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OPTIMISM AT C. E. R. A. MEETING

A striking feature of the annual meeting of the Central Electric Railway Association at Indianapolis last week was the expression of optimism which seemed to be there present. No one can deny that there are some dark spots in the electric railway business. During the past few years many electric railways have had a hard road to travel. The evidence of this is that capital for new railway enterprises is hard to obtain, and a number of strong operators and manufacturers who grew up in the industry have gone into other fields of endeavor. Perhaps one reason why the situation is as it is is that electric railway men themselves have held out no hope for improvement and thus have encouraged others to adopt the same mental attitude. While we believe the situation could be much better, we believe it is on the road to improvement. One encouraging feature, in our opinion, is that the public in general is beginning to understand that electric railway fares are now too low. Another is that there is greater recognition by the public of the necessity of a monopoly in urban transportation matters. These two facts, taken together, mean that while the former large profits are not now to be expected, the electric railway business in financing, operating and manufacturing still offers large opportunities, and these will probably increase rather than decrease in the early future.

THE BRADY MEDAL AWARD

The third recipient of the Anthony N. Brady memorial medal, awarded for meritorious achievement in promoting safety of public and employees, is the Connecticut Company, which thus takes its place in line with the Boston Elevated Railway and the Union Traction Company of Indiana. We understand that these awards were based upon not only the excellent showing made when the accident statistics of these companies were considered, but also fitly to recognize the comprehensive and intelligent effort which had been expended to reduce accident risks. The honors this year were divided with the Pacific Electric Railway, Los Angeles, Cal., and the Interstate Public Service Company, Indianapolis, Ind., both of which also made remarkable records. In due course we plan to give our readers a summary of the safety work of these companies, so that the reasonableness of the awards may be more apparent. For the moment we congratulate the recipients upon this recognition, and call attention to the fact that it is none too early to plan for the filing of credentials in preparation for the next award. For the companies receiving the award, the prestige and opportunity for local and general publicity which

it affords are well worth while. It is to be regretted that more companies do not place before the award committee the records of their safety work.

WHAT BAY STATE GAINS BY CAR REMODELING

The remodeling of 200 Bay State Street Railway cars to the modern fully-vestibuled type is in line with the general tendency throughout the country, but the use of pneumatic instead of manual control for the doors and steps is a most significant feature which calls for some comment. It is self-evident that for congested service, air operation of doors and steps should be the only thing to consider. However, when a railway with the cross-country and small town conditions of the Bay State practically standardizes on pneumatic control, there must be an expectation of certain substantial benefits, and we believe that these expectations will prove to be justified. In the first place, the comfort and safety of the passenger will be promoted. Who has not seen a vestibuled car running with doors open while the conductor was collecting fares and frigid zephyrs blew in on disgruntled riders? In the second place, it means a good deal to both conductor and motorman to be relieved of opening and closing doors hundreds of times a day. The conductor becomes a better fare collector and the motorman a keener operator. In the third place, the speedy opening and closing of doors will save an appreciable interval in the standing time of the car. When all the cars of a given route are equipped with air-operated control, this feature is sure to permit an increase in schedule speed, a decrease in number of cars required and more car-miles per platform man within the same working period. It is significant that this decision of the Bay State Street Railway has brought nothing but praise from the local press and this praise is well-deserved because it takes courage and foresight for a company in the financial position of the Bay State to blaze the way in car equipment progress.

STANDARDS NO BAR TO PROGRESS

In a paper read by A. L. Broomall last week before the Central Electric Railway Association and published elsewhere in this issue, emphasis was laid upon the inherently non-rigid nature of standards. It is an important point. The everlasting character that is frequently, and wrongly, ascribed to standard designs would, if it existed in fact, make each standard that was adopted an effective bar to progress along the line that it covered and would constitute an unanswerable argument against the principle of standardization. In practice, however, the purpose of establishing standards is not to deter original minds from trying anything

new, but rather to induce non-original minds (and these constitute a majority in every large industry) to adopt a standard design that differs only slightly from the ones they have been using. Axles for use with the small wheel offer a case in point. Admittedly, these additions to the axle standards are necessary, since the development of the small wheel is of incalculable benefit to the industry. At the same time their acceptance involves additional designs that must be turned out by the manufacturers and additional pieces that must be kept in stock by the railways or recognized by their repair-shop men. Superficially, this axle may seem to be a backward step and contrary to the ideal of standardization. But as a matter of fact the introduction of the new axles has added to the manufacturers' lists of designs not one-tenth part of the number that would have been added if no standard drawing had been adopted. And it has added appreciably fewer than the number that would be involved on any particular railway a few years from now, or after three or four different officials had successively introduced their pet ideas on axle design for the company's new small-wheel cars.

USES OF TRACK MAINTENANCE DATA

Last summer the *ELECTRIC RAILWAY JOURNAL* gave considerable space to articles and editorial comment on the subject of units for comparing track maintenance costs. The general consensus of opinion seemed to be that no present or prospective unit will permit a close comparison of these costs on different properties or on different sections of the same property, if the purpose of that comparison is to determine the relative effectiveness of the maintenance work in the two cases. It is not our present purpose to raise again the subject of units, although we appreciate the desirability of being able to do what the existence of the ideal unit would make possible. While the ideal unit is in the making, however, much can be done in the way of collecting and studying maintenance cost data or individual properties and in rendering the results of this work available for reference.

One of the most practical and comprehensive studies of costs of maintaining track in paved streets which we have seen has been under way in Brooklyn for the past ten years under the direction of C. L. Crabbs, engineer way and structure, Brooklyn Rapid Transit System. This work has now been described by R. C. Cram, of the same department, in an article published in this issue. The general plan employed in Brooklyn was briefly touched upon in a letter from Mr. Cram printed in the *ELECTRIC RAILWAY JOURNAL* for Aug. 26, 1916, page 363. He now goes into detail, giving complete data on a large number of track sections aggregating, in single-track length, nearly a hundred miles. His story speaks for itself and at the same time is suggestive along a number of lines.

In a letter printed in this paper last September C. G. Keen said that "the importance of any cost keeping is the end for which the costs are kept." With respect to

track maintenance this end in general appears to be two-fold. In the first place it is to determine when extensive repairs and replacements are necessary and a further use is to point out the weaknesses and strong points of various parts of the track structure and of the maintenance methods employed. A fairly sure indication of the condition of a piece of track, judged from the economic standpoint, is given by the average rate of expenditure upon it for maintenance purposes. There comes a time, however, when the cost of labor and materials will be so great as to offset the interest on reconstruction cost. Accurate cost records of reasonably small sections of track are therefore essential to effective maintenance. This latter point has been illustrated in Brooklyn and elsewhere in all cases where certain changes in construction were shown to be desirable by the rising barometer of maintenance costs. Excessive lightness of rail, imperfection in drainage, inadequacy of track foundation, etc., have all been indicated on this maintenance gage.

Whether way engineers will ever succeed in finding a unit of maintenance cost which is more rational than the present one of expenditure per mile or per foot per year is doubtful, but there is no question that they are laying a more scientific foundation for this maintenance work. This foundation will not only enable them to get the best possible return per dollar expended but will make their requests for maintenance appropriations more convincing. Rule-of-thumb methods are particularly out of place in the way department. The track not only represents an enormous investment, but its condition also reacts favorably or unfavorably upon the life of rolling stock and upon the comfort of the patrons. The latter, in turn, has an important effect upon the attitude of the public toward the management.

STANDARD CLASSIFICATION FOR TRUCKS

The suggestion for a standard classification or uniform system of symbols for identifying trucks, which was outlined by S. A. Bullock some time ago, and which subsequently has been discussed by a number of correspondents, is obviously a step in the right direction. With the growth of the industry different truck builders have elaborated their designs so that, at the present time, an expert is required to distinguish between the trade designations used by any one manufacturer, let alone the incomprehensible jumble of symbols presented before the railway man who has to consider the output of every truck builder in the market. Even the truck builders themselves are by no means certain as to the features described by competitors' trade names. In consequence, Mr. Bullock's suggestion has the very definite advantage of aiming to produce clarity for all concerned and to establish a permanent opportunity for direct comparisons in both the purchase and operation of trucks—provided, of course, that there can be developed a system of symbols that really describes each design to which it is applied.

On this latter point in general there seems to be relatively little doubt. But there does seem to be some

division of opinion in regard to the extent, or elaborateness, of the information that such a system of symbols should convey. In the communication of W. G. Gove that was published in our issue of March 3 there is offered a plan of using suffix letters which would definitely separate each detailed design of truck from every other design in the same general class. This plan has much to recommend it. Nevertheless, in principle, it appears to be almost diametrically opposed to the original conception of a standard nomenclature through its elaboration of detailed information.

In brief, the issue thus raised is important because it is basic in character. On the one hand, there is the originally suggested plan of classification, which provides for the establishment by symbol of only motor arrangement, wheel base and center-plate load. On the other hand, there is the possibility of using suffix letters, which, when coupled to the builder's name, would be enough to identify any truck without the use of any figures at all, but which would necessitate as many different symbols as there are truck designs, so that the plan would be, in effect, simplification of truck nomenclature rather than its standardization.

