in view of the condition and efficiency of the property no deduction should be made for depreciation from the cost found by the commission. The allowance made on account of superseded property is alleged to be inadequate. The protestants also hold that an allowance should be made for the reproduction of paving construction furnished jointly by the companies and the city. It is also contended that an allowance should have been made for franchises.

RHODE ISLAND TRUSTEES APPEAL TO COUNCIL

Federal Trustees of the Rhode Island Company Reiterate Their Plea for Relief from Franchise Conditions Considered to Be Unduly Burdensome

More than a year ago the trustees who are in charge of the property of the Rhode Island Company, Providence, under the federal decree providing for the disposition of the outside properties of the New York, New Haven & Hartford Railroad presented a plea to the Common Council of Providence for the modification of the franchise agreement under which the Rhode Island Company operates. The company asked relief from the provision of its franchise taxing its gross receipts, for abrogation of the clause covering payment by the company toward the cost of street repairs, for authority to charge a 6-cent fare or install a zone system and for other changes.

The petition came before the committee on railroads of the City Council for action on June 8. The company was represented by Rathbone Gardner, Theodore Francis Green and John P. Farnsworth, three of the five federal trustees. The hearing was designed originally to be a private conference between the railroad committee and the trustees, but the trustees understood that it was to be public and the members of the committee finally acquiesced in this view.

The trustees reiterated the request for relief filed previously with the Council. The principal plea for the company was made by Mr. Gardner. He quoted freely F. W. Doolittle, formerly director of the bureau of fare research of the American Electric Railway Association, in regard to the value of electric railway service and to the part played by the electric railways in the growth and prosperity of a community. The jitney situation was not now so acute in Providence as it had been. There were 149 jitneys in Providence, Pawtucket and Woonsocket and it was estimated that they diverted \$435,000 a year from the treasury of the company. In addition there were about 10,000 private automobiles in Providence, and \$2,000 was diverted daily from the treasury of the company if each one carried only four persons a day. At the time the contract was made between the city and the company nobody anticipated that a situation such as this would ever exist. Mr. Gardner said that it was unjust to call upon the company to pay 4½ per cent each year on practically \$1,000,000 of new street work. The 5 per cent tax on the gross receipts was also a manifest injustice. If the city needed this money then the proper alternative was a 6-cent fare. The cost of other necessities had increased 20 per cent to the consumer, but railway fares remained the same. The trustees requested the committee to report to the City Council that the terms and conditions of the franchise agreement were inequitable and recommend the appointment of the present railroad committee or some other to confer with the trustees to whom the property has been conveyed.

Mr. Farnsworth said that the company had lost about \$200,000 a year through giving transfers and allowing illegal rides. He said that the agreement of the company with its employees did not work well. The Public Utilities Commission controlled other activities of the company and he asked why it should not also control the wages of the employees.

Mr. Green said that the real questions were: What was the plant worth? What were the owners entitled to? The present owners, it seemed to him, were not getting more than a fair return on the actual present value of the property.

DECISION IN PORTLAND, ORE., VALUATION CASE

The Railroad Commission of Oregon has set the reproduction cost new of the property of the Portland Railway, Light & Power Company at a total of \$45,337,000. Deducting depreciation, the value on the property was placed at slightly less than \$41,000,000. Formal hearings on the valuation began on Jan. 25, 1915. Last October the company filed its final brief in the case. In that document the company contended that a just and fair valuation lay somewhere between \$61,795,629 and \$62,134,542. The former figure was given as the value of the property as determined by its original cost plus subsequent increments. The latter figure was given as the value of the property as determined by the reproduction analysis, considering the going value of the concern.

From the company's original claim of \$61,000,000 which included going value, water rights, etc., the commission eliminated about \$6,250,000 of property, contending that it was non-operating. Also the commission eliminated the company's claim for going value on the contention that the company did not compute such value correctly. An opportunity, however, will be given to the company later to present additional testimony on going value. On other minor reductions, including the elimination of \$700,000 working capital out of the claim for \$1,850,000, the commission found the money actually invested by present owners to be more than \$50,000,000.

Attention was called by the commission to the depleted earnings of the company caused by the competition offered by the Northwestern Electric Company and by the jitneys.

The brief of the company was referred to in the *ELECTRIC RAILWAY JOURNAL* of Oct. 30, 1915, page 922. It comprised 347 pages. The valuation of the company's properties involved a cost to the company of something like \$100,000.

DALLAS NEGOTIATIONS FAIL

All efforts to reach a compromise in the controversy between the city of Dallas, Tex., and the electric railway and lighting companies, as to valuations, earnings and control of the city over such public utilities as regards rates and betterments, are deadlocked, according to a formal statement just issued from the office of Mayor Henry D. Lindsley. At the municipal election on April 4, the voters of Dallas decided to adopt the valuations for these properties fixed by Edward W. Bemis in his report—\$3,600,000 on the light plant of the Dallas Electric Light & Power Company, and \$3,500,000 on the various street railway systems—and in-dorsed model service-at-cost franchises to give the companies a net earning of 7 per cent on these valuations. Since then negotiations have been under way between city officials and the companies owning the properties with a view to reaching a compromise. The utility companies insisted that their valuation figures of \$4,400,000 for the electric light plant and \$4,100,000 for the street railway properties east of the Trinity River be taken as basis. The valuation figures proved to be the rock on which the negotiations broke.

Immediately following the election, O. D. Young, acting for the United Electric Securities Company of Boston, which owned certain securities of the various utility properties in Dallas, and which, it was announced, had secured an option on these properties from Stone & Webster, entered negotiations with the city of Dallas looking to a reorganization of the various companies so as to meet the requirements of the city. Subsequently J. F. Strickland and C. W. Hobson, Dallas, were brought into the negotiations. It was explained that Mr. Strickland would undertake the organiza-

tion of an electric light company and Mr. Hobson would undertake to organize a street railway, provided a mutually satisfactory conclusion could be reached on the franchises themselves. The final conference was held on June 3.

In the course of the negotiations that followed the utility companies offered to yield on various points, but remaining steadfast in the announcement that no valuation figures would be accepted other than those fixed by the company, which are \$1,400,000 in excess of those fixed by Mr. Bemis. Among the concessions offered by the utility companies were:

Expenditure of \$5,000,000 on traction improvements in three years.

Building of two interurban lines in three years, each 30 miles long, to cost at least \$2,500,000.

An 8-cent light rate immediately, and a 7-cent light rate one year from Nov. 1.

Promise that light rates would never go higher than at present, even under the service-at-cost system.

Installation of the "London Sliding Scale" of light rates by which the company would receive a percentage of whatever saving might be effected by the introduction of economies.

A 1-cent power rate for factories.

THOMPSON COMMITTEE INVESTIGATION CONTINUES

In an effort to trace the commitments and obligations contracted by the Interborough Rapid Transit Company, New York, and chargeable to the city, the Thompson legislative committee on June 2 called Cornelius Vanderbilt, director of the company, and questioned him regarding the contract for third tracking the elevated lines, which it was proposed originally to award to John F. Stevens and which finally was let to the T. A. Gillespie Company. T. A. Gillespie was also a witness and continued in his refusal to allow the committee to examine the books of his Pittsburgh firm.

August Belmont, chairman of the board of directors of the Interborough Rapid Transit Company, was a witness on June 5 and testified about the purchase of the charters of the City Island and the Pelham Park Railroads by the Interborough Rapid Transit Company. Alfred Craven, chief engineer of the commission, was asked about readvertising the contracts for ballast.

Frank J. Sprague, testified on June 6 that his proposition to build the subway did not receive from the Public Service Commission or the city officials the serious consideration he felt it deserved. He offered to put up a certified check for \$100,000 and bond himself for the proper performance of the contract. He also criticized the method of the engineers in building the subway, pointing out that although several outlying sections were completed it would be impossible to use them until the main sections are finished.

Dr. A. F. Webber, chief statistician of the Public Service Commission, and Daniel L. Turner, engineer in charge of subway construction, testified regarding the prior determinations charged to the city by the New York Municipal Railway. Investigation of this subject was continued on June 7 when Leroy T. Harkness, assistant counsel, for the commission, was called. Dr. Webber was again called and questioned in detail regarding items approved by the commission.

On June 8 Col. T. S. Williams, president of the Brooklyn Rapid Transit Company, and Sigfried Cederstrom, a real estate expert of the commission, were the principal witnesses. Public Service Commissioner Travis H. Whitney was called on June 9 and testified regarding the interest the city would have to pay on money it has pledged to contribute to the new subways as co-partner with the transit companies. Mr. Whitney was also questioned regarding the bonuses paid by the Interborough Rapid Transit Company.

On June 12 the Thompson legislative committee started an investigation of the proposed purchase by the city of twenty-nine parcels of land owned by the New York, Westchester & Boston Railroad for the White Plains Avenue extension of the dual subway system. Experts for the city in 1911 appraised the land at \$76,000, but the railroad demanded \$613,000 for it. After condemnation proceedings, the price was fixed at \$404,000. The city disputed the

award, however, and the matter was taken to the Supreme Court. Henry W. Mayo, an assistant Corporation Counsel, who was assigned in December, 1913, to bring proceedings to condemn the property, was also a witness.

The Thompson committee returned to the prior determinations account of the New York Municipal Railway on June 13 and questioned Howard Abel, comptroller of the Brooklyn Rapid Transit Company and the New York Municipal Railway.

TRENTON ARBITRATION DEADLOCKED

The arbitration between the officials of the Trenton & Mercer County Traction Corporation, Trenton, N. J., and the Amalgamated Association growing out of the discharge of ten conductors for alleged fare sniping, has been further delayed by the resignation of Harry Morgan, an arbiter appointed by the company. Mr. Morgan expressed the opinion that the third arbiter could not be agreed upon.

After Peter E. Hurley, general manager of the company, and C. Howard Severs made many attempts to select a third man to act with them as arbiter they decided to each name a man and have the two select a third to act with the first two arbiters. The third man was to have been named on the afternoon of June 12 by Luke B. Travers, an organizer of the American Federation of Labor, named by the union, and Mr. Morgan. Messrs. Morgan and Travers submitted a half dozen names as possible arbiters. One was a stockholder in the corporation, but neither man could agree on the selection and Mr. Morgan resigned.

The corporation then announced that it would ask the City Commission to act as a board of arbitration. The commission, at the beginning of the trouble, agreed to try and settle the differences between the company and men, but the union objected.

After the company had refused to accept United States Judge Rellstab, former County Judge F. W. Gnichtel and John A. Campbell, president of the Trenton Potteries Company, the union issued a statement claiming that the corporation was opposed to arbitration by individuals and wanted the City Commission to act. Mr. Severs afterwards sent for National Organizer Shea and he arrived at Trenton on June 14 for a conference with Mr. Hurley and Rankin Johnson, president of the company.

The present arbitration relates only to the reinstatement of the men discharged. The question of working conditions is to be dealt with separately. The men met on June 9 and hinted that another strike would occur before they would accept the open shop and sliding scale proposals submitted by the company. It is now regarded as likely, however, that the working agreement will also be arbitrated.

EXCEPTION TAKEN TO SERVICE ORDER

The Public Service Commission for the First District of New York has been served with a writ of certiorari, calling for a court review of its order of May 18, 1916, directing the New York & Queens County Railway to put on more cars and generally to improve the service on all of its lines. The writ was signed on June 6 by Supreme Court Justice Thomas F. Donnelly, in New York County, on motion of James L. Quackenbush, attorney for the company, who is also general attorney for the Interborough Rapid Transit Company, and is returnable in twenty days. The order of the commission followed hearings held in May, at which representatives of the Flushing Association, who had urged better service in Queens Borough, were present. After service of the order the company asked for a rehearing, stating that the order was unnecessary; that it was confiscatory; that it could not be complied with; that compliance would compel operation of single truck cars, which, it was stated, was inadvisable; that the company did not have sufficient crews to operate the increased service, and could not procure them in time. The petition further stated that the company had been operating under a heavy deficit since 1911, and that the order would compel the expenditure of more than \$10,000 a month for additional operating expenses. It also held that the order of the commission made inflexible rules for operation, and therefore deprived it of the operation of its own lines. It was also pointed out that under the new system the company would have to operate 227 cars, when it possessed only 226. The com-

mission, on June 1, denied the company's application for rehearing, and the answer of the company to this denial was the writ of certiorari.

In an effort to get quicker results in these cases, the commission caused to be introduced in the last session of the Legislature a bill amending the public service commissions law, so as to provide that a writ of certiorari shall not be issued to review orders of the commission fixing rates or prescribing additions to or changes in plant, equipment or service. A compromise bill, aiming to hasten court procedure, was also introduced. The first bill was defeated, and the second made little progress during the session.

FULL BUFFALO WAGE SCALE

The new schedule of wages for the employees of the International Railway, Buffalo, N. Y., published in the ELECTRIC RAILWAY JOURNAL for May 27, page 1012, was not complete and moreover was not correct in all its details. The following is the scale of wages for motormen and conductors:

MAY 1, 1916, TO MAY 1, 1918	
First year.....	26 cents an hour
After first year.....	27 cents an hour
After second year.....	28 cents an hour
After third year.....	30 cents an hour
After fourth year.....	32 cents an hour
Fifth year and thereafter.....	33 cents an hour
MAY 1, 1918, TO MAY 1, 1919	
First year.....	26 cents an hour
After first year.....	27 cents an hour
After second year.....	29 cents an hour
After third year.....	31 cents an hour
Fourth year and thereafter.....	34 cents an hour

Shopmen, carhouse men, power house men, bridge and building department men, curve cleaners, switchtenders, receive an increase of 3 cents an hour for three years.

The rates of pay for engineers, conductors and brakemen operating freight service are to be as follows.

MAY 1, 1916, TO MAY 1, 1918			
	Engineers	Conductors	Brakemen
First year.....	31 cents	29 cents	27 cents
Second year.....	32 cents	30 cents	28 cents
Third year.....	33 cents	31 cents	29 cents
Fourth year.....	34 cents	32 cents	30 cents
After four years.....	35 cents	34 cents	31 cents
MAY 1, 1918, TO MAY 1, 1919			
First year.....	32 cents	30 cents	28 cents
Second year.....	33 cents	31 cents	29 cents
Third year.....	34 cents	32 cents	30 cents
Fourth year.....	35 cents	33 cents	31 cents
After four years.....	36 cents	35 cents	32 cents

STORMS DAMAGE RAILWAY PROPERTY IN FOUR STATES

Excessive rains and severe electric storms in Buffalo during the first week of June played havoc with schedules of city and interurban cars of the International Railway. The power generating plants at Niagara Falls were compelled to suspend temporarily several times. Floods in South Buffalo forced several lines to stop operating and in many sections high trailers attached to snow plows were used.

High waters of the Mississippi River are causing trouble to the Tri-City Railway, Davenport, Iowa. For the third time this year the water has rushed over a dam connecting Suburban Island, a pleasure resort, with the Iowa shore. The tracks of the company over the dam have been washed away twice and John G. Huntoon, general manager, expects that considerable reconstruction will be necessary. On June 9 the river was far above normal and traffic had to be abandoned. The river will probably not recede for at least a week, and it will be necessary to rebuild a part of the dam and replace the tracks washed away.

A heavy rainstorm tied up the Peoples' Railway and the Ohio Electric Railway for some time on June 2. The storm did considerable damage near Dayton and Xenia.

Nearly a mile of track of the Toledo Beach line of the Toledo Railways & Light Company was washed out by the heavy rollers of Lake Erie during a storm there on June 7.

Although the recent tornado in Arkansas caused considerable damage in Hot Springs, service on the Hot Springs Street Railway was interrupted for but three or four hours. The only damage done was to the power house stacks and the end of the boiler house roof.

Strike on Western Ohio Railway Averted.—Through the mediation of the Lima Chamber of Commerce and the Wapakoneta Business Men's Club, the threatened strike on

the Western Ohio Railway was averted on June 10. The company has entered into a contract giving the men a wage advance of 10 per cent. They will now be paid on a basis of 22 cents an hour for the first year, 24 cents for the second, 26 cents for the third and 30 cents for the fourth and thereafter.

Iowa Electrification Plans Delayed.—In a statement made on June 9, E. H. Ryan, president of the Muscatine North & South Railway, a steam line between Muscatine and Burlington, Iowa, explains that the delay in the reorganization of the road has been due to the inability of the company to perfect arrangements to finance the proposed plan. The company will reorganize and convert the road into an electric line. A meeting of the directors had been called for June 1, but lack of developments resulted in the postponement of the meeting.

New Wage Agreement in Tri-Cities.—The Tri-City Railway has closed a new three year contract with its men in Davenport, Rock Island, Moline and Muscatine. More than 600 men are affected. An increase of 2 cents an hour in wages is granted. The new maximum for the first year of the agreement is 31 cents an hour for men in the service three years or over, 28 cents for the men in the service two years and 26 cents for beginners. The second year the range is 32 cents, 29 cents and 27 cents. The third year it will be 33 cents, 30 cents and 28 cents.

Norfolk Franchise Ready for Councils.—The committee of ten and the officials of the Virginia Railway & Power Company, Norfolk, Va., who have been considering the new franchise for the company have held several conferences and have changed the wording of some of the provisions of the tentative grant. A question arose in regard to the term "physical connection" in the provisions covering transfers between various lines. An agreement was reached on this and the franchise is now ready for action by the Councils. No date has been set for a meeting.

Preparedness in New England.—At the last meeting of the New England Railroad Club a committee of five was appointed to see what could be done to assist in solving the problem of mobilizing troops, equipment and supplies in that section of the country. The committee is authorized to confer with the railway operating associations and railroad clubs, with the General Staff of the War Department and such other organizations as may be deemed advisable. The results of the committee's work are to be placed in the hands of the executive committee of the club not later than the October meeting.

Municipal Railway Employees Seek Increase in Pay.—An increase of 5 cents an hour in pay has been asked by the platform men employed on the San Francisco (Cal.) Municipal Railway. The pay of the men at present is 37½ cents an hour and they are permitted to work only eight hours a day. While the exposition was open and business was heavy the men worked seven days a week. When the exposition closed and some of the cars were taken off the runs the men were reduced to six days a week work. The charter provides that city employees cannot be paid more than the limit of wages for like employment elsewhere.

Effort to Attack Kansas City Franchise Fails.—The Supreme Court of Missouri has denied the application of certain citizens of Kansas City, Mo., for a mandamus to compel Judge Slate of the Cole County Circuit Court to take up their appeal from the ruling of the Public Service Commission in respect to the Kansas City Railways. The commission had issued a certificate of necessity for the steps under the reorganization plan, and had in effect approved the franchise. The petitioners hoped through the court proceedings to secure a finding adverse to the franchise. The action of the Supreme Court eliminated the only remaining effort to cloud the franchise.

Annual Banquet Washington Stone & Webster Club.—The Stone & Webster Club of Washington held its annual banquet at the Hotel Washington Annex, in Seattle, on May 17. Frederick S. Pratt, chairman of the board of directors of the Puget Sound Traction, Light & Power Company, and vice-president of the Stone & Webster Management Association, was a special guest. The principal speaker of the evening was C. W. Howard of Bellingham. The following officers were elected by the club: G. A. Rich-

ardson, superintendent of the Seattle railway department of the Puget Sound Traction, Light & Power Company, president; Leslie Coffin, Bellingham manager; E. G. Barnes, Everett manager; L. H. Bean, Tacoma manager, and A. L. Kempster, Seattle manager of the Puget Sound Traction, Light & Power Company, vice-presidents; E. A. Batwell, re-elected secretary, and F. O. Straight, re-elected treasurer.

Removal of Receiver Urged in Strike Action.—A stockholders' action to remove Nathan A. Bundy as receiver of the Buffalo (N. Y.) Southern Railway is threatened by Charles M. Gaffney, as attorney for Henry Lein, a stockholder in the company. Mr. Lein and other stockholders who appeared before the special committee of the Board of Supervisors to inquire into the strike of platform men for union recognition and a wage increase, declared they had no objections to union recognition and urged the supervisors to force the receiver to concede certain demands of the men. It is costing the county \$200 a day to patrol the 27 miles of track between the Buffalo city line and Hamburg, Orchard Park and Ebenezer. A few cars have been operated by experienced crews willing to work at the old scale of wages.

Worcester & Warren Difficulties Settled.—The controversy on the Worcester & Warren Street Railway, Worcester, Mass., over wages has been settled, and a new schedule of pay dating from June 4 has been adopted. The local union at first asked for a sliding scale which ranged from 25 cents an hour for first-year men to 30 cents for men of five years or greater service. In reply to the original demands the company offered a schedule of approximately 10 per cent increases. Conductors, motormen, track oilers and carhouse employees will receive a 10 per cent increase. Motormen and conductors of more than two years' service will receive 25 cents an hour, 23.5 cents being granted to men between one and two years' service and 22.5 cents to first-year men. The officials of the union representing the men have stated that they are satisfied with the increase.

PROGRAM OF ASSOCIATION MEETING

Central Electric Railway Association

The full program for the summer meeting of the Central Electric Railway Association has been sent to members. As stated previously, the meeting will be held on the steamer South American, sailing from Toledo, Ohio, at 11 a. m. on June 27 and returning on June 30. The program committee has invited a number of notable and prominent electric railway officials from various sections of the United States to join the association for the meeting. Nearly all have accepted and will address the association at such times as will be arranged on board the steamer. Announcement will be made on the bulletin board. Subjects for addresses have not been requested or assigned. Entertainments will be provided by the supply men's committee. Arrangements have been made for the movement of two special cars from Indianapolis to Toledo. These cars will be at St. Joseph to take care of the party on the return trip after their arrival at Benton Harbor, Mich., at 11.30 a. m., June 30, and will probably leave St. Joseph after lunch, about 1.30 p. m., arriving at South Bend at 3 p. m., Goshen at 4.25 p. m., Peru at 7.10 p. m. The Ohio Electric Railway will have a car at Peru to meet these specials and take the Ohio people home via Fort Wayne, Lima and Springfield. It may be that the Union Traction Company of Indiana's car will return to Anderson via Tipton and Alexandria instead of coming through to Indianapolis. The Terre Haute, Indianapolis & Eastern Traction Company's car will return to Indianapolis. Arrangements have been made with the Western Union Telegraph Company for a representative to accompany the party to look after the telegraphic needs of those who take the trip.

Charles L. Henry, president of the American Electric Railway Association and past-president of the Central Electric Railway Association; Britton I. Budd, president of the Chicago Elevated Railroads; W. Kesley Schoepf, president of the Ohio Electric Railway, and Hugh M. Wilson, vice-president of the McGraw Publishing Company, Inc., publisher of the *ELECTRIC RAILWAY JOURNAL*, are a few of the men prominent in the industry who expect to participate in this trip.

Financial and Corporate

ANNUAL REPORTS

Havana Electric Railway, Light & Power Company

The comparative income statement of the Havana Electric Railway, Light & Power Company, Havana, Cuba, for the calendar years 1914 and 1915 follows:

	—1915—		—1914—	
	Amount	Per Cent	Amount	Per Cent
Gross earnings	\$5,541,302	100.00	\$5,396,713	100.00
Operating expenses and taxes	2,337,506	42.18	2,595,321	48.09
Net income	\$3,203,796	57.82	\$2,801,392	51.91
Other income	147,874	2.66	102,119	1.89
Gross income	\$3,351,672	60.48	\$2,903,511	53.80
Fixed charges	1,115,414	20.13	1,094,140	20.27
Surplus after charges.....	\$2,236,258	40.35	\$1,809,371	33.53

A summary of the operations of the various departments of the company also follows:

Department	Gross Earnings from Operation	Operating Expenses and Taxes	Per Cent of Gross Earnings	Net Earnings from Operation	Per Cent of Gross Earnings
Electric railway.....	\$2,907,143	\$1,299,216	44.69	\$1,607,926	55.31
Electric light.....	1,856,131	457,331	24.64	1,398,799	75.36
Gas	512,756	330,160	64.38	182,596	35.62
Stage lines	265,271	250,796	94.54	14,474	5.46
Total	\$5,541,302	\$2,337,506	42.18	\$3,203,796	57.82

For the railway there was a decrease of 2.84 per cent in passenger earnings and 0.27 per cent in total earnings. Operating expenses decreased 8.11 per cent and net earnings from operation increased 6.72 per cent. More than 6 miles of new track were laid during the year, and ten new standard passenger cars and two double-truck freight locomotives were finished in the shops. The earnings of the stage lines decreased 17 per cent because of the depression in tobacco manufacture and the exclusion of Spanish money from circulation. Trials of electric storage-battery vehicles are now being made, and the introduction of the new equipment is awaiting the results. The electric light and power output increased more than 12 per cent, as compared with 1914. Earnings increased 15.5 per cent, while operating expenses decreased 11.55 per cent, and net earnings from operation showed an increase of 26.8 per cent. In the gas department the net earnings were 10.6 per cent greater than in 1914, although the total earnings from operation showed only a small increase. The total expenditure for new construction during the year was \$1,258,091, consisting mainly in the continuation and completion of projects and work laid out in 1914.