However, there seems to be no reason why a choice between the two principles cannot be made or a compromise between them established. The important thing is to get uniformity, since electric railway trucks, through lack of consideration, have been allowed to develop along the most heterogeneous lines and their need for at least some elements of standardization is pressing. It is to be hoped that makers and users can combine to accomplish this initial step, and in this regard a pertinent point is raised by L. M. Clark in his communication that appears on another page, this being a query as to whether the manufacturers or the users should "start the ball rolling." We believe that action may best be obtained through both, and since both may be heard in the committee on equipment, under Chairman Gove's recently announced policy, this committee is undoubtedly the best place to discuss details. Of course, no formal action may be taken without the concurrence of the Engineering Association's executive and standards committees, but in view of the fact that President F. R. Phillips has in a recent communication favored the Association's consideration of the matter, discussion would seem to be in order even though the equipment committee already has in hand a really vast amount of work in its revision of existing standards.

RELIABILITY FOR OVERHEAD CONSTRUCTION.

Inspection is, admittedly, a vitally important factor where the problem of maintenance is controlled largely by the record of train delays. For this reason the policy that has been recently adopted by the New York, Westchester & Boston Railway, as outlined on another page, whereby inspection of overhead lines is reduced almost to zero, comes rather as a surprise, this road priding itself especially upon its remarkable operating record and the practically perfect reliability of its service. Upon analysis, however, the great reduction in

the extent of the inspections appears particularly logical, even for a road that regards the promptness of its trains as all-important, and thus is raised the question of the value, in general, of elaborate examinations of overhead constructions of the heavy catenary type.

From the tabulated list of interruptions that is given in the article in question it appears that the causes of failure, aside from those brought about by the cars, are subject to classification under four general headings exclusive of the miscellaneous and unknown defects. Of these classifications three, namely, lightning, foreign material across cables, and shorts caused by birds, are absolutely independent of inspection, being respectively acts of providence, acts of man and acts of animals. No examination, regardless of its elaboration, could possibly forestall them. The remaining cause for interruptions, or that involving grounded insulators, might conceivably be affected by inspections provided these were sufficiently thorough, but in practice the chance of this is rather slim. A majority of the insulator failures, which, it may be said, occur almost invariably on insulators subject to mechanical stress, come from the indirect effects of lightning or, more frequently, from the physical effect of heat and expansion, and in consequence these failures are hardly more susceptible to inspection than those in the first-named classifications. Even under the heading of "miscellaneous" there are few causes of interruption that could be appreciably affected by frequent inspections as opposed to periodical ones, and the conclusion is inevitable that high-grade overhead construction is just about as well off when it is left alone as it is when being given the most elaborate attention.

The improvements that have been made in the Westchester's feeder and contact system, as the outgrowth of several years experience with it under actual operating conditions, point directly toward the same end. Characteristic of this is the substitution of wood-stick strain insulators for dead-ended cables in place of the porcelain equipment that was originally installed. For the 11,000-volt lines impregnated wood has proved to be eminently desirable, and of course, under mechanical tension it is thoroughly reliable. This is primarily the quality that has warranted its introduction. Although the wood involves a certain amount of maintenance expense for an annual varnishing this cost is insignificant when it eliminates the need for the fragile porcelain which may let go at unexpected moments and shut down a section of the line.

Similarly there has been adopted a reinforcement of steel over insulators that adjoin crossings or are in position where an insulator failure might cause serious damage by burning the cable in two and letting the ends fall. The change has eliminated the disc insulators on the "pig-tail" safety strands that were originally used for this purpose, and with the reduction in the number of insulators interruptions in the power supply have naturally decreased. This, after all, is the simple ideal toward which all design of overhead construction may aim to best effect, because every insulator is a source of potential weakness.

Maintenance of Overhead on the Westchester

The New York, Westchester & Boston Railway Has Recently Adopted the Plan of Minimizing the Inspection of Its Overhead Contact System and Feeders, Reducing the Expense of Upkeep to a Rate of Approximately \$9 Per Mile of Track Per Month

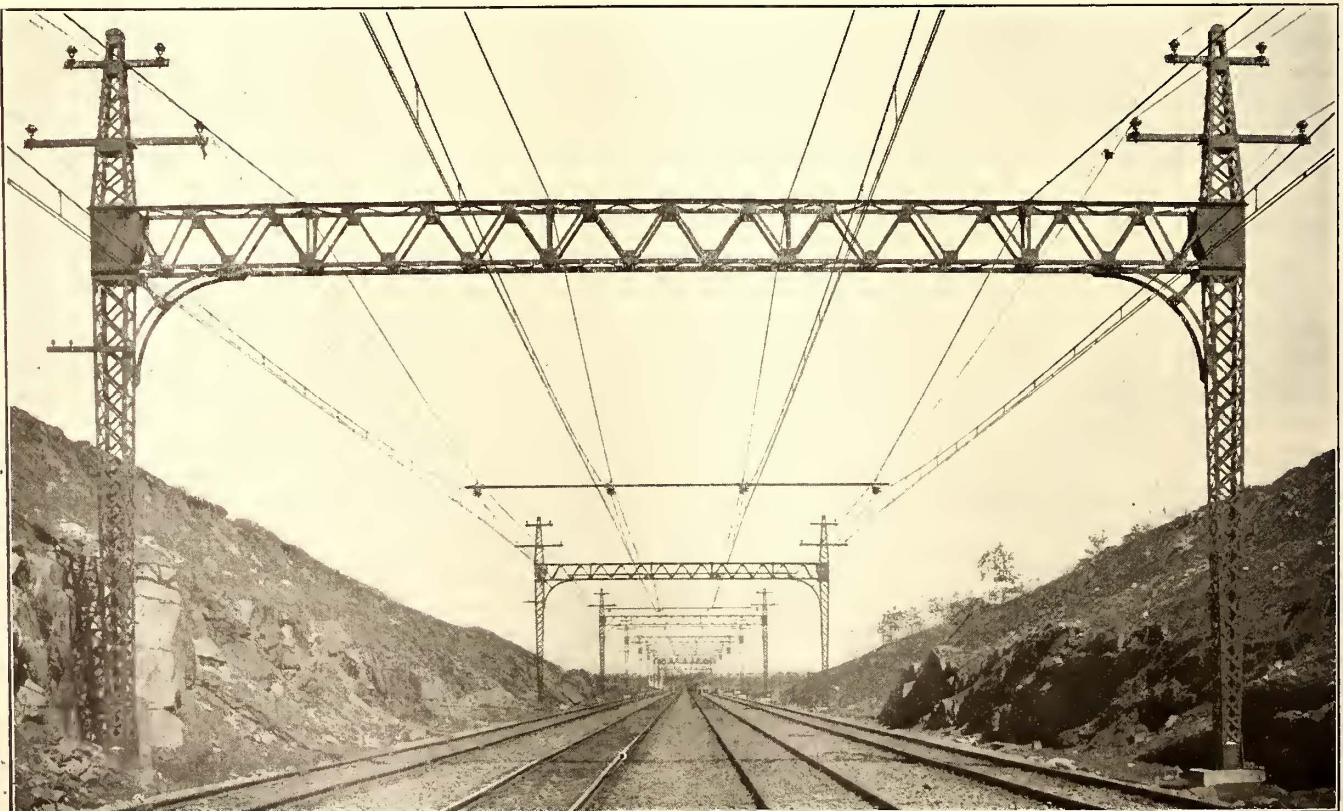
DURING the past year there has been under way on the New York, Westchester & Boston Railway an investigation as to the amount of attention that is really necessary for the proper maintenance of high-grade overhead construction such as is installed on that road,* and the result has been a material reduction in the time devoted to inspection. Under the new plan that has been adopted only three inspections per month are made, and the line crew is thus enabled to devote practically all of its time to the repair of defects that are reported and to routine work such as renewing oil for sectionalizing switches, adjustments of the contact wire and the like. Naturally, a very great decrease in cost of maintenance has been effected, since the original plan was to operate a work train, manned by several linemen, to make nightly inspections of the contact system. Until about four months ago, when the new plan got fully under way, the total expense for maintaining the overhead construction averaged about \$29 per month per track-mile, but subsequent to this the cost has been reduced to about \$9 per mile per month, apparently without sacrificing the reliability of the service or involving delay in making repairs. It is expected that, except for extraordinary occurrences, the maintenance cost can be held at this figure indefinitely for

the future. This does not include, however, intermittent expenditures of large amount such as painting the steel work on the catenary bridges which, it may be said, are about due now for repainting. It does not seem likely that general renewal of any part of the overhead construction will be necessary for many years to come. Even wear on the contact wire, which was quite rapid during the first two years of operation, has practically ceased since the under side of the wire has worn to a flat surface. The width of this flattened section has remained at about $\frac{1}{8}$ in. for the past two years, the increase in wear being not measurable.

The above-mentioned unit cost of \$29 per track-mile per month is an approximate average for the year 1916, but a steady reduction has been taking place for some time past up to December, 1916, since which date the cost has been cut by almost two-thirds. The unit cost figure has been based upon a single-track mileage of 54.41, and it includes the costs on the feeder system, although, of course, the feeder mileage is really independent of the track mileage. As a matter of fact there are approximately 181 miles of feeder in the installation.