Comparative statistics of operation for the railway department show the following results:

	1915	1914	Per Cent Change
Total number of passengers carried	54,304,079	55,893,367	-2.84
Passenger car-miles	11,000,775	10,778,706	+2.06
Passenger earnings	\$2,715,203	\$2,794,668	-2.84
Passenger earnings per car-mile.....	\$0.2472	\$0.2594	-4.70
Total earnings from operation.....	\$2,907,143	\$2,915,032	-0.27
Total operating expenses.....	\$1,262,393	\$1,373,937	-8.11
Total operating expenses per car-mile	\$0.1147	\$0.1275	-10.00
Operating ratio	43.42%	47.13%	-7.87
Net earnings from operation.....	\$1,644,750	\$1,541,094	+6.72

In spite of all efforts to develop traffic, it is again necessary to report a small decrease of railway earnings, the second time in the history of the company. The operating expenses, however, were decreased in greater proportion, so that the ratio between them was materially improved and the net earnings from operation increased 6.72 per cent. The deleterious effects of the European war appeared most clearly in this department, as the tobacco trades were greatly depressed by it and a very large number of the tobacco workers, who were regular patrons of the street cars, were without employment after August, 1914.

Another depressing influence was the appearance of some 1600 cheap automobiles, mostly Ford, which carried two passengers from place to place within the central district, an area about 1½ miles square (2.5 km. square), for 20 cents,

and additional passengers and for greater distances at fixed rates based upon a zone system. These vehicles forced most of the cabs out of business, while those which were left had to reduce their fare to 10 cents. This is the form in which the jitney reached Havana. It was really the cheap automobile taxicab common to European cities, and while it was undoubtedly a serious competition, especially in rainy weather, it was less destructive than the irresponsible 5-cent jitney buses in the United States.

In Havana gasoline, in less than barrel lots, has not sold below 33 cents per gallon during the last five years and now costs 38 cents. Lubricating oil pays 100 per cent duty, and repair parts and tires cost 50 per cent more than in the United States, while the automobile cabs pay a license of \$12.50 per year each and are subject to stringent police regulation. It seems probable that there are as many automobile taxicabs in service as can make a bare living, and any adverse changes in business affecting the patrons will leave a number without means of subsistence.

General business, other than tobacco, grew in prosperity as the year advanced, and the railway receipts reflected this, as may be judged by the record of passenger earnings in 1914 and 1915 by months, a decrease of \$10,062 in January having gradually grown into an increase of \$11,470 in December. The freight equipment had less work to do than in previous years, the locomotive-hours at 20,933 being a decrease of 29.4 per cent and the trailer-hours at 36,945, a decrease of 17.6 per cent, the ratio of the first total to the second being 56.5 per cent, as compared to 65.9 per cent in 1914.

Oakland, Antioch & Eastern Railway

The gross income of the Oakland, Antioch & Eastern Railway, Oakland, Cal., for the twelve months ended Dec. 31, 1915, amounted to \$607,951. The total operating expenses were \$416,765, being 68.8 per cent of the total operating revenue as compared to 73.3 per cent for 1914. The net operating revenue was \$188,651, and the gross income less operating expenses totaled \$191,186, or about 60 per cent of all interest charges. The details of these earnings are as follows: Passenger revenue, \$506,986; revenue freight, \$64,126; express and milk revenue, \$20,870, and revenue from all other sources, \$15,966. The number of passengers carried was 710,908, while the tons of freight amounted to 104,598 and the car mileage to 1,855,253.

In the preceding year the passenger revenue amounted to only \$391,523, and milk and express revenue to only \$10,196, these items in 1915 showing large increases of \$115,463 and \$10,674 respectively. During 1915 there were no construction projects along the line on account of conditions existing, and real estate development was almost at a standstill. The freight earnings showed a decrease of \$3,602 in 1915 over 1914. Included in the 1914 earnings, however, there was an amount of \$21,469, which covered the freight earnings on construction material shipped to the Sacramento Valley Electric Railroad.

It is said that the future freight of the company must necessarily depend mainly on standard shipments to the growing population along the line and of the farm products raised by them. The planting of sugar beets was experimented on in the neighborhood of Chipps Island with success, and the indications are that this industry will be a large freight producer. A considerable acreage will be planted this year between Sacramento and Chipps Island, and will bring a steady increase of freight. The company can also look forward to quite a substantial revenue from the rice industry, the development of which is starting.

During 1915 the Panama-Pacific International Exposition was held in San Francisco and considerable passenger business was derived from visitors. How much this benefited the road is largely problematical, as both the week-end and suburban business of the company showed a decrease over the previous year, although the number of people settling along the line is steadily increasing. This the company believes is explained by the fact that the largest tributary population of the line is in the Bay Cities, population of approximately 750,000 people. This population during the summer of 1915 did little traveling, spending time and money at the fair. The heavy increase in passenger earnings came from the northern and distant points.

REPORT OF MAINE COMMISSION

The Public Utilities Commission of Maine has just issued its first annual report for the period from Nov. 1, 1914, to Oct. 31, 1915. Besides a general description of the preliminary work accomplished by the commission during the year and the detailed policies to be pursued along certain lines, the report contains statistics for steam and electric railways for the year ended June 30, 1915, the data for other utilities being omitted for the reason that they did not begin their real year under commission rule until July 1, 1915.

The mileage of the electric railways at present operating in Maine amounts to 518.63 miles, involving a property investment of \$30,089,138. This total represents an increase of \$5,269,317 over the property investment as of June 30, 1914. In 1915 the companies paid in dividends \$402,797 on \$16,105,486 of capital stock, the rate, therefore, being 2.50 per cent, while in 1914 they paid dividends of \$341,599 upon \$14,105,686 of capital stock at a rate of 2.42 per cent.

For the sixteen reporting companies the total operating revenues for the fiscal year ended June 30, 1915, amounted to \$3,066,923, of which \$2,754,456 came from passenger traffic and \$228,934 from express and freight traffic. The total operating expenses were \$1,945,917, divided as follows: Way and structures, \$292,069; equipment, \$242,000; power, \$321,039; conducting transportation, \$749,069; traffic, \$41,176; general and miscellaneous, \$303,951, and transportation for investment (cr.), \$3,389. The net revenue from railway operations amounted to \$1,121,006, and the addition of net revenue from auxiliary operations brought

revenue of \$2,228,483. Taxes amounted to \$285,705 and non-operating income to \$53,441, so that the gross income was \$1,996,219. After the deduction of \$922,641 for interest, rentals and other charges, the net income totaled \$1,073,577. The business depression was reflected in the earnings of the subsidiaries for several months beginning with April, but conditions improved materially in the last few months of the year.

Cape Town Consolidated Tramways & Land Company, Ltd., Cape Town, S. A.—The profit and loss account of the Cape Town Consolidated Tramways & Land Company, Ltd., showed a debt balance of £816 for 1915, as compared to £1,894 for 1914. The operation of the tramways during the year resulted in a profit of £1,486, as compared to £1,521 in the previous year. The number of passengers carried increased 54,605 and the receipts £1,270, but the heavier cost of operation made the profit somewhat less than in 1914.

Chicago & Milwaukee Electric Railroad, Highwood, Ill.—The Chicago, North Shore & Milwaukee Railroad has been incorporated in Illinois with a preliminary capital of \$100,000 as the successor to the Chicago & Milwaukee Electric Railroad, recently sold at auction to the reorganization committee. The incorporators and first board of directors are: Archie F. Hopper, John Moran and Frank Stava, and E. L. White, Chicago; W. D. Johnston, Evans-ton; and Keith Richardson, La Grange.

Eastern Texas Electric Company, Beaumont, Tex.—The Eastern Texas Electric Company has declared an initial dividend of \$2 per share on the common stock, payable on

COMPARATIVE STATISTICS FOR MAINE ELECTRIC RAILWAYS FOR YEARS ENDED JUNE 30, 1914 AND 1915

Companies	Miles of Road Operated		Earnings from Operation Per Mile		Expenses of Operation Per Mile		Net Earnings from Operation Per Mile		Per Cent of Operating Expenses to Earnings	
	1915	1914	1915	1914	1915	1914	1915	1914	1915	1914
	Androscoggin Electric Company	29.80	31.99	\$2,839	\$2,791	\$1,537	\$1,636	\$1,301	930	54.00	58.62
Aroostook Valley Railroad	31.99	90.40	2,765	3,977	1,835	3,145	930	\$1,154	66.35	78.40
Atlantic Shore Line Railway	90.40	57.10	3,977	6,488	3,261	3,485	715	866	82.00	54.76
Bangor Railway & Electric Company	57.10	4.12	6,488	3,228	3,652	3,751	2,835	2,878	56.00	94.20
Benton & Fairfield Railway	4.12	7.61	3,228	9,049	3,094	6,251	133	230	95.86	69.00
Biddeford & Saco Railroad	7.61	7.00	9,049	5,641	6,817	4,006	2,232	2,806	75.00	74.00
Calais Street Railway	7.00	82.86	5,641	12,631	4,356	8,505	1,284	1,394	77.20	67.30
Cumberland County Power & Light Company	82.86	3.10	12,631	2,604	7,200	1,696	5,393	4,125	57.20	65.00
Fairfield & Shawmut Railway	3.10	155.14	2,604	4,286	1,534	2,833	542	908	73.86	66.12
Lewiston, Augusta & Waterville Street Railway	155.14	2.13	4,286	4,648	2,887	3,191	1,667	1,452	63.40	65.00
Norway & Paris Street Railway	2.13	29.80	4,648	5,087	3,449	3,191	1,198	1,895	74.21	51.74
Portland-Lewiston Interurban Railroad	29.80	5.72	5,087	1,644	667	1,643	890	31	42.82	98.14
Rockland, South Thomaston & Camden Street Railway	5.72	21.47	1,644	5,425	1,486	3,918	158	1,573	90.38	71.53
Rockland, Thomaston & Camden Street Railway	21.47	12.20	5,425	1,991	3,918	1,387	1,506	624	72.23	68.00
Somerset Traction Company	12.20	10.50	1,991	2,022	1,582	5,551	409	634	79.45	68.00
Waterville, Fairfield & Oakland Railway	10.24		2,022	8,717	2,022	9,630	2,781	4,078	68.09	57.64

the total to \$2,030,085. Taxes amounted to \$85,205, non-operating income to \$98,730 and deductions from income to \$1,414,161, so that the net income for the year was \$629,448.

The accompanying table gives the mileage, gross earnings from operation per mile of road, operating expenses per mile, operating ratio and net earnings from operation per mile for the years ended June 30, 1914 and 1915, for all the electric railways in Maine. It will be observed from the table that of the fourteen railways reporting for both 1914 and 1915, only three showed higher gross earnings from operation per mile in 1915 than in 1914 and only three showed higher net earnings per mile. Moreover, only three companies reported a better operating ratio in the last fiscal year. In general, the best showing seems to have been made by the Cumberland County Power & Light Company and the Lewiston, Augusta & Waterville Street Railway.

Alabama Traction, Light & Power Company, Ltd., New York, N. Y.—The total operating revenues of the Alabama Traction, Light & Power Company, Ltd., for the year ended Dec. 31, 1915, were \$1,014,345, of which \$86,349 came from the railway department. The operating expenses totaled \$402,908 for all departments and \$71,675 for the railway department. After deducting miscellaneous charges, the gross income before bond interest and depreciation amounted to \$650,360.

American Railways, Philadelphia, Pa.—The operating revenues of the American Railways subsidiaries for the year ended Dec. 31, 1915, totaled \$5,438,247, with operating expenses and depreciation of \$3,209,763, leaving net

July 1 to stock of record of June 16. The directors have also declared a semi-annual dividend of \$3 on the preferred stock, payable on July 1.

Helena Light & Railway Company, Helena, Mont.—The Helena Light & Railway Company is asking for tenders until July 6 through the Columbia Trust Company, New York, N. Y., for as many of its first mortgage 5 per cent bonds as will exhaust \$18,768 now available for the sinking fund.

International Traction Company, Buffalo, N. Y.—The International Traction Company, Buffalo, which suspended dividend payments on its 4 per cent cumulative preferred stock in June, 1910, has voted the payment of all of the 42 per cent back dividends due on its preferred stock. A large part of the \$5,000,000 preferred stock outstanding was recently exchanged for new 7 per cent preferred, which carries the accrued dividends with it. The payment of the remaining back dividends was made possible through the sale last April of \$1,050,000 6 per cent serial notes. The directors also voted an initial dividend of 1¼ per cent on the common stock and the regular dividend of 1¼ per cent on the first preferred stock and 1 per cent on the outstanding 4 per cent preferred stock. The dividends are payable on July 1.

Kansas City (Mo.) Railways.—The temporary bonds of the Kansas City Railways have been taken up and new bonds signed and issued. Practically every detail of the reorganization is now completed. Frank Hagerman, who has so large a part in the reorganization, has severed all connections with the company, and is no longer acting even in an advisory capacity. He may, it is said, retire soon from active practice.