When placed on the same unit basis the maintenance for the contact system has been about double that for the feeders, the two together amounting to roughly three-fourths of the total expense for the department. The difference between the total cost and the sum of the costs for feeders and contact system is due to

*A complete description of the overhead contact system and feeders on the New York, Westchester & Boston Railway was published in the *ELECTRIC RAILWAY JOURNAL* for June 15, 1912, page 1004.



WESTCHESTER LINE MAINTENANCE—COMPOUND CATENARY CONSTRUCTION ON TANGENT TRACK

charges for general expense, such as repair work on the catenary bridges and on the switching equipment installed on or about them. For the latter there are involved annual inspections of oil in the transformers for the so-called 22,000-volt, three-wire arrangement* (which was introduced on the New York, Westchester & Boston Railway at the same time as on the New York, New Haven & Hartford Railroad), and examinations of the oil circuit breakers used for sectionalizing the contact wire, whenever a ground occurs to operate them.

The total cost includes the wages of a train crew and the expense for fuel for the gasoline-operated line car, which is used, together with a work car, by the line crew when working on the contact system. It includes, also, the expense due to a considerable amount of new construction work carried on in 1916, which consisted largely in the installation of wood-strain insulators to reinforce the somewhat unreliable porcelain insulators that had been installed at all dead ends of contact wire. There is included also the expense due to the cumulative effect of a disastrous sleet storm which occurred late in December, 1915, and involved an unprecedented amount of repairs and replacement on the feeder system during the first half of 1916.

PRESENT METHODS OF INSPECTION AND REPAIR

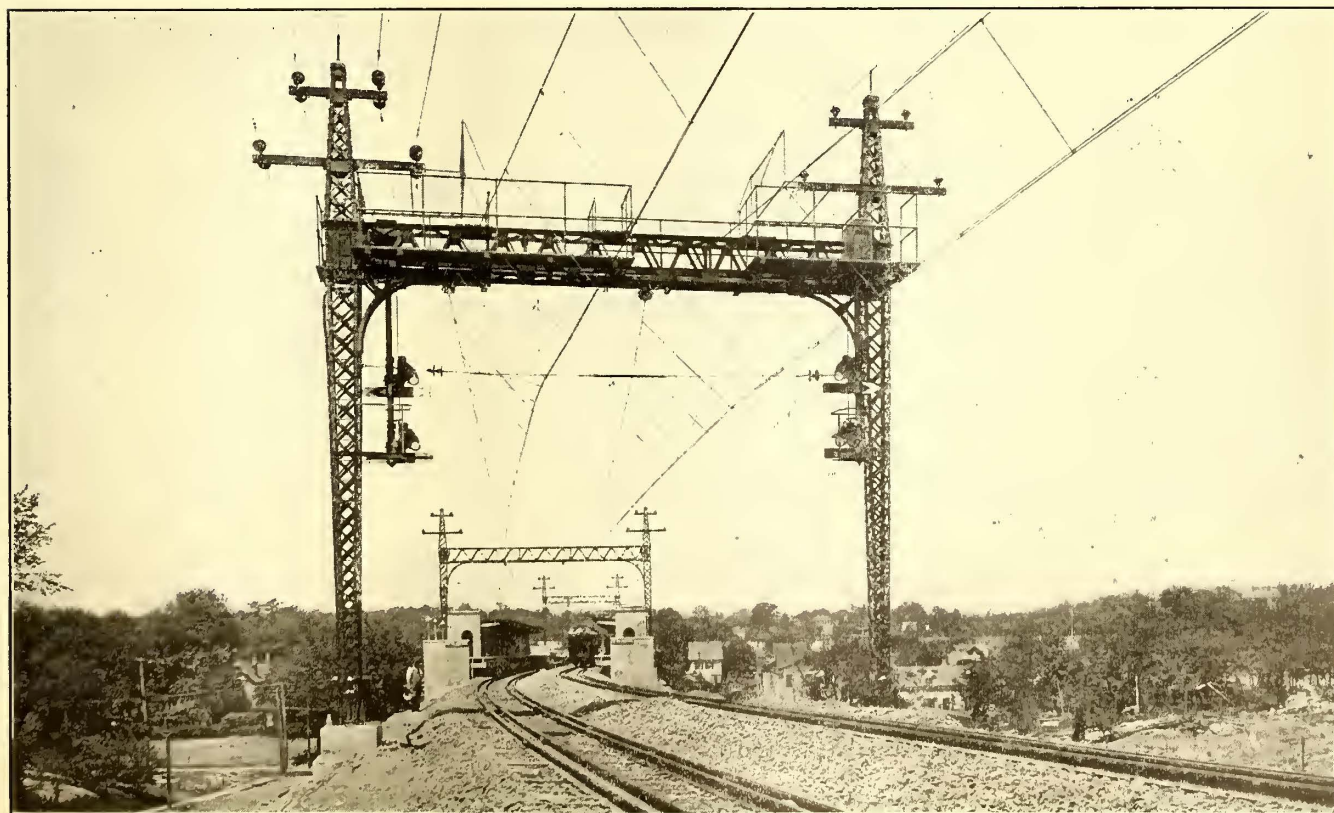
In brief, it has been found that, with the overhead construction in good condition, defects do not occur from day to day, so that daily attention means a disproportion between the time spent in looking for defects and that actually devoted to their repair. This condition is emphasized by the fact that, because of traffic conditions, only about half of the time of a line crew that is engaged in inspection is effective.

Under the present arrangement an inspection is made once each month by the general foreman of the elec-

trical department. This department, according to the organization adopted by the New York, Westchester & Boston Railway, is responsible for all power wiring and lighting for the road, and is part of the general maintenance force reporting to F. Zogbaum, engineer of maintenance. The general foreman, during his monthly inspection of the overhead construction, rides on the second car of regular train and watches the action of the contact wire and the pantograph on the car ahead, making notes when anything improper is observed. One complete trip over the whole line is made, requiring in general about three hours. The majority of defects thus discovered are in the nature of lack of adjustment of the contact wire over the center of the track or, on curves, its failure to ride centrally on the pantograph shoe. In addition, there is some tendency for the small bolts of the hanger clips to work loose, thus letting a short section of the steel contact wire hang free from the horizontal copper track-conductor wire that supports it. Occasionally, also, the Tee-iron deflectors (which are installed at frogs in the contact system to keep pantographs from catching in the diverging wires) work loose and have to be brought up to line, because if they are allowed to hang down sufficiently an opportunity is afforded for pantographs to catch in them and get torn off. It should be said here that the line is really under inspection at all times by the train crews, who report any defects that they observe in the overhead construction during their trips over the road.

In addition to the monthly inspection as outlined above a semi-monthly examination is given to the system by the foreman of the line crew. For the contact wiring, this semi-monthly inspection is made from the platform of the previously-mentioned gasoline line car and is carried out at night when power can be shut off from various sections of the line as desired. Repairs are made at this time also, and it is seldom necessary under the new arrangement to have the line and crew on the road at other times. The semi-monthly inspection

*A description of the 22,000-volt, three-wire system for single-phase feeders was published in the *ELECTRIC RAILWAY JOURNAL* for May 2, 1914, page 960.



WESTCHESTER LINE MAINTENANCE—EXPERIMENTAL SECTION OF SINGLE CATENARY CONSTRUCTION

TABLE I—CAUSES OF INTERRUPTIONS OF POWER DISTRIBUTION EXCLUSIVE OF FAILURES AT SOURCE OF SUPPLY
—NEW YORK, WESTCHESTER & BOSTON RAILWAY

Cause of Interruption	1915										1916		1916					1917							
	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	
Broken pantograph	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Short or ground on car	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Section break bridged by car	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Trolley insulator grounds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Feeder insulator grounds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Foreign material across cables	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Shorts caused by birds	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cause unknown	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Lightning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Miscellaneous	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

*Includes series of similar interruptions on a single day, this being counted as one interruption.

†Includes shorts between car roof and pantograph that were caused by birds.

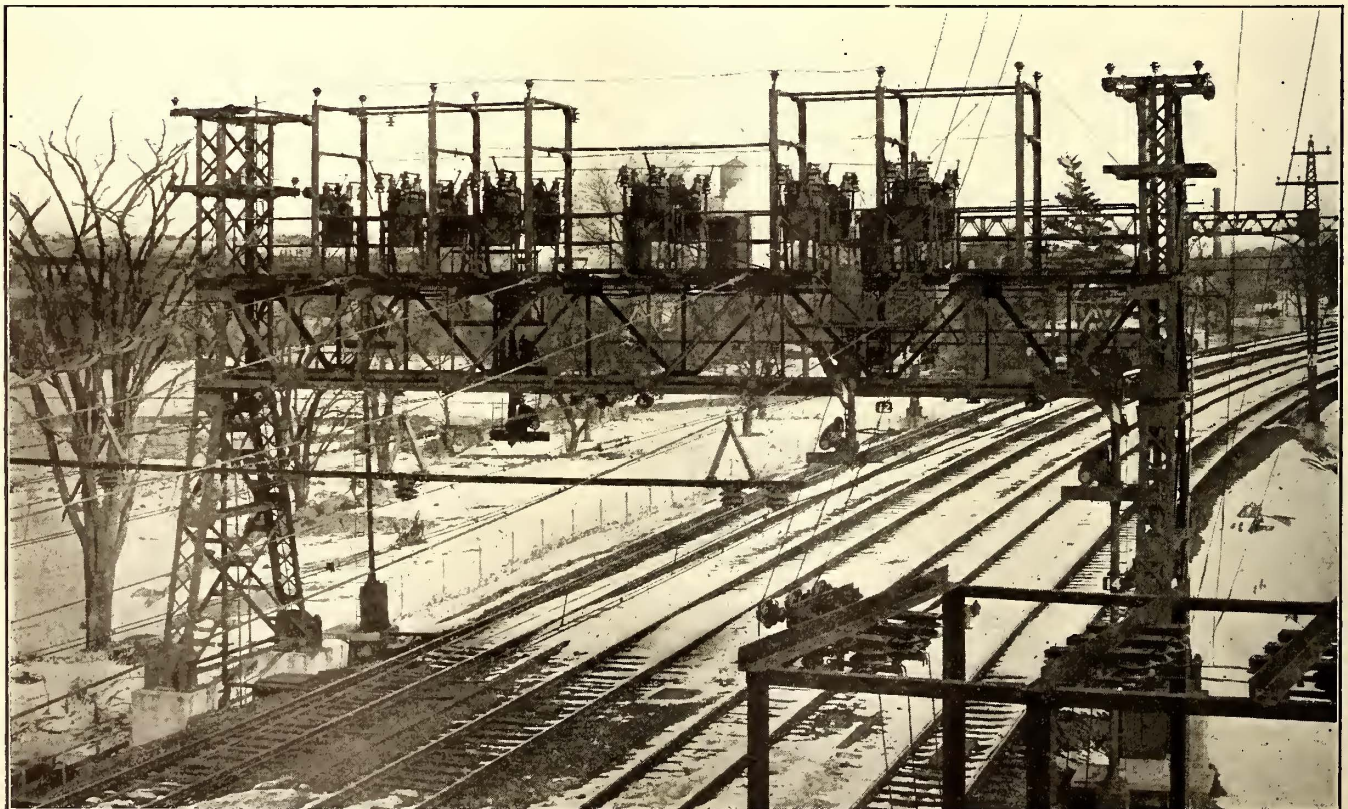
‡Of interruptions traced directly to lightning, roughly one-half affected feeders only. One-fourth of the number affected the contact system only. The remainder affected the three-phase line only and there were a few cases where all lines were affected.

of the feeders and sectionalizing bridges is made from the ground during the daytime.

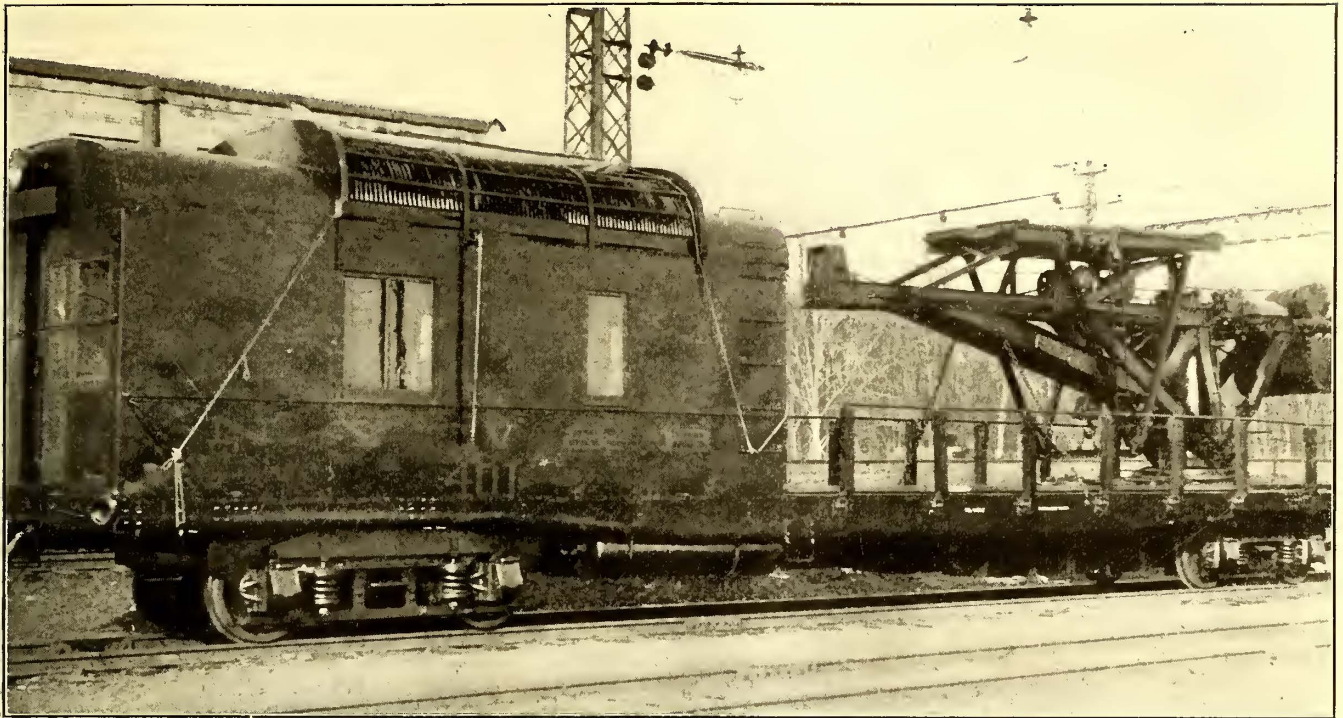
Reduction in the use of the line car for inspections of the contact wiring, it may be said here, has effected an appreciably large part of the saving in cost of overhead maintenance. Originally, the line car was frequently double-crewed, and the payroll for its operation alone approached \$300 monthly. Some two years ago this was reduced to about \$200 monthly by cutting out extra service, but this minimum expense could not be avoided so long as the car was in service every night. At present, the train-crew's payroll for the two or three nights that are worked during the month amounts to \$15 or \$20 per month. The item of fuel for the line car has of late been even greater than the train crew's wages, and the rising price of gasoline brought the total for this item of expense during last summer as high as \$270 per month, resulting in the company even considering the possibility of equipping the car with a motor-generator set for operation electrically from the overhead system when power was available. By cutting down on the service, however, this expenditure has been

reduced to the order of \$30 per month, and the need for electric operation of the line car has probably been eliminated.

With the limitation of the number of inspections to three each month, and the opportunity of having the line crew devote practically its entire time to repair work the personnel required for overhead maintenance on the 54 track-miles of line in service has been reduced to a line foreman and three linemen. This gang works normally from 7 a. m. to 6 p. m., except two or three times per month, when it works from midnight to 11 a. m., the first part of this latter shift being devoted to inspection and repairs affecting the contact system, as it comes in the hours when traffic is light, although service on the Westchester is maintained all night. The time during daylight hours is devoted to work on the sectionalizing bridges and power feeders. Part of the line crew is, of course, subject to emergency calls at any hour. Approximately three-fourths of the time of the force is devoted to the transmission and contact system for propulsion power. The remainder is utilized in maintaining the signal transmission system, the station



WESTCHESTER LINE MAINTENANCE—ANCHOR BRIDGE WITH CIRCUIT BREAKERS FOR SECTIONALIZING CONTACT SYSTEM



WESTCHESTER LINE MAINTENANCE—GASOLINE-DRIVEN LINE CARUSED FOR INSPECTION AND REPAIR OF CONTACT SYSTEM

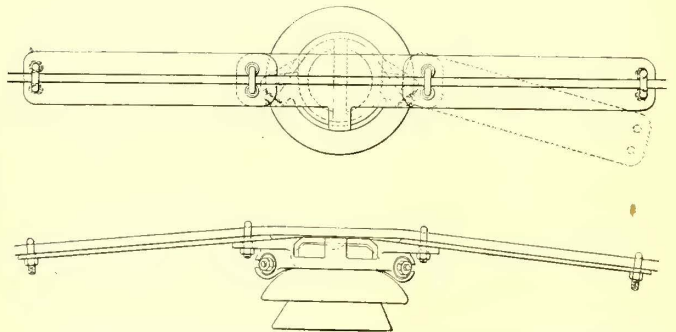
lighting, the station elevators and the other electric power equipment about the road and its permanent plant.

NEW CONSTRUCTION

A considerable amount of construction work has, as mentioned in a previous paragraph, been carried on during the past year with the idea of reducing routine maintenance expense. Probably the most interesting item of this character is a new type of insulator guard that has been installed in the feeder lines at crossings or other points where the failure of an insulator and the consequent arcing and burning at the cross-arm might let the feeder fall where it would cause damage or injury to persons. The provisions originally made for this purpose consisted of short pieces of steel strand, or pig-tails, clipped to the feeder a few feet on either side of the cross-arm that was to be protected and fastened at the opposite ends to the cross-arm itself, so that if the feeder should be burnt apart at the insulator the ends of the conductor would still be held up. Each pig-tail was, of course, provided with a disc insulator between the clip at the feeder and the attachment to the grounded cross-arm.