Lisbon (Portugal) Electric Tramways, Ltd.—The result of the operations of the Lisbon Electric Tramways, Ltd., for 1915 was a profit of £59,917. During the year the tramways carried 67,101,249 passengers, as compared to 63,758,037 in 1914. Owing to the prevailing conditions, however, the abnormally high price of coal and other supplies, as well as the cost of labor, caused a considerable increase in expenses. The company also suffered from the heavy depreciation in exchange.

Newport News & Hampton Railway, Gas & Electric Company, Newport News, Va.—Allen & Peck, Inc., Syracuse, N. Y., have made an offer of \$30 a share to the syndicate which holds \$1,109,700 of the common stock of the Newport News & Hampton Railway, Gas & Electric Company. Allen & Peck have been operating the property for the owners for some years, and are also among the managers of the syndicate which holds the stock. Other syndicate managers are Alexander Brown & Son, Baltimore, and Brown Brothers & Company, New York. Participants have the option of taking the stock or accepting the offer. A voting trust for five years will be formed.

Northern Electric Railway, Chico, Cal.—The reorganization plan for the Northern Electric Railway was to come up for hearing before the California Railroad Commission on June 13. The plan was described in the *ELECTRIC RAILWAY JOURNAL* of Oct. 23, 1915. Signatures to the plan have been obtained from the holders of 80 per cent of the bonds, thus making it binding. John P. Coghlan, receiver of the company, has filed with the commission separate valuations for the Northern Electric Railway, Sacramento & Woodland Railroad, the Northern Electric Railway (Marysville & Colusa branch), the Sacramento Terminal Company and the Northern Realty Company. This report fixes the original cost of all the properties at \$11,999,640, and states that it would cost \$10,327,434 to reproduce the properties new. The present value, after depreciation, is fixed at \$9,238,917. The engineers of the commission are also at work on a valuation of the properties.

Oakland, Antioch & Eastern Railway, Oakland, Cal.—The pamphlet report of the Oakland, Antioch & Eastern Railway for the year ended Dec. 31, 1915, contained the following reference to the reorganization plan: "The financial plan suggested by the management and amended by the bondholders' committee in January, 1915, has been approved by the Railroad Commission with some slight modifications, and in so far as it applies to the bondholders has been declared operative. It is the desire of the company to have the plan regarding the stockholders' loan of \$3 a share made operative, as by this means it is expected that the necessity for any future assessments will be avoided. The present assessment of \$1.50 a share, which has been paid by a large majority of the stockholders, will be rescinded when the plan regarding stockholders' loan has been declared operative and the money so paid applied on account of the loan, but it cannot be rescinded until a very large percentage of the stockholders have agreed to the plan. The company has at this time issued a call for a payment by the stockholders of 50 cents a share, making \$2 in all, and the balance of \$1 will not be called for at this time. In accordance with the plan the stockholder receives notes for the money loaned, secured by bonds at 80, which is preferable to paying an assessment, where he receives no security whatever. The amount of money realized from this call of 50 cents has been very satisfactory, but before the directors take action on the rescinding of the assessment, it is necessary that more money be paid, and for this reason the stockholders who have signed the agreement and not paid the amount to the Union Trust Company are urged to do so, particularly those who have already paid the assessment of \$1.50, as by paying the 50 cents per share asked for they are put in the position of a secured creditor. With a proper response made to this request the assessment can be rescinded shortly and the plan will be declared operative, leaving the management at that time in a position to devote all its time and energy to increasing the business of the road for the benefit of all concerned."

Philadelphia (Pa.) Rapid Transit Company.—James G. Balfour has been elected a director of the Union Traction Company, succeeding George W. Elkins, resigned. John C.

Gilpin has been elected a director, succeeding Jacob S. Disston, resigned.

Rhode Island Company, Providence, R. I.—The Industrial Trust Company, the Providence Banking Company and Bodell & Company, Providence, are offering for subscription at 98½ and accrued interest, yielding 5.35 per cent, the unsold balance of \$1,000,000 of a total of \$1,662,000 of Rhode Island Company's 5 per cent five-year secured gold notes. The notes are dated March 1, 1916, are due on March 1, 1921, and are callable at 101 and interest. They are coupon notes in the denomination of \$1,000 and the interest is payable on March 1 and Sept. 1 at the office of the Industrial Trust Company, Providence, or the Old Colony Trust Company, Boston, Mass. The Industrial Trust Company is trustee of the issue. The notes are secured by the deposit of \$2,078,300 par value of stock of the United Traction & Electric Company, which is operated under lease by the Rhode Island Company.

Rome Railway & Light Company, Rome, Ga.—Spencer Trask & Company, New York, N. Y., are offering for subscription \$850,000 of first mortgage 5 per cent gold bonds of the Rome Railway & Light Company. The former first and consolidated mortgages of the company have been canceled and the new issue is a direct first mortgage. The new bonds are dated April 1, 1916, and will mature on April 1, 1946. Interest is payable in April and October at the office of the Fidelity & Columbia Trust Company, Louisville, Ky., trustee, and at the office of Spencer Trask & Company. The bonds are in the denomination of \$500 and \$1,000. The issue is redeemable in whole or in part at 105 and interest on any interest date on sixty days' notice. The authorized issue is \$3,000,000, of which \$2,150,000 are reserved to be issued for not exceeding 80 per cent of net cash cost of additional property or equipment.

Seattle, Renton & Southern Railway, Seattle, Wash.—Judge A. W. Frater, of the King County Superior Court, has entered an order confirming the sale of the Seattle, Renton & Southern Railway to the bondholders' committee, represented by John C. Higgins. He set June 10 as the last day for the receivers to file their final account, and June 19 for the final hearing on all matters pertaining to the receivership. W. R. Crawford, former president of the company, and attorneys for certain creditors, renewed objections to signing the order.

South Carolina Light, Power & Railways Company, Spartanburg, S. C.—The gross earnings of the South Carolina Light, Power & Railways Company for 1915 were \$444,563, including inter-company departmental items amounting to \$40,744, while the operating expenses and taxes, including a like amount, totaled \$211,101. Interest on funded debt amounted to \$150,000, and dividends of \$42,000 were paid on the preferred stock, leaving a surplus of \$41,462. The company expended \$84,616 for additions and betterments during the year.

Toledo Railways & Light Company, Toledo, Ohio.—The original plan of reorganization of the Toledo Railways & Light Company, underwritten by Henry L. Doherty & Company in 1912, provided that until Dec. 7, 1912, the owners of the capital stock of the Toledo Railways & Light Company might exchange their holdings for stock of the new company, namely, the Toledo Traction, Light & Power Company, without payment of any assessment. Most of the stockholders exchanged for the new securities, and for some time past there have been no privileges of exchange available to the original minority interests. On account of the numerous requests for this exchange, the company has again made available the original privilege for a limited time. Thirteen per cent of the original stock still remains to be converted under the plans.

United Railroads, San Francisco, Cal.—The San Francisco *Examiner* recently quoted Jesse W. Lienthal, president of the United Railroads, as follows in regard to the proposed readjustment of the finances of the company: "Out of courtesy to the Railroad Commission nothing will be given out until the application is formally filed. Further than to say that the underlying bondholders are fully protected by the plan, I cannot yet discuss their status."

DIVIDENDS DECLARED

California Railway & Power Company, San Francisco, Cal., quarterly, 1 3/4 per cent, prior preferred.
 Duluth-Superior Traction Company, Duluth, Minn., quarterly, 1 per cent, preferred.
 Eastern Power & Light Corporation, New York, N. Y., quarterly, 1 3/4 per cent, preferred.
 El Paso (Tex.) Electric Company, 3 per cent, preferred; 2 1/2 per cent, common.
 Illinois Traction Company, Peoria, Ill., quarterly, 1 1/2 per cent, preferred.
 International Traction Company, Buffalo, N. Y., quarterly, 1 1/4 per cent, 7 per cent first preferred, quarterly, 1 per cent, 4 per cent second preferred; 42 per cent on account of accumulated dividends on the 4 per cent second preferred; 1 3/4 per cent, common.
 Manila Electric Railroad & Lighting Corporation, Manila, P. I., quarterly, 1 1/2 per cent.
 Nashville Railway & Light Company, Nashville, Tenn., quarterly, 1 1/4 per cent, preferred.
 Springfield Railway & Light Company, Springfield, Mo., quarterly, 1 3/4 per cent, preferred.
 Tri-City Railway & Light Company, Davenport, Iowa, quarterly, 1 1/2 per cent, preferred; quarterly, 1 per cent, common.
 Union Traction Company, Philadelphia, Pa., \$1.50.
 United Light & Railways, Grand Rapids, Mich., quarterly, 1 1/2 per cent, first preferred.
 United Traction & Electric Company, Providence, R. I., quarterly, 1 1/4 per cent.
 West End Street Railway, Boston, Mass., \$2, preferred.
 West India Electric Company, Ltd., Kingston, Jamaica, quarterly, 1 1/4 per cent.

ELECTRIC RAILWAY MONTHLY EARNINGS

AURORA, ELGIN & CHICAGO RAILROAD, WHEATON, ILL

Period	Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., April, '16	\$154,830	\$100,685	\$54,145	\$42,112	\$12,033
1 " " '15	142,011	96,837	45,174	40,039	5,135
10 " " '16	1,618,791	1,037,988	580,803	407,831	172,972
10 " " '15	1,653,820	1,061,363	592,457	398,809	193,648

CLEVELAND, PAINESVILLE & EASTERN RAILROAD, WILLOUGHBY, OHIO

1m., Apr., '16	\$34,436	\$20,223	\$14,213	\$11,463	\$2,750
1 " " '15	30,151	*18,266	11,885	10,961	924
4 " " '16	127,792	*76,992	50,800	44,621	6,179
4 " " '15	113,037	*69,126	43,911	43,779	132

CUMBERLAND COUNTY POWER & LIGHT COMPANY, PORTLAND, ME.

1m., Apr., '16	\$211,944	*\$134,794	\$77,150	\$66,287	\$10,863
1 " " '15	186,786	*111,821	74,965	70,403	4,562
12 " " '16	2,717,239	*1,591,665	1,125,574	798,254	327,320
12 " " '15	2,543,812	*1,437,484	1,106,328	762,960	343,368

HUDSON & MANHATTAN RAILROAD, NEW YORK, N. Y.

1m., Apr., '16	\$503,689	*\$209,981	\$293,708	\$214,117	\$79,592
1 " " '15	465,488	*190,929	274,559	211,748	62,811
4 " " '16	1,981,711	*857,506	1,124,205	853,982	270,223
4 " " '15	1,861,907	*777,400	1,084,507	844,852	239,655

INTERBOROUGH RAPID TRANSIT COMPANY, NEW YORK, N. Y.

1m., May, '16	\$3,231,007	\$1,227,271	\$2,003,736	\$1,191,140	†\$873,561
1 " " '15	2,904,773	1,009,935	1,894,838	1,092,041	†786,463
11 " " '16	32,933,751	12,832,558	20,101,193	12,561,738	†8,067,913
11 " " '15	30,744,299	11,881,198	18,863,101	11,958,814	†7,470,966

NASHVILLE (TENN.) RAILWAY & LIGHT COMPANY

1m., Apr., '16	\$193,641	*\$113,361	\$80,280	\$42,815	\$37,465
1 " " '15	176,040	*103,949	72,091	41,992	30,099
12 " " '16	2,207,502	*1,358,923	848,579	514,503	334,076
12 " " '15	2,216,599	*1,294,976	921,623	491,119	430,504

NEW YORK & STAMFORD RAILWAY, PORT CHESTER, N. Y.

1m., Apr., '16	\$27,135	*\$24,098	\$3,037	\$7,979	†\$14,903
1 " " '15	25,507	*23,246	2,261	7,975	†15,691
10 " " '16	308,865	*251,796	57,069	79,939	†22,361
10 " " '15	308,567	*255,950	52,617	79,060	†26,070

NORTHERN OHIO TRACTION & LIGHT COMPANY, AKRON, OHIO

1m., Apr., '16	\$399,830	\$238,484	\$161,346	\$49,696	\$111,650
1 " " '15	279,281	183,538	95,743	51,423	44,320
4 " " '16	1,518,582	908,372	610,210	207,333	402,877
4 " " '15	1,101,351	709,451	391,900	204,438	187,462

PORTLAND RAILWAY, LIGHT & POWER COMPANY, PORTLAND, ORE.

1m., Apr., '16	\$447,967	*\$250,968	\$196,999	\$181,537	\$15,462
1 " " '15	442,526	*248,634	193,892	182,985	10,907
12 " " '16	5,458,582	*3,065,985	2,392,813	2,203,132	189,681
12 " " '15	5,886,595	*3,182,996	2,703,599	2,202,489	501,110

VIRGINIA RAILWAY & POWER COMPANY, RICHMOND, VA.