These insulators gave a great deal of trouble through breaking down electrically, even though they were subject normally to no mechanical stress. During the past year they have been largely replaced by the device shown in the accompanying illustration. This, in brief, consists of a heavy steel reinforcement of the feeder at cross-arms where protection is desired against the cable's falling. The central section is a large carrier cap of cast iron that fits over the top of the insulator and supports the feeder. At either side of the cap is attached a supporting bar that can swing freely through a considerable arc, and to these supporting bars the feeder is clipped. If, however, the insulator fails, and even lets the conductor fall across the grounded cross-arm, the resultant arcing affects only the large body of metal of the carrier cap or supporting bars and limits the chance of its burning through before the short-circuit opens the nearest sectionalizing circuit-breakers. Since these caps have been installed the elimination of

the pig-tail insulators has materially reduced the number of interruptions due to the feeder system. It is worthy of note, also, that none of the pin insulators to which the caps are applied has failed, possibly because the extended area of metal above the insulator has tended to distribute the flux from lightning discharges, which no doubt have some indirect effect, since it is found that most insulator trouble on the Westchester comes in the summer. In this connection, however, it should be said that the direct effect of lightning is not noticeable in the case of the pin insulators for the feeders and is very



WESTCHESTER LINE MAINTENANCE—DEVICE FOR PROTECTING FEEDERS AGAINST EFFECTS OF GROUNDED INSULATOR

limited with the contact system. The use of a compound catenary with a grounded main supporting cable over the major portion of the road is undoubtedly responsible for this, no ground wire being installed on the sections of the road where the compound construction is used.

Another feature of recent new construction on the road has been the previously-referred-to installation of wood strain insulators in series with the barrel-type porcelain insulators that were originally used at all dead ends. The latter type of insulator has displayed a tendency to crack mechanically and to permit flashing through, and since excellent results had been obtained with impregnated wood section breaks at yard sidings, it was decided to use wood also for dead ends. The bar-

rel-type porcelain insulators, nevertheless, were left in place because they had ample strength mechanically and some dielectric strength even when cracked. These wood strain insulators are made with triple sticks 4 ft. long and they have proved thoroughly satisfactory. In fact, Mr. Zogbaum states that (possibly with an increase in length, to say, 5 ft. to give a greater factor of safety against flashing over) wood will eventually be used on the Westchester road to the absolute exclusion of porcelain for strain insulators, although it is recognized that the routine maintenance of the wooden insulators is somewhat greater than with porcelain. Porcelain insulators, when they hold, involve absolutely no maintenance expense, whereas the wooden insulators have to be painted each year with two coats of spar varnish; otherwise the weather tends to blacken the surface of impregnated wood and this superinduces flashovers.

EXPERIENCE WITH SINGLE CATENARY

Mention should, perhaps, be made here of the experience obtained, during the past five years, with the single catenary construction that was installed as an experiment over a short section of this road when it was constructed. This type of contact system, instead of being designed to hang from a grounded messenger strand with two points of support between catenary bridges, has contact wires (including the horizontal track conductor to which the steel contact wire is clipped) supported directly with rigid hangers from a single catenary cable swinging between bridges. The spacing between hangers is 10 ft., the same as in the case of the compound catenary construction. Also the spacing between bridges is 100 yd., so that the real difference between the two designs is the elimination of the main supporting strand and cross-beams used with the compound type. The single catenary construction is thus simpler and cheaper to install than the compound catenary. A ground wire for lightning protection is installed, however, along the tops of the uprights on the catenary bridges that carry the feeders.

Experience has shown that the single catenary has no particular defects, and in general its service has been satisfactory. It has, however, cost somewhat more for maintenance than the compound catenary, mainly because of the necessity for more frequent adjustments and the greater difficulty of making the adjustments when they are needed. Unfortunately, a definite comparison between the two designs on the Westchester is impossible, for the reason that the section of the road over which the single catenary is installed is composed almost altogether of curves. Since the major difficulty with the design appears in connection with keeping the contact wire central over curved track, the expense for maintenance on this section cannot be properly compared with that which obtains over the remainder of the road, where more than two-thirds of the line is on tangents.

Based upon broad generalities, however, the opinion prevails that, if the span between catenary bridges was reduced—say from 300 ft. to 250 ft.—the single catenary type of construction would be equally reliable and somewhat less expensive to maintain than the compound catenary construction.

RECORD OF POWER INTERRUPTIONS

To give an idea of the causes of trouble that occur with the high-tension contact system that is used on the road, there is shown in the table on page 474 a record of power interruptions from all causes (except failure at the source of supply) that have occurred during the past two years. This includes every case of power off any section of the line, whether or not any trains were delayed.

The record is divided between interruptions caused by car equipment and those caused by the overhead lines themselves, the latter being about two-thirds of the total. Of the interruptions that were caused by direct shorts, grounds or other failures of the overhead construction (as distinguished from those involving the car equipment) slightly more than one-half affected the contact system only. Approximately 30 per cent affected the feeders only, and 15 per cent affected the three-phase line that is run on the same poles as the feeders. The latter class of failure does not involve loss of propulsion power, since a ground on the three-phase line does not affect feeders or contact lines unless the localizing circuit-breakers on the three-phase line should fail to operate. The interruptions that involved all lines approximated 3 per cent of the total number.

The proportion of the various causes of interruptions affecting each of the above-mentioned classes of wiring is roughly the same in all cases. In each class of wiring the grounding of insulators is productive of more failures than all other causes put together, but it should be said that, owing to the difficulty of definitely distinguishing the indirect effects of lightning, the record of grounded insulators undoubtedly includes a number of cases that really are chargeable to this cause.

The item headed "Shorts caused by birds" includes also several cases where squirrels that climbed upon the catenary bridges brought about short circuits. In one such instance a squirrel managed to ground one of the bus lines that run across the sectionalizing bridges and thus caused an interruption on an entire section of the line. However, the grounds caused by birds on pantographs are not entered under this item, since they fall more properly under the head of interruptions involving car equipment. Although this type of accident appears to require a rather extraordinary combination of circumstances, including a bird of sufficient size that has to stand in a certain position, the occurrence is not at all uncommon. Such interruptions, of course, are wholly temporary since the tremendous power behind the supply of current instantaneously turns the bird into smoke, and the prompt opening of the circuit-breakers at the ends of the section extinguishes the arc. The circuit-breakers are thrown in immediately afterward by the operator at the nearest interlocking tower, at which point distant control is provided, and thus delay is avoided.

Comment may be made also in connection with the item headed "Section break bridged by car." This class of accident, which is really an operating failure rather than a failure of the contact system, is brought about by a train (generally a freight train) running from a live section of the main line into a siding that normally stands out of service. For such sidings the contact wire is sectionalized by a wood break at the end adjoining the main line, and a knife-switch with a back contact grounds the siding when it is open. The ends of the contact wires are run out in wings past the wood break and thus power is not cut off and reapplied to a car that passes from the main line to the siding if the siding is alive. However, if the siding is dead, the passage of a pantograph shoe on a car moving into the dead section provides a short circuit from the live contact wire, across the air gap, to the grounded wire parallel to it, and this grounds the live section.

In the record for June, 1916, the unusual number of fourteen interruptions charged to trolley insulator grounds were brought about largely by failures of the previously mentioned strain insulators which have now been largely replaced with wood-stick insulators.

Of the interruptions shown under the head of miscellaneous, the one occurring in April, 1915, was a case where power was off all lines because of an extraordi-

nary snowfall. The weight of the wet snow that collected on the horizontal safety screens (installed at various points to protect workmen or the public from contact with live conductors) was sufficient to buckle a number of them and thus ground the lines at several points.

The miscellaneous interruption that appears in June, 1915, was due to a grounded arcing-shunt of a circuit breaker on a sectionalizing bridge, and the one shown for July was caused by a short-circuit in a station-lighting transformer. The latter involved the three-phase line only, and this class of interruption, as mentioned before, does not affect the propulsion power supply. The series of failures indicated in the miscellaneous record for September, 1915, came about through an excessively hot day, the change in temperature being sufficient to crack several porcelain insulators and thus permit grounds.

In the record for October, 1915, the two miscellaneous

interruptions were due to grounded jumpers on one of the sectionalizing bridges, and the two in December were due to a severe sleet storm that lasted through two successive days and caused several grounds on the lines, including also grounds on several of the pantographs on cars. The miscellaneous interruption recorded in February, 1916, was caused by a flash-over to ground that occurred in a low-roofed tunnel through which the road runs, and the two failures recorded in September, 1916, came about through broken pull-off wires that dropped with the live portion against the roof of a passing car. The October interruption was due to a grounded sectionalizing switch, and the same cause accounts for the two November interruptions. The miscellaneous interruptions appearing respectively in January and February of this year were both due to short-circuits of station-lighting transformers which, as before described, opened the three-phase circuit only.

Comments on Some Disputed Points in Car Design

R. E. Danforth, General Manager of the Public Service Railway, Discusses Open vs. Closed Car, Longitudinal Seats, Ventilation and Other Points

THE Public Service Railway, which forms a part of the Public Service Corporation of New Jersey, operates electric cars under as widely varying conditions as any property in this country. It has city, suburban and interurban lines widely scattered over the State. The general manager of this system, R. E. Danforth, has been a careful student of car design as related to this interesting property, and has determined certain principles which apply to local conditions. A representative of the ELECTRIC RAILWAY JOURNAL recently called on Mr. Danforth and asked him to give his views on the subject of car design.

Mr. Danforth said: "I do not agree with many managers of electric railways as regards the future of the open car. I notice that it is the fashion now to decry this car and that very few orders are being given for it. The ELECTRIC RAILWAY JOURNAL seems also to be of the opinion that this type of car is practically dead. The chief objections to the car seem to be an alleged liability to accidents and the impossibility of applying the prepayment system of fare collection to it. Now, while I am willing to admit that the open car is not as desirable, comparatively speaking, as it formerly was, there are still conditions under which it is the best type of car. One of these is in localities where the hot season is long. The Public Service Railway has so much faith in this type of car that during 1916 it built 126 open car bodies, and is building fifty more for 1917. During this season it will have more than 600 of these cars in operation. The chief advantage of this type of car is that it is popular with the public. No other type in summer is as good a business-getter. There is a sense of airiness and openness to this type

of car which is not possessed by any other, and which appeals strongly to the average passenger on a hot summer day or evening.

"Some of the other important advantages of this type of car are that it is inexpensive to build, it is light in weight, it possesses the maximum seating capacity for its floor area, and it is quick in loading and unloading. We have not found any serious increase in the number of accidents due to the use of this car. The experience of the Public Service Railway with the very long type of open car used by this company was described in the issue of the ELECTRIC RAILWAY JOURNAL for June 19, 1916, page 1171, and it was on the basis of the experience there described that the company is building the fifty open cars mentioned before. In my opinion, it will not be many years before there will be a sufficiently large demand for open-bench cars to warrant the manufacturers in building them regularly. With modern methods of handling car bodies, it is a very simple matter to remove the open car bodies from the trucks



R. E. DANFORTH

at the end of the summer season for storage during winter."

Another interesting point made by Mr. Danforth was in connection with the longitudinal-seat car. He said:

"While I agree in part with the contention of a recent editorial in the ELECTRIC RAILWAY JOURNAL to the effect that there is a narrow field on urban surface lines for the longitudinal-seat car, I firmly believe that under certain conditions its use is not only permissible, but actually necessary to obtain real accommodation for the public. Where very heavy peak loads must be carried for short distances passengers prefer to stand rather than to wait for following cars. In standing they are

far more comfortable in a longitudinal-seat car, which is provided with proper facilities for the convenience of standees, than they are in a cross-seat car where their presence interferes with the movement of passengers through the car. Crowded in a narrow aisle, as in a cross-seat car, standees interfere with the proper distribution of their own number, so that standing room in one part of the car may be at a premium whereas other parts are far from filled.

"The important advantages of the longitudinal-seat cars are that they possess great emergency capacity, and they permit rapid movement of passengers from one part to another."

As is well known, Mr. Danforth holds certain positive views regarding car ventilation. On this subject he said:

"My observation and experience have shown very clearly that, while the monitor deck roof in its old form may not be desirable, a modern roof must provide the ventilating equivalent of the old type if ventilation is to be successful. In the closed cars now building for the Public Service Railway, a so-called compromise roof is used. This from the standpoint of ventilation is equivalent to the older form of roof, which it closely resembles in appearance. While it is true that good ventilation is secured in a few arched-roof cars, this is due to the fact that in such cars there is considerable space between the roof and the headlining. This space is to a considerable extent the equivalent of the monitor deck, and is used to contain air ducts.

"The difficulty of securing good ventilation in a car in which there is not the equivalent of a monitor deck has been clearly demonstrated by a special car which we use for parties, etc., and which is furnished with both forced and exhaust-draft fans. The capacity of either of these fans is ample to change the air in the car every three minutes, but with both fans operating the ventilation is unsatisfactory. There is a vital ventilating principle in having openings through which air can circulate in horizontal planes as it can in the old-fashioned monitor deck roofs or in the compromise roofs provided with louvers equivalent to the older deck sash. Successful ventilation consists in the movement of large volumes of air, and the ventilating device must create a positive air movement. The difficulty with fans is that they move diluted air. It is possible with a monitor roof so to install ventilators that disagreeable down drafts are avoided."

In connection with the general subject of car maintenance Mr. Danforth made a number of valuable suggestions regarding the keeping and use of records. He said: "I believe that there is great opportunity for improvement in the matter of record keeping systems. Sometimes very elaborate detailed schemes are used when only general over-all costs are required. The lack of needed records is absolutely inexcusable, but when such records have served their purpose they are, of course, useless and should not be kept up. The purpose of records is to induce economies, and to produce this effect it should be possible to confront any individual responsible for expenditures with a record of what he has spent and how he has spent it, and all of this within a few days of the actual expenditure. These records, however, need go into great detail only on special occasions when some unusual expenditure is to be analyzed. They should, moreover, never be so cumbersome that they are studied only by the man who makes them. A busy man will not wade through oceans of detail for the information which he desires.

"In this connection, I found it possible on one railway system in which I was interested to reduce the store-

room clerical force by 75 per cent by eliminating the keeping of elaborate records which, while they would have proved interesting for special studies, were not used sufficiently to justify their cost. The kinds of records that are most valuable are those permitting a comparison of the use of supplies and labor on several divisions of one system, and of the rates of consumption of these elements per unit on the same divisions during different periods. Such data can be brought down to surprisingly small compass if only the essentials are included. The more analytical records referred to before may be necessary when the general records reveal excessively high rates of consumption on certain parts or in certain quarters. The danger in such cases is that the analysis made for such a purpose may be incorporated in the office routine and become a permanent burden."

As Mr. Danforth will in a few weeks complete his tenth year of service as general manager of Public Service Railway, in which position he succeeded Albert (now Sir Albert) H. Stanley, a few words regarding his career are not inappropriate. This career has had one dominating characteristic, an intense devotion to the principle of singleness of purpose as a requisite to success. From the time when, as a boy, he forced the management of the then recently electrified street railway in Buffalo, N. Y., to give him a job in spite of itself, he has accomplished task after task through concentration and devotion to his work. He is at the same time one of the most considerate of men, always ready to lend a hand in any movement which promises better working conditions for his men. He is constantly striving to develop the native abilities of his assistants for the company's benefit and their own. For this reason he instigated the formation of the local company section of the American Electric Railway Association and has loyally supported it. For the same general purpose he instituted a cadet course some years ago for the purpose of trying out and training technical graduates. His spirit is shown by his statement to the boys at one time: "Whenever one of you boys is ready for my job I shall step out." As a college graduate, Cornell, '91, he has always appreciated the fact that a college course can do much for a young man of the right type. He has, however, consistently ruled that the graduate begin at the bottom without any prejudice in his favor and make his way solely on merit.

Mr. Danforth is a disciplinarian who expects to work hard himself and to be surrounded with diligent co-workers. He has no patience with inefficiency. While of none too robust a constitution he has, by the exercise of care, been able to do the exacting work incident to his several responsible positions without exhaustion. These positions have included among others the superintendency of the Buffalo (N. Y.) Railway and the general managership of the Rochester (N. Y.) Railway.

Experiments with Non-Bleeding Paving Blocks

Experiments have been made in Minneapolis with so-called non-bleeding paving blocks laid with sand and ordinary pitch filler. Very little oil appeared on the surface of the sand-filled sections, but the other sections showed considerable bleeding, which was thought to be due to the filler. Other experiments indicated that blocks laid at angles of 67½ deg. and at 45 deg. with the curb show less trouble from joint wear than those laid at 90 deg. Expansion joints at right angles to the curb are not considered useful or beneficial.

Analysis of Track Maintenance Costs

Data and Deductions from Ten Years' Records of Maintenance Costs on Nearly a Hundred Miles of Surface Track in Brooklyn, N. Y.

By R. C. CRAM

Assistant Engineer, Way and Structures Department, Brooklyn Rapid Transit System

THE subject of unit costs for comparison of track maintenance expenses has had much attention during the year past as developed in the editorial correspondence of the ELECTRIC RAILWAY JOURNAL. Perhaps the prevailing thought emphasized throughout the discussion was to the effect that such units in the first instance would have their chief value in permitting comparisons of track types and their maintenance costs in varying conditions as developed on one property.

LIMITATIONS IN COMPARING MAINTENANCE DATA

It is thought that the lack of uniformity in standards of track maintenance on different properties will continue for some time to come, particularly as no two properties are situated in similar positions as regards financial ability. For this reason alone, comparisons of unit costs for track maintenance between different properties are very apt to be misleading even though the properties may have identical standard types of track construction.

It is indeed most unfortunate that several years of service are usually required for the development of the principal defects in a track structure located in a paved street. It is also equally unfortunate that there may be several changes in the engineering staff of the railway, and very likely the engineer most competent to judge the performance of tracks, even when assisted by records of maintenance costs, may have left the property by the time the records become of value. It is therefore quite true that, as the JOURNAL said editorially, "It must be remembered that the successful use of any unit cost depends on the accuracy of the

accounting methods used in determination of that cost," but to this should be added the statement that the person analyzing such cost should have an intimate knowledge of the property covering the period for which the records are kept.