1m., April, '16	\$475,699	\$222,973	\$252,726	\$147,578	†\$113,092
1 " " '15	410,943	201,145	209,798	136,903	†80,404
10 " " '16	4,682,348	2,190,971	2,491,377	1,449,335	†1,121,486
10 " " '15	4,271,726	2,060,011	2,211,715	1,362,487	†916,558

*Includes taxes. †Deficit. ‡Includes non-operating income.

Traffic and Transportation

ALBANY BUS PETITION DENIED

Commission Denies Petition That Would Permit Direct Competition with Electric Railway

The application of Chauncey L. Butler and George W. Gallien, Jr., for a certificate for the operation of a motor bus line from the railroad station in Albany, N. Y., to West Albany via Washington Avenue and Allen Street was denied by the Public Service Commission for the Second District of New York, on June 9. The commission decided that while public convenience might, to some extent, be served by the line, no proof of the necessity of it had been presented. The order of the commission recites that while the primary purpose of the line is to serve the people of the village of West Albany, it is admitted that it cannot be operated profitably unless it is permitted to take passengers through Albany, where by its franchise such business is limited to the part of the route west of the intersection of Central and Washington Avenues. The order shows that in the territory to which the line is restricted by franchise in Albany, it would be only 150 ft. from Central Avenue at Northern Boulevard, 450 ft. at Lexington Avenue, 500 ft. at Robin Street, 700 ft. at North Lake Avenue, and about 1000 ft. for the rest of the distance up Washington Avenue, while throughout this latter stretch the line would run through vacant lots. The only built up territory where the line would not be close to existing electric railway facilities, according to the order, is that part of Allen Street immediately about the corner of Washington Avenue. The order then says:

"The interested parties agree that the bus line could not live if it were restricted to the West Albany traffic and to the carrying of passengers to and from the section bounded by North Allen Street, Lincoln Avenue, Kent Street, Ontario Street, and Lancaster Street. Every passenger that it would obtain outside of these limits would be taken directly away from the lines of the United Traction Company beyond question.

"All of the evidence shows that the bus line would be a convenience but that it is not an actual necessity because people along the route which it would traverse can reach the lines of the United Traction Company with some slight inconvenience, and that inconvenience only exists to a notable degree in the section along Allen Street, between Lincoln Avenue and Allen Street.

"From the facts and the evidence presented to the commission it is apparent that public convenience and necessity do not require the granting of this application because the public along the proposed route of the bus line is now served by the United Traction Company fairly well. To grant this application would be to deprive the existing carrier, upon which the public depends, of the traffic which it is now enjoying, a substantial portion of which it would be necessary for the competing carrier to obtain in order to earn a sufficient revenue to pay its operating expenses.

"The result of granting such a certificate might be to deprive the public of the service which it is now getting from the United Traction Company lines in this section of the city, which would surely happen if its revenues should fall off to the point where it would be necessary to reduce the service. That this would not meet with the approval of the public goes without saying, as it expects service regularly each and every day in the year under all conditions. It has been repeatedly demonstrated that the way to accomplish better service from public utilities is not by introducing competitors into the field, as sooner or later one or the other is forced out of business, and the public always pays all the expenses incident to any such experiment."

The protest of the United Traction Company against the application for bus rights in this instance was referred to previously in the ELECTRIC RAILWAY JOURNAL of June 3, page 1064.

COLLISION ON NEW YORK ELEVATED

Company Spending \$1,400,000 for Signals—Review of Negotiations With Commission Over Signal Protection

One man was killed and eleven persons were seriously injured as a result of a rear-end collision on the afternoon of June 8, between two south-bound elevated trains on the Third Avenue line of the Interborough Rapid Transit company, New York, N. Y., just north of the 149th Street Station. About thirty other passengers were slightly injured. Following the accident the Coroner's office in the Bronx ordered an investigation.

Frank Hedley, vice-president and general manager of the company, after making a preliminary examination issued a statement in which he said:

"There were no defects in the equipment and the conditions surrounding operation at that point were precisely as they have been for a great many years. The trains on the Third Avenue line are not controlled by automatic block signals at present and the signal which separated the train which was run into from the following train was a signal which is never used except to hold Third Avenue trains when a train from the West Farms branch is coming in on the Third Avenue line. It should be stated that the directors of the company some five or six months ago authorized the installation of automatic block signals and automatic stops on all curves on the elevated railroad, and that these signals and stops are being put in place as rapidly as possible. To install automatic block signals and stops on all the straight line, as well as curves, of the elevated structures would reduce its carrying capacity 20 to 25 per cent. We have always felt, therefore, that the most satisfactory method of operation was to choose competent motormen and rely upon their judgment in keeping sufficient headway between themselves and the train preceding."

On June 9, Theodore P. Shonts, president of the Interborough Rapid Transit Company, authorized a statement in part as follows:

"Comment upon the unfortunate accident on the Third Avenue Elevated Railroad indicates a widespread opinion that automatic signals and train-stopping devices should be installed on all the tracks of the elevated railroad, so as to make such an accident absolutely impossible.

"Local trains on the elevated are being operated in precisely the same manner as locals in the subway. There are no signals, except on curves on local tracks in the subway, and the dependence is solely upon the care and judgment of motormen. These men are carefully picked and trained, and they have the supreme motive of their own safety to intensify their sense of responsibility. Express tracks in the subway are equipped with automatic block signals and train-stopping devices.

"We are now spending \$1,400,000 in adapting to the use of the elevated lines automatic signals and train-stopping devices on the express tracks, at all switch points, and on curves on local tracks where the motorman cannot for a safe distance obtain a clear view of the track ahead of him.

"It would be possible, of course, to install automatic signals and train control devices on all tracks. The expense involved does not seriously concern us. We are prepared to go to any expense to insure the safety of the people who travel on the elevated and subway.

"The fact is, however, that the art of train control has not yet developed any automatic system which would make possible the expeditious operation of the number of trains necessary to handle the crowds on such lines as the local tracks of the Third Avenue Elevated.

"If any automatic train-stopping device now known were to be installed the inevitable result would be the cutting down of the capacity of the elevated by fully 25 per cent. If anybody can develop a signal system which will promote safer conditions than those under which we are now operating, we will spend all the money necessary to install it. But such a signal system must be one under the operation of which we can perform the transportation service which the people of New York demand."

The Public Service Commission as long ago as April of last year directed the Interborough Company to equip its elevated lines with "a system of signals capable of prevent-

ing collisions, the system to be so designed as to permit the operation of their tracks to their maximum capacity." A trial installation was to be made by Oct. 1, 1915, and the results submitted to the commission by June 1 of this year. Hearings were held by the commission and many reports were received supporting the company's contention that the signal art had not yet perfected a system which would meet the requirements of the commission. As a result the original order was modified to provide for a signal system which should "afford protection against collisions and at the same time reduce the capacity of the lines as little as possible." Tests were ordered made on these lines and a report submitted by March 1 next. At a hearing on April 24 Mr. Hedley testified that he believed it was unwise to decrease the present factor of safety by experiments. He said the company was spending \$1,000,000 to equip the elevated third track and all tracks at curves and interlocking points with the signal system employed in the subway. The commission took the matter under advisement then, but has taken no new action since the receipt, on May 4, of a formal notice from the company that it had begun the installation of the system advocated by Mr. Hedley.

NEW SERVICE ORDER IN MILWAUKEE

Will Be Temporary and Will Be Based on Headway and Not on Number of Passengers

On June 13 the Railroad Commission of Wisconsin handed down a decision in regard to the application of The Milwaukee Electric Railway & Light Company for an interpretation and modification of the general service order issued on Nov. 25, 1913. The commission states that it will issue a new service order based on a definite number of seats on each line passing a specified point or points in each direction instead of requiring a certain number of seats per 100 passengers. As the increase in service which the city desires to secure will depend in a measure upon the valuation of the property which is now in progress under the direction of the commission, the new order will be temporary only. While the new order will specify a definite number of seats, the number of seats required on any line will be determined by applying the standard for rush hour and non-rush-hour service specified in the original order of Nov. 25, 1913, to traffic checks which will be made from time to time under the direction of the commission. These standards specify sixty-seven seats for 100 passengers in the maximum half-hour of each rush period and 133 seats for 100 passengers in the non-rush-hour periods, with a gradual transition in the number of seats for 100 passengers from the maximum half-hour of the rush period to the normal non-rush ratio. A seat requirement will be determined separately for week days for Saturdays and Sundays.

The order of Nov. 25, 1913, defined a standard of service for half-hour periods. Instead of the half-hour period being used in this trial order, either one-fourth, one-half, three-fourths or one-hour period will be specified as best suits the requirements for any particular line and for any part of the day.

RECORD-BREAKING TRAFFIC ON BOSTON ELEVATED RAILWAY

Without a single accident to an individual on either the surface or rapid transit lines, the Boston Elevated Railway handled the heaviest volume of traffic in its history on May 27, the day of the Boston preparedness parade. The passenger revenue was \$68,559, and the greater portion of the traffic was handled between noon and midnight, as the parade did not start until 1 p. m. Nearly 1,000,000 passengers were handled by the Washington Street tunnel alone, another 250,000 being carried on the Cambridge subway and Atlantic Avenue elevated trains. A headway of one and a half minutes was maintained all day long in the Washington Street tunnel. At the Park Street subway station 35,000 persons were accommodated between 2 p. m. and 7 p. m., and 22,000 were handled at Scollay Square. More than 500,000 passengers patronized the stations in the Boylston Street, East Boston and Tremont Street subways. The

parade was somewhat shortened from its estimated length, and this threw an enormous burden of travel upon the company before the peak load of the early evening was expected; but by 8 p. m., about two hours after the parade ended, the streets of the downtown section presented their normal appearance. The underground lines proved of the greatest convenience to persons wishing to cross the route of the parade, and many paid fares simply to accomplish this more speedily than was possible on the surface. The downtown surface car service was withdrawn from many of its usual channels for about five hours. Two slight derailments were reported during the day on the surface lines. About 150 per cent of normal traffic was handled by the steam railroads entering Boston.

Jitney Zone Prescribed in Tulsa.—The City Commission of Tulsa, Okla., has enacted an ordinance barring jitneys from Main Street, the principal thoroughfare of the city. The ordinance was regarded as imperative owing to the congestion on Main Street caused by so many jitneys and other automobiles.

Reports Required on Turn Backs.—The Public Service Commission for the First District of New York has ordered that every street railway within its jurisdiction report daily the number of cars which are turned back before reaching the point indicated on destination signs carried by the car. The order will take effect on June 28.

Interurban Cars Run Express in Buffalo.—Interurban cars on the Buffalo & Niagara Falls division of the International Railway, Buffalo, N. Y., are being operated inside the Buffalo city limits express service. No stops are made to discharge local passengers outgoing, but stops are made to collect passengers bound for points north of the city line. A similar order was made effective on the Buffalo & Lockport division some time ago.

Another Railway Publication.—The British Columbia Electric Railway, Ltd., Vancouver, B. C., has begun the publication of a four-page paper of railway chat intended for circulation among the public. The paper is 4 in. wide by 7 in. high. It is still unnamed. Three prizes, \$15, \$10 and \$5, respectively, are offered for the most suitable suggestions for the baby. The first issue appeared on Friday, June 2. Nearly 25,000 copies were picked up by patrons by the night of June 3.

Seattle Committee Acts on One-Man Cars.—The franchise committee of the City Council of Seattle, Wash., by unanimous vote has recommended the passage of an ordinance which will permit the Puget Sound Traction, Light & Power Company to operate a one-man car on the Summit Avenue and the Twelfth Avenue lines, as an experiment. The committee, however, deferred action on the request of the Western Washington Power Company to operate one-man cars over the Greenwood lines of its system.

Preparations Made for Chautauquans.—Additional service has been put into effect from Westfield, N. Y., to points on Chautauqua Lake and southwestern New York by the Chautauqua Traction Company and the Jamestown, Westfield & Northwestern Railway. The latter company will shortly receive four new all-steel interurban cars which will be operated in express service from Westfield to Jamestown and other Chautauqua Lake points. Twenty-five Chicago-New York trains over steam lines will make daily stops at Westfield this season to connect with the electric railways to Chautauqua County summer resorts. An extensive advertising campaign is being carried on by the electric railways.

Wilkes-Barre Jitney Case Heard.—The Public Service Commission of Pennsylvania on June 13 sat in Wilkes-Barre, Pa., to hear the complaint of the Wilkes-Barre Railway against 500 jitney operators in the Wyoming Valley. The company alleged that the jitneys were competing illegally against a public service that was fully adequate as prescribed by law. The jitney operators contended that the jitneys were not competitors of the electric railway because they used gasoline. William D. B. Ainey, chairman of the commission, announced that a ruling would be made on the points of necessity and competition. In June two dozen other complaints were filed with the Public Service

Commission against jitneys operating in various parts of Pennsylvania without certificates of convenience from the commission, and they have been listed for action in conjunction with others from Scranton, Pittsburgh, New Castle and other places.

Service Standards Fixed for Baltimore.—The Public Service Commission of Maryland decided on June 13 to modify the tentative rules regarding standards of service for the United Railways & Electric Company, Baltimore. The original rules provided that the cars outside the down-town zone provide on Saturdays, Sundays and holidays after 1 p. m. an average of a seat per passenger during half hour periods. Under the amended rules the cars will be permitted to carry enough passengers to fill all seats and one for every 3 sq. ft. of unobstructed floor space. The commission refused to cancel the rule providing that when a car is filled to its capacity as set by the commission the loaded car must bear a "Full Car" sign. The question as to whether the sign should be placed on the front of the car was left to be settled by officials of the company and Bruce W. Duer, the commission's transportation expert. The company asked for the modification of the rule covering crowded cars on Saturday and Sunday afternoons and on holidays, because of the excursion crowds which must be handled. Mr. Duer considered the request a reasonable one and so told the commission. Because of the time required to have the "Full Car" signs made the commission fixed July 15 as the date for the rule to become effective.

Handling Berries at Louisville.—As a result of good work done by R. H. Wyatt, general freight agent of the Louisville & Interurban Railroad, Louisville, Ky., all berries shipped out of the berry-growing section centering at Middletown will be sold f.o.b. the cars of the Louisville & Interurban Railroad at Middletown. Heretofore all sales have been made f.o.b. Louisville, although the bulk of the fruit had been transported from Middletown to the city by the Louisville & Interurban Railroad. One result was to establish two buying centers for the same concentrated growing section, one in Louisville and the other at Middletown, about 14 miles out. Some growers hauled their produce by wagon to Louisville. Records kept of the prices and the manner in which the quality of the fruit was affected and displayed by Mr. Wyatt to the growers showed them conclusively that they could profit better by selling at the Middletown station. Both road and growers are best served that way. The usual plan is to load non-iced express cars of the electric line about 3 or 4 o'clock in the afternoon, and transfer to the iced refrigerator express cars of the steam roads in town. An hour serves to make the trip and transfer and the berries arrive in Chicago next morning "with the dew on." The annual crop in this instance does not amount to more than about fifty cars, but the idea would work as well with many times the quantity.

Protest Against Jitneys in Allegheny.—The Public Service Commission of Pennsylvania has under consideration the petition of the Allegheny Valley Street Railway, Tarentum, against forty jitney bus operators. The company claims that the buses have virtually become common carriers without the sanction of the commission, and that many of the jitneys are operating along the lines of the company, although the company is able to render adequate and convenient service. The jitney operators assert that the company has not maintained full schedule since the strike of its employees, declared last August. At a recent hearing O. P. Hess, superintendent of transportation of the company, described the topography of the district, the streets where both the cars and the jitneys operate, and testified as to the car schedules. J. C. Watt exhibited a number of photographs of jitneys with patrons standing on the running boards and sitting on the mud guards. H. S. Swift, treasurer of the company, declared that the deficit of the company was \$15,784 in 1914 and \$83,157 in 1915. The company then closed its case. A jitney operator who was formerly a conductor of the company said that following the strike the schedules became very irregular. He admitted that the buses and cars operated on the same routes in some places, but said that the jitneys took patrons wherever they cared to go. He hauled between 150 and 175 passengers daily.

Personal Mention

Mr. J. C. Donald has resigned as general superintendent of the Asheville Power & Light Company, Asheville, N. C.

Mr. James Hullett has been appointed general foreman at the shops of the Kentucky Traction & Terminal Company, Lexington, Ky., succeeding Mr. E. M. Carr, resigned.

Mr. George Carson, formerly claim agent of the Puget Sound Traction, Light & Power Company, Seattle, Wash., has been appointed claim agent of the Fifth Avenue Coach Company, operating buses on Fifth Avenue, New York, and controlled by the New York Transportation Company.

Mr. John Dickson has been appointed superintendent of motive power of the Spokane, Portland & Seattle Railway, Oregon Trunk Railway, Pacific & Eastern Railway, Oregon Electric Railway, United Railways and Spokane & Inland Empire Railroad, with headquarters at Portland, Ore., the position of general master mechanic being abolished.

Mr. Rufus Moses, formerly freight agent of the Mahoning & Shenango Railway & Light Company at Sharon, Pa., has joined the main office force of the company as traffic agent, a new position in which he will have immediate jurisdiction over the freight department and other traffic matters. Mr. Moses has been with the company for several years.

Mr. John D. Sallee, for the last twenty-six years connected with the Kentucky Traction & Terminal Company, Lexington, Ky., and its allied interests, much of the time as general freight agent, has resigned, to leave active business life. Mr. Sallee is succeeded by Mr. J. J. Bonfoeld, who for twelve years has been local freight agent of the company.

Mr. W. F. Heinemann, for the last three years superintendent of overhead and block signals of the Kansas City, Clay County & St. Joseph Railway, Kansas City, Mo., has also been placed in charge of the power department. This department has been under Mr. J. N. Spellman, master mechanic, whose duties have been increased with the growth of the road and of business. Mr. Heinemann was formerly connected with the Des Moines (Iowa) City Railway.

Mr. C. H. Kretz, who has been elected president of the Gas, Electric & Street Railway Association of Oklahoma, is general manager of the Okmulgee Ice & Light Company. Mr. Kretz is a native of Louisiana and was educated at his State university and at Cornell. Upon graduation at the latter institution he was commissioned an engineering officer in the United States Navy with the rank of ensign, and served during the Spanish-American war. In 1899 he was appointed assistant professor of mechanical engineering at Louisiana State University and served the institution for seven years as a member of its faculty. The next four years were spent as the manager of Baton Rouge Electric & Gas Company, Baton Rouge, La. Later he was appointed manager of the Beaumont (Tex.) Traction Company.

Mr. Walter M. Brown, whose appointment to the Seattle, Renton & Southern Railway, Seattle, Wash., was noted in the ELECTRIC RAILWAY JOURNAL of June 3, will probably be made general manager of that company. Mr. Brown entered railway work with the St. Louis division of the Cleveland, Cincinnati, Chicago & St. Louis Railway in September, 1899. He served as freight and passenger brakeman and later was promoted to freight conductor, which position he held until September, 1904, when he resigned to enter business for himself. In February, 1907, Mr. Brown accepted employment in the train service of the St. Louis division of the Illinois Traction System. He was later appointed dispatcher and chief dispatcher, resigning on March 1, 1909, to accept a position as superintendent of railways with the Central Illinois Public Service Company and the Central Illinois Traction Company with headquarters at Mattoon, Ill. On Feb. 1, 1915, his jurisdiction was extended to cover the electric, gas, water and heat departments at Mattoon. It was from this position that he resigned on May 22 to assist in the management of the reorganized Seattle, Renton & Southern Railway.

Construction News

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

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

RECENT INCORPORATIONS

*Chicago, North Shore & Milwaukee Railroad, Chicago, Ill.—Incorporated at Springfield to purchase and operate the Chicago & Milwaukee Electric Railroad, recently sold at auction to the reorganization committee. Capital stock, \$100,000. Incorporators and first board of directors: Archie F. Hopper, John Moran, Frank Stava and E. L. White, Chicago; W. D. Johnston, Evanston, and Keith Richardson, La Grange.

Oil Fields Short Line Electric Railway, Oklahoma City, Okla.—Incorporated to construct a line from Peckham on the St. Louis & San Francisco Railway to Braman on the Santa Fé System, 16 miles. Plans are being considered to electrify the line. Capital stock, \$200,000. Incorporators: J. A. Frates, Sr., J. A. Frates, Jr., Roy Snyder, W. Mathews and J. H. Grant.

Carolina Rapid Transit Company, Clinton, S. C.—Incorporated to construct a line from Spartanburg to Clinton. Capital stock, \$50,000 minimum and \$3,500,000 maximum. Among the incorporators are: J. F. Jacobs, Clinton; W. C. Gray, Laurens; W. H. Gray, Woodruff; W. P. Patton, Cross Anchor, and R. P. Morgan, Union.

FRANCHISES

Martinez, Cal.—The Martinez & Concord Interurban Railroad has received a franchise from the City Council to construct the first unit of its main line to connect Martinez and Concord. [May 27, '16.]

Chicago, Ill.—The Chicago Surface Lines have received a franchise from the Council to construct lines on Canal Street from Kinzie Street to Archer Avenue and on Lake Park Avenue from Forty-seventh to Fifty-ninth Street.

Baltimore, Md.—The United Railways & Electric Company has asked the Council for a franchise to construct double tracks on Liberty Heights Avenue from Berwyn Avenue, Forest Park, to the Resterstown road.

Hamburg, N. Y.—The Buffalo Southern Railway has asked the Council for permission to extend its line through additional streets in Hamburg so as to accommodate the southerly section of the town.

Dayton, Ohio.—The Ohio Electric Railway has received a franchise from the Council to construct 1 mile of single track on Fourth Street from Main to Jefferson Street.

*East Cleveland, Ohio.—J. L. Free Land Company, 1004 Prospect Avenue, S. E., Cleveland, has received a franchise from the City Council of East Cleveland to construct and operate an electric railway on Noble Road.

Spokane, Wash.—The Spokane & Inland Empire Railway has received a franchise from the Council for the construction of an extension of its line on Grand Boulevard South from Thirty-third Avenue to the Palouse Highway.

TRACK AND ROADWAY

Birmingham Interurban Development Company, Birmingham, Ala.—Surveys have been completed of this company's line from the Warrior River at Nichols Fishtrap to Jasper, via Dora, Cordova and Flat Creek, about 28 miles. The company proposes to construct a line from Birmingham to Jasper, about 50 miles. W. W. Shortridge, Birmingham, secretary. [April 29, '16.]

Fort Smith Light & Traction Company, Fort Smith, Ark.—At a recent meeting of the City Council and a committee of the Chamber of Commerce, H. C. Hoagland, general manager of the Fort Smith Light & Traction Company, submitted and discussed a proposition made by the company for the extension of its carline to the Arkansas Zinc Smelting Company's plant now nearing completion. The offer made by the company was that the city of Van Buren

should pay for the grading and cost of constructing a roadbed, estimated at approximately \$2,500, and that the Fort Smith Light & Traction Company would charge a 5-cent fare from the city to the smelter, and vice versa. The proposed extension would be about one mile.

Pacific Electric Railway, Los Angeles, Cal.—Engineers for the Pacific Electric Railway have estimated the cost of constructing a loop in the business district of Pasadena to relieve congestion on Colorado Street at about \$35,000. Surveys will soon be made by the company for its proposed extension from Brea to Fullerton.

Municipal Railways of San Francisco, San Francisco, Cal.—The Board of Supervisors on June 5 upheld the Mayor's veto of the resolution providing for a car line across Golden Gate Park. In place of the cars the city may operate a line of automobile buses between the Richmond district and the Sunset section to be run in connection with the Municipal Railway.

Atlanta & Anderson Electric Railway, Atlanta, Ga.—Arrangements have been completed for financing this company's proposed line from Atlanta to Anderson, S. C., and it is expected that construction will be begun by Sept. 1. J. L. Murphy, Atlanta, is interested. [April 29, '16.]

Washington & Lincolnton Railroad, Washington, Ga.—A contract has been awarded to H. B. Hoppenbeitel Company, Macon, for grading 3 miles of this company's proposed line. The company proposes to construct a railway from Washington to Lincolnton. J. R. Dyson, Washington, president.

Rapid Transit Company of Illinois, Murphysboro, Ill.—A contract has been let by this company to William Martin, St. Louis, for the construction of this company's line from East St. Louis to Mount Vernon, via Chester and a spur from Steeleville to Murphysboro. The company is also contemplating the extension of the line from Mount Vernon to Vincennes. D. P. Roberts, East St. Louis, Ill., is interested. [March 4, '16.]

Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind.—This company reports that block signals are being installed on its interurban line between Terre Haute and Brazil. The contract has been let to the General Railway Signal Company.

Arkansas Valley Interurban Railway, Wichita, Kan.—It is reported that the Arkansas Valley Interurban Railway is negotiating for the purchase of the Southwestern Interurban Railway. With the acquisition of this line, a connecting line will be built between Wichita and Winfield, and when that is completed through cars will be operated from Hutchinson to Wichita, Winfield and Arkansas City. It is also proposed to construct an extension north to McPherson and Salina.

Wichita Railroad & Light Company, Wichita, Kan.—This company has announced that it may postpone indefinitely the erection of a permanent bridge over the Arkansas River, because of the difficulty in getting contractors to bid on it, in view of the uncertain quotations on steel.