MAINTENANCE RECORD—STANDARD TRACK					SEC. No. _____
STREET _____ FROM _____ TO _____		TYPE OF CONSTRUCTION _____			MONTH _____ YEAR _____
DESCRIPTION OF WORK	AUTH.	LABOR	MATL.	TOTAL	
JOINTS					
CORRUGATIONS					
PAVEMENT					
REMARKS					

TRACK MAINTENANCE DATA—FIG. 1, BLANK FORM USED IN RECORDING DATA

Nevertheless, there is no doubt as to the wisdom of making every reasonable effort, even at considerable expense, for the purpose of obtaining cost information in such degree of detail as will enable the engineer to make a correct analysis of expenditures for track maintenance with the view to eliminating such features of construction as may be found to have led to high maintenance charges.

INSTALLED ON - Grand Street - FROM Marcy Avenue - TO Hooper Street - DATE July - Aug. 1915.
2114.50 Lin. Ft. single track

BALLAST - Earth
RAIL 7" groove girder - L. S. Co. 101-433 521 - Q. H. Grade B.
JOINTS - Cast Weld - T. D. Co. - Opposite
JOINT BOLTS - None except at Compression Joints
TIES R. S. Y. P. - 5" x 8" x 8' - 2' C. - C.
TIE PLATES - None
SPIKES - 5/8 x 9/16" Std. H. R. - 4 per tie.
TIE RODS - Double end - 2" x 3/8" - 6' C. - C. - Plan 9880-6
BONDS - None
RAIL FILLER - Cement mortar - 1:4
PAVING - Recut second hand granite blocks - 1" sand-cushion
PAVING JOINTS - Cement grout - 1:1 1/2
PAVING FOUNDATION - Gravel concrete 1:3:6

REMARKS High carbon rail treated with Titanium - Single track operation.
Considerable rain during progress of job - much retamping done.
Very little grade change.

REQ. 8341 AUTH. B-8698
REFER TO PLAN PAVEMENT OUTSIDE Recut Granite
Pitch and sand joints on concrete.

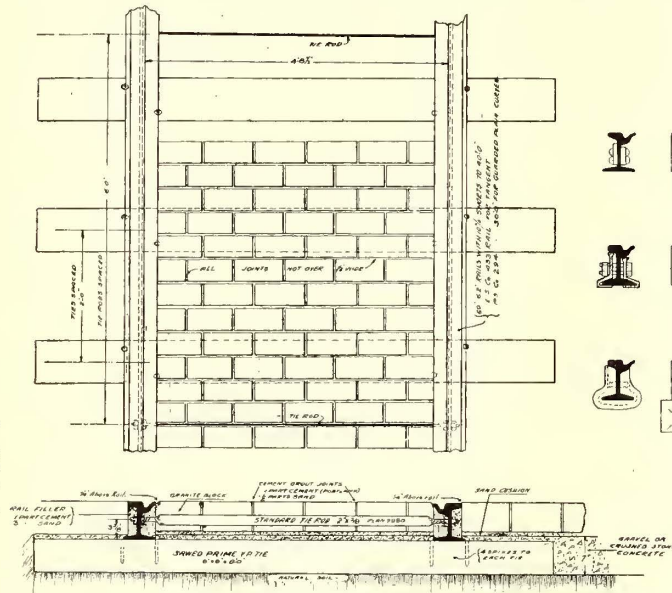
BROOKLYN RAPID TRANSIT SYSTEM, ENGINEERING DEPARTMENT, BROOKLYN, N. Y.	
SURFACE TRACK CONSTRUCTION IN PAVED STREETS	
SCALE 1" = 10'	MARCH 25 1917
DRAWN BY J.W.B.	SURVEY BOOK NO. B
CHECKED BY _____	FILE NO. _____
CORRECT	PLAN NO. _____
APPROVED	

ENG. WAY & STRUCTS

TRACK MAINTENANCE DATA—FIG. 2, FORM USED FOR PERMANENT RECORD OF SURFACE TRACK CONSTRUCTION IN PAVED STREETS, B. R. T. SYSTEM

Perhaps the most important statement made in the JOURNAL'S editorials on the subject is that appearing on page 257 of the issue for Aug. 12, 1916, which was as follows: "It must further be remembered that it is the average annual cost that is of value as a comparative unit." The subject has had our consideration in Brooklyn on this basis for several seasons, and it is thought that the results of the efforts to obtain such units have fully confirmed our opinions as to the value

Before this form was put in use it had already been found desirable to make up a permanent record of the type of construction used on each job, and this record is used as the basis for securing cost data by means of the section number designated in the circle shown in the upper right-hand corner of the record drawing reproduced in Fig. 2. This obviates the necessity for separate job orders for each bit of maintenance work on the standard sections, as all such work need only be referenced by timekeepers and cost clerks on Form M by adding the section number to the items in the various reports of labor and material, as segregated through charges to annual blanket authorizations for maintenance of joints, repairs to pavement and grinding corrugation. A list of standard sections is furnished to all timekeepers, material clerks, supervisors and others having to do with supervision and accounting for materials and work. A check as to whether charges are being made to the sections as incurred is had by following the daily gang assignment record from which it is readily determined whether or not work is in progress on standard sections. While this system has required considerable effort and special accounting in connection with regular routine of distribution of accounts, it is believed that the resulting figures in Table I are fairly accurate.



TRACK MAINTENANCE DATA—FIG. 3, B. R. T. STANDARD SURFACE TRACK CONSTRUCTION WITH WOOD TIES AND GRANITE BLOCK PAVING

of the data and of the effort that has been required to obtain the information here presented. Due allowance must be made for some apparent inconsistencies in the tables which follow, but these are mainly due to occasional misunderstandings on the part of the many persons who are necessarily engaged in gathering, reporting and distributing the various charges in detail.

The maintenance data collected on the Brooklyn Rapid Transit System are presented in the accompanying tables and graphs, but it will readily be appreciated that they would be of no particular service to other engineers without some explanations. These in turn clearly show how little value such records have even for the property upon which they are secured if the results cannot be analyzed in the light of experience and knowledge of the factors which have had an influence in causing the more radical variations from the average units.

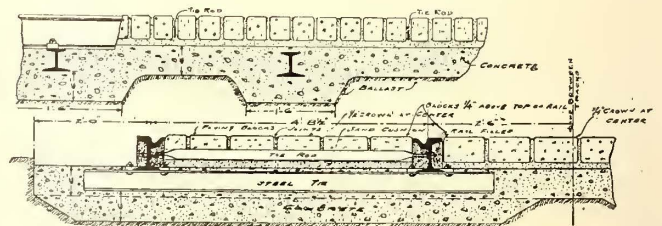
COLLECTING AND RECORDING MAINTENANCE DATA

The way and structure department of the Brooklyn Rapid Transit System, under the direction of C. L. Crabbs, engineer of way and structure, has been engaged in the collection and tabulation of data on maintenance costs on the modern standard surface tracks of the system as built since 1907. Statistics have been gathered covering items considered as strictly maintenance repairs on standard surface tracks since reconstruction, and excluding all charges to maintenance accounts accruing to those accounts as occasioned by the extraordinary charges due to reconstruction. In other words, the records are intended to show charges for the regular maintenance expenses to date on standard tracks since their reconstruction. Table I gives a summary of information obtained in detail by the surface track division, compiled through the use of Form M, as shown in Fig. 1. It will be seen that this form is designed to segregate charges into three general classes, viz., joints, corrugation and pavement, with space for special items and for remarks.

DEVELOPMENT OF THE STANDARD TYPE OF CONSTRUCTION

A brief description of the development of the standard construction should be of assistance in considering the data presented in the tables. It was not until 1909 that complete replacement with modern construction began to be warranted to any great extent.

The work that was done in 1907 consisted of new construction under new franchises, while that in 1908 covered one fair-sized reconstruction job and one other very small section. The type of construction adopted for the more extensive work beginning in 1909 is shown in Fig. 3. This was continued only during that season, being modified in 1910 by the substitution of wood ties as shown in Fig. 4.



TRACK MAINTENANCE DATA—FIG. 4, B. R. T. SURFACE TRACK CONSTRUCTION WITH STEEL TIES

Installed on Flatbush Avenue from Fulton to Fiftieth Street, April to June, 1909. Ballast, stone concrete; rail, 7-in. grooved girders, L. S. Co. 102-423, and P. S. Co. 102-284, 60-ft. length; joints riveted, 29 1/2-in. plate, 16 holes staggered; ties 7 ft. Carnegie Steel Co. M25, 14 1/2 lb., 4 ft. c. to c.; rails attached with steel clips and bolts, four per tie; tie rods, 2 in. x 3/8 in., 4 ft. c. to c., partly 8 ft. c. to c.; bonds, one 37 1/2 in. compressed-terminal cross-bonding every 1000 ft.; rail filler, cement mortar; paving, 5-in. granite blocks; paving joints, cement grout; paving foundation, combined stone and concrete. During construction traffic was run on temporary siding Lafayette to Fourth Avenues; silicate of iron was used in concrete in parts.