Cincinnati, Newport & Covington Railway, Covington, Ky.—It is reported that this company contemplates the construction of several suburban extensions in the vicinity of Newport.

Worcester (Mass.) Consolidated Street Railway.—Plans have been practically completed for the construction of the \$3,500 concrete bridge on Elm Street, Millbury. The new bridge is to be of slab concrete construction and will replace the wooden bridge now across the Blackstone Canal. Work has been begun by the Worcester Consolidated Street Railway repairing the bridge on Providence Street over which the Blackstone Valley cars pass. The bridge is of wood and the underpinning and the street part of the bridge will be made stronger.

Electric Short Line Railway, Minneapolis, Minn.—It has been announced that the complete right-of-way has been obtained and grading begun on a 70-mile extension of this company's line from Hutchinson to Montevideo, via Clara City. H. F. Balch & Company, Minneapolis, has the contract for the grading. It is estimated that the extension will cost about \$1,000,000, and it is expected that the line will be completed within a year.

United Traction Company, Albany, N. Y.—Work will be begun at once by this company on the reconstruction of its tracks from Hoosick Street to First Street, Lansingburgh, with 14-lb. rails. The line is to be ballasted with rock.

New York Municipal Railway Corporation, Brooklyn, N. Y.—Bids will be received by the New York Municipal Railway Corporation until June 19 for furnishing and installing ducts and manholes. For further information apply to the chief engineer, W. S. Menden, 85 Clinton Street, Brooklyn.

International Railway, Buffalo, N. Y.—The Ontario Railway Board has asked the International Railway to reconstruct its tracks from Queen Street to the river dock in Queenston, and to supply additional safety switches and improve the grades and curves.

Little Falls & Johnstown Railroad, Little Falls, N. Y.—This company reports that franchises and rights-of-way have been secured for its proposed line from Little Falls to Johnstown, with branch to Fort Plain and Canajoharie, but construction has been postponed to avoid the high construction cost at the present time. J. Ledlie Hees, Forty-second Street Building, New York, president. [Dec. 28, '12.]

Interborough Rapid Transit Company, New York, N. Y.—Proposals have been invited for the construction of the 180th Street yard of Route No. 18, a part of the White Plains Road elevated extension of the Lenox Avenue branch of the first subway. The yard is to be located on city property. The general plan of construction calls for an elevated railroad yard, consisting of an embankment, the embankment being confined on the westerly, southerly and part of the easterly sides by retaining walls. The yard will have a capacity for about 275 cars. The work must be completed within twelve months from the delivery of the contract. The Public Service Commission for the First District of New York will open these bids on June 26. The commission has rescinded its action in awarding the contract for the construction of Route 31, the Livonia Avenue elevated extension of the Eastern Parkway subway in Brooklyn to Dennis Conners at \$1,376,122, and decided to reject all bids taken on this contract. The reason for the action of the commission was the effort to save money for the city in the purchase of structural steel.

Piedmont & Northern Railway, Charlotte, N. C.—Surveys have been begun by this company for the extension proposed to be constructed from Gastonia to Spartanburg, S. C., about 50 miles.

Ardmore (Okla.) Railway.—This company, which has recently been organized to take over the property of the Ardmore Electric Railway, will soon place the line in operation. The property will be put in first-class condition. Citizens of the Fourth Ward, southeast Ardmore, have offered a substantial bonus for an extension of the line to that section, and it is said the proposition is being considered by the company.

***Tulsa, Okla.**—The Tulsa Chamber of Commerce has under consideration a proposition submitted by promoters of an electric interurban line from Columbus, Kan., to Tulsa, Okla. John R. Ross, president of the company promoting the proposed interurban, conferred with officials of the Chamber of Commerce, asking a cash bonus of \$100,000, 10 acres as a site for terminals, a site for a downtown office and right-of-way from Tulsa to Collinsville. Under the proposition submitted, the company would erect a magnificent interurban terminal station at Tulsa, in which city shops and general offices of the line would also be maintained.

Ottawa (Ont.) Electric Railway.—This company plans to build a bridge at Rockliffe Park, to be of concrete and steel construction. The cost is estimated at \$6,000.

Toronto (Ont.) Suburban Railway.—The City Council of Toronto has decided to request the Toronto Suburban Railway to construct a line on Davenport Road east of Bathurst Street.

Sandwich, Windsor & Amherstburg Railway, Windsor, Ont.—This company reports that it will reconstruct about one-half mile of single track with double track on London Street between the Michigan Central Railway and Bridge Avenue, Windsor.

Portland Railway, Light & Power Company, Portland, Ore.—Under a plan adopted by the City Council, the Portland Railway, Light & Power Company will be compelled to stand 8 per cent of the cost of eliminating grade crossings along the line of the Oregon-Washington Railroad & Navigation Company's tracks, from the head of Sullivan's Gulch to the city limits, amounting to \$48,000.

***Hershey, Pa.**—It is reported that a new electric line to begin at Manheim, Pa., extending through the country district of Lebanon County, touching at Union Square, Mastersonville, Mount Gretna, Colebrook, Lawn and Bachmansville, is to be built in the near future. The M. S. Hershey Chocolate Company interests are among the backers of the project, which was first suggested by citizens from Manheim and Bachmansville. The Manheim people have agreed to build a line of about 16 miles if the Hershey interests will build a line from near Deodate, a distance of 2½ miles. A survey of the proposed route is now being made. The proposed line would connect near Deodate with a line extending from Hershey to Elizabethtown. The entire road will be operated when completed by the Hershey interests.

Port Jervis & Delaware Valley Railroad, Matomoras, Pa.—This company has been organized to construct a line from Matamoras to Milford. The stockholders authorized a bond issue of \$500,000, \$125,000 of which is to be used in the construction of the new road, the balance to be held in reserve for future extensions and development. The following officers were elected. J. A. Vandegrift, president; Alfred Marvin, Matomoras, vice-president; W. A. Cullen, secretary, and W. E. Soden, treasurer. E. E. Mandeville, president of the Port Jervis Light & Power Company, James S. Holden and J. H. Van Etten were also included in the board of directors. [March 25, '16.]

West Penn Traction Company, Pittsburgh, Pa.—It is reported that this company is contemplating the construction of an extension to Dunbar, via South Connellsville, bridging the Yough River at Fayette.

Rhode Island Company, Providence, R. I.—This company is relocating its tracks from the south side to the center of the County road at Hampton Meadows, Barrington.

Saskatoon (Sask.) Municipal Railway.—The City Council of Saskatoon plans to construct about 1200 ft. of double track to cost approximately \$8,600.

Carolina Rapid Transit Company, Clinton, S. C.—A report from this company states that plans are being made to begin construction within six to twelve months on its proposed line to connect Spartanburg, Woodruff, Union, Laurens, Clinton and Cross Anchor. A meeting will be held by the board of incorporators on June 20 for the purpose of considering bids for the preliminary survey of the various routes suggested. J. F. Jacobs, Clinton, president. [May 6, '16.]

Chattanooga Railway & Light Company, Chattanooga, Tenn.—This company is reconstructing its double tracks along Oak Street, Chattanooga.

Beaumont (Tex.) Traction Company.—Approximately \$100,000 will be spent by the Beaumont Traction Company within the next few months for improvements to its lines in Beaumont. The reconstruction and paving of 1½ miles of track on Magnolia Avenue will cost about \$68,000, and the reconstruction and paving of tracks on Emmett Avenue about \$11,000. The 1½-mile extension to the Magnolia refinery will cost about \$20,000. Work on these improvements will be begun immediately.

Corpus Christi (Tex.) Traction Company.—Work has been begun on the construction of this company's line from Corpus Christi to Ward Island, a distance of 12 miles, the track paralleling the shores of Corpus Christi Bay and penetrating a rich vegetable and grain producing section. The second line, upon which construction will be begun within twelve months, will extend west for a distance of 15 miles, its ultimate destination being Bishop. Electric cars will be operated for the passenger traffic and gasoline cars for the freight service. It is stated that an arrangement will be made with the Corpus Christi Railway & Light Company for the use of its lines within the city limits. At Ward Island the Corpus Christi Traction Company owns 2800 acres of land, surrounded on two sides by

Corpus Christi Bay and on the other sides by the Oso Arroyo, which will be converted into a summer amusement park. J. H. Caswell, Corpus Christi, general manager. [April 1, '16.]

Houston, Richmond & Western Traction Company, Houston, Tex.—Contracts are being placed by the Houston, Richmond & Western Traction Company for material for the construction of its proposed electric interurban railway between Houston and San Antonio. C. C. Godman, Kansas City, president. [May 13, '16.]

Seattle, Renton & Southern Railway, Seattle, Wash.—About \$225,000 will be expended on improvements to the Seattle, Renton & Southern Railway, which has recently been purchased by bondholders, represented by Peabody, Hough-teling & Company, Chicago.

SHOPS AND BUILDINGS

Waterbury & Milldale Tramway Company, Waterbury, Conn.—This company reports that contracts have been let for the construction of its new carhouse at Meriden and Frost Roads, Waterbury.

Springfield (Mass.) Street Railway.—This company is building a new operating house at Westfield to be used for storage and to take the place of its two old carhouses, which will be turned into repair shops. New machinery and equipment will be added.

Salem & Pennsgrove Traction Company, Salem, N. J.—This company, which is building a line between Salem and Pennsgrove, has prepared plans for the construction of a new carhouse. Stern & Silverman, Philadelphia, are engineers.

Waverly, Sayre & Athens Traction Company, Waverly, N. Y.—A report from this company states that it is now placing concrete floors and inclosed pits in its carhouse and is installing an electric car hoist purchased from the Columbia Machine Works & Malleable Iron.

Northern Ohio Traction & Light Company, Akron, Ohio. This company has awarded contracts for the steel work of its new terminal building on North Main Street to the McClintic-Marshall Company of Pittsburgh for about \$100,000. Contracts for the foundation and brick work will be awarded soon.

Nashville-Gallatin Interurban Railway, Nashville, Tenn.—It is reported that this company plans to construct an interurban station.

POWER HOUSES AND SUBSTATIONS

Morris County Traction Company, Morristown, N. J.—Plans are being made by this company to erect a new transformer station in the vicinity of Kenvil, with a new pole line to connect with the Dover transmission system.

Salem & Pennsgrove Traction Company, Salem, N. J.—Plans have been prepared by this company for the construction of a new brick and concrete power station. Stern & Silverman, Philadelphia, are engineers.

Columbus Railway, Power & Light Company, Columbus, Ohio.—On June 12 the City Council defeated the ordinance granting the company permission to build a power house on its property on the Scioto River bank, just north of West Broad Street. The Council took the ground that it should prevent the erection of permanent structures on the immediate river banks until the conservancy commission has established and promulgated definite flood prevention plans.

Cleburne (Tex.) Street Railway.—Superintendent Daniel DeWitt of the Cleburne Street Railway reports that the work of installing the rotary converter and building a feed line east of the Santa Fé tracks is going forward satisfactorily. The Texas Light & Power Company expects to cut the power in as soon as the converter is installed and the feed line built, which will enable the Cleburne Street Railway to operate its cars. This is expected to be done before July 1.

Houston, Richmond & Western Traction Company, Houston, Tex.—It is reported that a contract will soon be let by this company for the construction of a power station in connection with its proposed line between Houston and San Antonio. C. C. Godman, Kansas City, president.

Manufactures and Supplies

MAINTENANCE DEPARTMENTS BUSY ON REPAIR WORK

Although the demand for electric railway shop and car-house tools and machinery has been small during the past year compared with the tremendous flood of orders for machinery and machine tools from other manufacturing fields, particularly that of munitions, yet there has been considerable activity in this field. Indeed, according to the statements made by the manufacturers as a result of a large number of personal interviews and mail inquiries, the sales to electric railway companies have been at least as large as last year and in several instances there has been a marked increase. The cause is ascribed to the general industrial activity which means that the railways are doing a larger business, thus subjecting their equipment to severer service conditions. Consequently there has been an increase in the amount of maintenance work and machinery required to repair defective mechanical and electrical rolling-stock apparatus.

One company which manufactures both car hoists and jacks reports a relatively stronger demand for the former tool, the explanation being that the railways are becoming more impressed with the advantages of greater quickness and safety in making car repairs by lifting the car body off the truck by means of the car hoist rather than making use of the jacking-up process. There has also been an increased call for various types of apparatus used in repairing motors and rewinding motor coils. Such machinery as portable electric drills and grinders, certain resistance-type electric welding outfits and oil burners are finding a good market for track as well as for repair shop purposes. For indoor work, portable electric drills are said to be more in demand by carbuilding plants than by the shops of the railways themselves. A maker of oxy-acetylene apparatus for welding and cutting metals reports a steadily growing business in the Eastern railway field, with a prospect of continued growth during the next six months.

Owing to the high prices and difficulty of obtaining raw materials and also because of the overcrowding of factories with orders in general, 10 per cent advances in prices have been made by some of the larger electrical manufacturers who sell small motors for use with grinding wheels, small drill presses and air compressors, motor-generator welding sets, resistance grids and portable electric tools for use in electric railway repair shops. Prices of lathes, wheel presses and boring machines have also risen from 10 to 15 per cent within about a year. Some of the makers of welding and burner outfits have not yet raised their prices but are uncertain of their future ability to stand pat on account of the uncertain raw material situation. One of the chief manufacturers of electric drills and grinders has not changed, and does not contemplate any changes in, its prices on 500 to 600-volt machines, such as are customarily used in repair shops. On the other hand, another company, which makes similar tools for only 110 to 220 volts, is about to make an advance of 20 per cent in prices.

Deliveries of repair shop machinery, which are being much retarded at present by the difficulty in obtaining raw materials, seem to be suffering a great delay among the larger manufacturers of miscellaneous electrical apparatus. For example, small motors are taking eight to nine weeks to deliver and various kind of motor repair machinery about one month. The deliveries on 500, 550, and 600-volt drills and grinders for repair shops are taking from about one to three weeks; certain types of repair-shop lathes about one month. Wheel presses can be secured immediately from stock. The condition of deliveries on some of the larger forms of shop machinery are subject to great variation according to the present demand from other industries for the different types. On some grades reasonable shipments are possible while others which are popular with the general industrial fields cannot be obtained sooner than from two to six months. Deliveries on complete welding appa-

ratus, although varying a great deal in length of time, in some cases can be made from stock in a week or less. Prompt deliveries, although frequently non-obtainable, have lately been particularly urgent, owing to the fact that requisitions for new machinery made out by the railway maintenance departments are often being held up for some time before the expenditure is authorized, at the end of which time the need for the repair machinery has become extra pressing.

ROLLING STOCK

Sioux Falls (S. D.) Traction System has just purchased a new car.

Johnstown (Pa.) Traction Company recently lost one of its cars by fire.

Union Street Railway, New Bedford, Mass., expects to purchase twelve closed car bodies.

Des Moines (Ia.) City Railway has ordered two 1½-ton automobile trucks from the White Company.

Vicksburg Light & Traction Company, Vicksburg, Miss., has purchased one single-truck, double-end car, complete with equipment.

Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio, has ordered six 50-ft. interurban cars from the Cincinnati Car Company.

New York Central Railroad, New York, N. Y., will convert nineteen of its standard trail cars into motor cars, with field control motors, for the electric suburban service. This re-equipment will be made in addition to the purchase of twelve new 70-ft. motor cars which this company will order, as previously noted.

Toronto (Ont.) Civic Railway, noted in the ELECTRIC RAILWAY JOURNAL as having recommended the purchase of thirteen new cars from the Preston Car & Coach Company at a cost of \$4,907 per body, has had this recommendation accepted by the City Council, including also the following contracts for accessory equipment: trucks, Dawson & Company, price per set \$828.50; electrical equipment, Canadian Westinghouse Company, price, each, \$1,866; wire and cable, Eugene F. Phillips Electrical Works, Ltd., Montreal, per car \$123.17; fare boxes, Coleman Fare Box Company, each \$51.10.

New York State Railways-Rochester Lines are rebuilding forty double-truck cars for prepayment service. These cars are of the company "600" type. They are being lengthened from 46 ft. to 47 ft. 2 in., the additional length being due to the extension of the rear platform. The front platform has been altered by inclosing one side and adding a two-leaf, clear-glass folding door at the exit side. The rear platform has been equipped with a pair of two-leaf folding doors of the same type. The doors at both ends of the car are manually operated in connection with folding steps. The rear platform has no dividing rail. The cars will also be changed from double-end to single-end operation.

Kansas City (Mo.) Railways, noted in the ELECTRIC RAILWAY JOURNAL of May 13 as having ordered seventy-five closed prepayment cars from the St. Louis Car Company, has specified the following details for this equipment:

Seating capacity.....48	Window fixtures...Groove fixture
Total weight of car...37,700 lb.	Curtain material....Pantasote
Bolster centers, length, 19 ft. 7 in.	Destination signs....Hunter
Length over body...29 ft. 10 in.	Door-operating mechanism,
Length over vestibule, 43 ft. 10 in.	St. Louis
Width over sills.....8 ft. 6 in.	Hand brakes.....Peacock
Width over all.....8 ft. 8 in.	Heaters.....Consol.
Height, rails to sills.....31 in.	Headlights.....Golden Glow
Sill to trolley base...8 ft. 10¾ in.	Motors.
Body.....Semi-steel	4 G. E. 247, form D, inside hung
Interior trim.....Cherry	Registers.....International R-7
Headlining.....Agasote	Seats, St. Louis stationary, rattan
Roof.....Arch	Step treads...Universal anti-slip
Underframe.....Steel	Trolley catchers.....Earl
Air brakes.....G.E.	Trolley base.....U. S. 13
Axles,	Varnish.....Murphy
Jones & Laughlin cold rolled	Ventilators....St. Louis Special
Control.....K. 35-G 2	Wheels...Griffin, 30 in., cast iron
Couplers.....Railway Std.	
Curtain fixtures,	
Forsythe short tip, closed	

The general type of these new cars will be the same as the last order of fifty cars placed with the American Car Company, except that bulkheads on the cars now ordered will be of steel construction instead of wood, as in the previous order.

Reading Transit & Light Company, Reading, Pa., noted in the *ELECTRIC RAILWAY JOURNAL* of April 15 as having ordered fifteen semi-convertible motor cars from The J. G. Brill Company, has specified the following details for this equipment:

Seating capacity.....	52 Brakes.
Length of carbody over corner posts	33 ft. 10 in. Peacock; Brill patented ratchet handles of bronze
Length of each vestibule from end of car body to outside vestibule sheathing.....	5 ft. 6 in. Bumpers...Hedley anti-climbers
Length of car body over vestibules	44 ft. 10 in. Drawbars.....Brill radial Gongs.....Brill "Dedenda" Bells.....Brill bronze Trimmings.....Bronze
Length of car body over bumpers	46 ft. 1 in. Inside finish.. Cherry, stained dull Seats and backs.. Brill "Winner" Heaters.....Peter Smith
Width of car body over sills and sheathing.....	8 ft. 5 in. Headlights.....Crouse-Hinds Curtains.....Pantasote Sand boxes.....Brill "Dumpit" Body frame, Ash and yellow pine
Height from rail to top of floor, 3 ft. 5 1/4 in. Posts	Ash
Center to center of side posts, 2 ft. 5 in. Steps, Folding; Mason safety tread	
Height from rail to top of trolley board.....	11 ft. 10 3/4 in. Retrievers.....Ohio Brass Registers.....International Life guards.....H-B Signs.....Hunter Push buttons, Consol.; Farraday buzzer in vestibule
Radius of sharpest curve... 35 ft. Platforms, Window arrangement, Brill semi-convertible tandem sash	
Round-end; sheathed outside and inside with sheet steel	
Doors, Four-part folding; upper panels glazed	
Underframe.....Composite	
Bolsters....Truss; wrought iron	
Flooring, Motors.....GE-247-D Fixtures..Safety Car H. & L. Co. Air brakes.....G. E. Trucks, 27 M.C.B. 1 trucks, double; 6 ft. wheelbase; Brill half-ball brake hangers; Brill journal boxes	
Yellow pine; maple mat strips in aisle and on platform	
Roof, Brill plain arch; poplar covered with duck; concealed steel rafters	
Ventilators.....Railway utility	

TRADE NOTES

White & Kemble, New York, N. Y., have removed their office from 56 Pine Street to the Liberty Tower, 55 Liberty Street.

American Spray Company, Boston, Mass., has issued Bulletins Nos. 42 and 61 describing its spray air cooling and washing system for air entering generators and other machinery.

Scofield Engineering Company, Philadelphia, Pa., is preparing plans with DeArmond, Ashmead & Bickley, engineers and architects, for a new twelve-story office building and separate power house building for the Franklin Trust Company. Specifications for this undertaking will be ready about June 20.

F. R. Blair, formerly secretary, treasurer and sales manager of the S. K. F. Ball Bearing Company, has resigned to become president of the F. R. Blair & Company, Inc., with offices at 50 Church Street, New York. Mr. Blair is engaged in developing motor efficiency devices for use with automobiles.

G. C. Kuhlman Car Company, Cleveland, Ohio, on June 12 filed plans with the building commissioner at Cleveland, Ohio, for an extension to its plant on 140th street. It will be 442 ft. long and 81 ft. wide, and will contain 35,863 sq. ft. of floor space. The construction will be brick and steel and will cost about \$100,000.

Holden & White, Chicago, Ill., general sales agents in the United States for the Wasson Engineering & Supply Company, have received an order from the Des Moines City Railway for forty-one Wasson air retrieving trolley bases. These bases will be used on the new cars now being built for Des Moines by the McGuire-Cummings Manufacturing Company.

Roller-Smith Company, New York, N. Y., maker of electrical instruments and circuit breakers, has established another sales agency, namely, the Electrical Material Company, 589 Howard Street, San Francisco. The latter company will handle the Roller-Smith products in part of the States of California, Oregon and Idaho and the entire State of Nevada.

Graphite Lubricating Company, Bound Brook, N. J., has changed its name to the Bound Brook Oil-less Bearing Company. The change in name was made owing to the many misinterpretations as to the exact nature of this company's products. No change in organization has been made. The company manufactures Bound Brook graphite and bronze oil-less bearings and Nigrum-treated wood oil-less bearings, exclusively.

Union Switch & Signal Company, Swissvale, Pa., has put on the market a form of soldering paste known as "Union Soldering Paste" which is strictly non-acid and therefore free from ingredients which cause corrosion. This paste is particularly designed for making joints in signal wires. Its constituent parts are pure neutral salts in a solution held strictly to government specifications, and a pure high-grade hydrocarbon conveyor.

General Electric Company, Schenectady, N. Y., has received an order from the New York Central Railroad for twelve two-motor equipments of the GE-260 type, the motors having a rating of approximately 200 hp. P. C. control will be used with these equipments. This company has also received an order from the Connecticut company for thirty double-motor equipments and air brakes. The motors will be used with K control.

ADVERTISING LITERATURE

Norton Company, Worcester, Mass., has issued a catalog describing and illustrating the many and varied types of its grinding wheels and accessory machinery.

Roller-Smith Company, New York, N. Y., has issued Bulletin No. 200, which describes its portable direct-reading bond testers for testing the conductivity of rail bonds.

American Taximeter Company, New York, N. Y., has issued a booklet describing and illustrating its various types of "Superior" recording instruments for automobiles and trucks.

Alexander Milburn Company, Baltimore, Md., has issued a catalog describing and illustrating its oxy-acetylene welding and cutting apparatus, including welding torch, regulators, cutting torch and oxy-acetylene plants.

C. W. Hunt Company, West New Brighton, N. Y., has issued Catalog No. 15-3, which contains illustrations and complete descriptions of its standard types of gates or valves for controlling the flow of bulk materials. The dimensions are given on those which are more frequently used in power house and storage pocket design.

Hensley Trolley & Manufacturing Company, Detroit, Mich., has issued a forty-page catalog illustrating its facilities for manufacturing trolley wheels, harps, contact springs and washers, and setting forth the advantages of these Hensley products. This company advises that since the beginning of 1914, it has more than trebled the sale of its trolley wheels which necessitated quadrupling its plant floor space.

TRANSPORTATION PLANK IN REPUBLICAN PLATFORM

Planks from the Republican platform of interest to the electric railway transportation industry follow:

"Interstate and intrastate transportation has become so interwoven that the attempt to apply two, and often several, sets of laws to its regulation has produced conflicts of authority, embarrassment in operation and inconvenience and expense to the public. The entire transportation system of the country has become essentially national. We, therefore, favor such action by legislation, or, if necessary, through an amendment to the Constitution of the United States as will result in placing it under exclusive federal control.

"We believe in a careful husbandry of all the natural resources of the nation—a husbandry which means development without waste, use without abuse.

"We pledge the Republican party to the faithful enforcement of all federal laws passed for the protection of labor. We favor vocational education, the enactment and rigid enforcement of a federal child-labor law, the enactment of a generous and comprehensive workmen's compensation law, within the commerce power of Congress, and an accident compensation law covering all government employees. We favor the collection and collation under the direction of the Department of Labor of complete data relating to industrial hazards for the information of Congress, to the end that such legislation may be adopted as may be calculated to secure the safety, conservation and protection of labor from the dangers incident to industry and transportation."