In the latter part of 1911 the riveted joint was definitely abandoned and cast-weld or continuous joints were substituted. The latter were primarily for situations under elevated structures and other places where conditions were not satisfactory for use of the welding cupola. This combined use of the two types last men-

tioned was continued until 1914, since which time practically all joints have been cast welded. It will be noted that steel ties and riveted joints, used almost exclusively from 1908 up to 1911, are located in the sections showing the highest maintenance charges, while the charges show definite decreases beginning in 1911, when wood ties were substituted. The tabulations seem to show the wisdom of the changes both in ties and in type of joints.

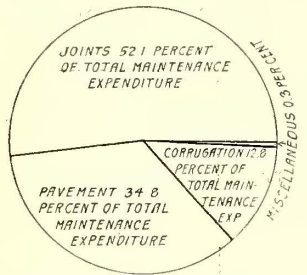
Table I gives a tabulation of the detailed charges

obtained from Form M divided into three general classes of joints, pavement and corrugation. It also shows the length of each section, the total expenditure on each section from date of reconstruction to Jan. 1, 1917; the total cost per foot of single track to Jan. 1, 1917, for each section; the average annual cost per foot of single track for each section, as well as summaries giving grand totals and weighted averages. Columns have been added to the original tabulation to indicate the kinds of ties and joints in service.

TABLE I—MAINTENANCE COSTS—STANDARD SURFACE TRACK TO JAN. 1, 1917. BROOKLYN RAPID TRANSIT SYSTEM, WAY AND STRUCTURE DEPARTMENT

Sec. No.	Street	From	To	Ties	Joints	Joints	Pavement	Corru- gation	Misc.	Total	Length Ft. S. T.	Cost per Ft. to Date	Year Laid	Cost per Ft. per Year
1	Lafayette Avenue	Flatbush Avenue	Fulton Street	Steel	El. weld	\$68.07	\$208.09			\$276.16	1,742	\$	1907	\$
2	Livinston Street	Court Street	Flatbush Avenue	Steel	El. weld	2963.22	5,767.79	\$821.62	\$10.89	9,563.52	6,509	1.468	1907	0.163
3	Berzen Street	Vanderbilt Avenue	300 ft. westerly	Wood	Rivet	2.22	51.55			53.77	600	0.089	1908	0.011
4	Fulton Street	Jorlander on Street	Flatbush Avenue	Steel	Rivet	10,888.57	713.20	826.28		12,428.05	4,336	2.869	1908	0.358
5	Washington Avenue	Flushing Avenue	Creek	Steel	Rivet	578.74				864.56	3,448	0.251	1909	0.036
6	Ninth Avenue	Union Street	9th Street	Wood	Rivet	666.35	272.78	2,418.80		3,357.93	6,634	0.506	1909	0.072
7	Fulton Street	Myrtle Avenue	Tillary Street	Steel	Rivet	1,269.82		133.73		1,403.55	1,394	1.006	1909	0.144
8	Fulton Street	Flatbush Avenue	Hudson Avenue	Steel	Rivet	148.90	35.02			183.92	258	0.714	1909	0.102
9	Flatbush Avenue	Fifth Avenue	Plaza Street	Steel	Rivet	8,220.33	418.08	1,453.28		10,091.69	5,832	1.732	1909	0.248
10	Flatbush Avenue	Fulton Street	Fifth Avenue	Steel	Rivet	2,933.44	992.09	785.95		4,711.48	4,450	1.058	1909	0.151
11-18	Broadway	Havemeyer Street	Ralph Avenue	Steel	Rivet	36,782.61	21,958.33	1,302.09	187.00	60,230.03	21,953	2.748	1909	0.392
20	New Lots Avenue	Rockaway Avenue	Junius Street	Wood	Rivet		79.24			79.24	3,925	0.020	1910	0.003
21	Rockaway Avenue	East New York Ave.	Riverdale Avenue	Wood	Rivet	4,635.14	1,144.30	1,256.37		7,035.81	7,850	0.896	1910	0.149
22	Nostrand Avenue	Fulton Street	Berzen Street	Wood	Rivet	61.16	352.16	382.59		980.91	2,782	0.352	1910	0.059
23	Flushing Avenue	Washington Avenue	Broadway	Wood	Rivet	883.32	4,983.47	387.98		6,254.77	13,710	0.456	1910	0.076
24	Fulton Street	Ashland Place	Vanderbilt Avenue	Wood	Rivet	7,650.18	1,658.47	203.19		9,511.84	6,212	1.532	1910	0.255
25	Berzen Street	Nostrand Avenue	Rozers Avenue	Wood	Rivet		9.44			9.44	1,238	0.007	1910	0.001
26	Berzen Street	Rockaway Avenue	300 ft. w. of Vanderbilt	Wood	Rivet		66.94			66.94	982	0.069	1910	0.111
27	Court Street	Fulton Street	Livinston Street	Steel	Rivet	822.03	667.43	3.27		1,492.73	1,156	1.291	1910	0.215
29	Manhattan Avenue	Driggs Avenue	Newtown Creek	Wood	Rivet	1,239.68	3,820.07	643.00		5,702.75	10,252	0.556	1911	0.111
30	St. Johns Place	New York Avenue	Alhany Avenue	Wood	Cast weld.	237.82	86.70	496.83		821.35	4,250	0.193	1911	0.039
31	Fifth Avenue	Prospect Avenue	25th Avenue	Wood	C. W. & riv.	4.00		42.52		46.52	4,264	0.011	1911	0.002
32	Flatbush Avenue	Lincoln Road	E. 26th Street	Wood	Rivet	695.76	42.40	1,776.62		2,514.78	15,415	0.164	1911	0.033
33	Flatbush Avenue	L. I. R. R.	Nostrand Avenue	Wood	Rivet	2.21	8.78	139.21		150.20	882	0.171	1911	0.034
34	Fifth Avenue	Atlantic Avenue	Flatbush Avenue	Wood	Rivet		15.85			15.85	570	0.028	1911	0.005
35	New Lots Road	Junius Street	Berrigan Street	Wood	Rivet		119.60			119.60	13,770	0.009	1911	0.002
36	Driggs Avenue	No. 12th Street	Jorimer Street	Wood	Rivet		187.20			187.20	948	0.198	1911	0.039
37	Broadway	Beckford Avenue	Rockling Street	Wood	Rivet	29.18	372.40	52.09		453.67	1,534	0.296	1911	0.059
38	Fifth Avenue	Flatbush Avenue	Prospect Avenue	Wood	Rivet	517.93	1,887.04		51.32	2,456.29	14,604	0.169	1911	0.024
39	Seventh Avenue	Flatbush Avenue	Fourteenth Street	Wood	Continuous	14.51	519.24			533.75	11,754	0.046	1912	0.012
40	Fulton Street	Vanderbilt Avenue	Reid Avenue	Wood	Continuous	156.40	1,547.19			1,703.59	20,710	0.083	1912	0.021
43	Stirling Place	Washington Avenue	Rozers Avenue	Wood	Cont. & e. w.	115.58	221.61	212.53		549.72	5,040	0.108	1912	0.027
44	Church Avenue	Gravesend Avenue	36th Street	Wood	Rivet	2.13		33.24		35.37	2,198	0.016	1912	0.004
46	Flatbush Avenue	Mall one Street	Lincoln Road	Wood	Cast weld	62.40		133.08		195.48	1,342	0.146	1912	0.036
47	Rockaway Avenue	Riverdale Avenue	Heperan Avenue	Wood	Cast weld	568.25	328.83	758.59		1,655.67	3,352	0.494	1912	0.123
48	5th Avenue	60th Street	65th Street	Wood	Cast weld	14.16	57.52	16.18		87.86	1,794	0.049	1912	0.012
50	3rd Avenue	Hamilton Avenue	26th Street	Wood	Cast weld	27.92	600.64	25.96		654.52	4,354	0.151	1912	0.038
51	Nostrand Avenue	Fulton Street	Putnam Avenue	Wood	Continuous	32.90	614.81	49.03		696.74	2,332	0.297	1912	0.074
52	Washington Avenue	Sterling Place	Atlantic Avenue	Wood	Cast weld	213.81	149.45	5.67		368.93	4,418	0.084	1912	0.021
53	Flatbush Avenue	Park Plaza	Mall one Street	Wood	Cast weld	22.40		728.39		750.79	7,274	0.103	1912	0.025
54	Mall one Street	Nostrand Avenue	Kineston Avenue	Wood	Cast weld	16.46				16.46	4,586	0.004	1912	0.001
55	16th Avenue	58th Street	Sea Beach Line	Wood	Cast weld	4.32				4.32	2,230	0.002	1912	0.001
56	Berzen Street	Vanderbilt Avenue	Franklin Avenue	Wood	Cast weld	66.12	1,374.21	35		1,440.68	6,786	0.212	1913	0.071
57	Church Avenue	Stratford Road	Ocean Parkway	Wood	Cast weld	10.61		70.61		81.22	2,339	0.035	1913	0.012
58	Church Avenue	Ocean Parkway	Gravesend Avenue	Wood	Cast weld		12.25	892.10		904.35	2,282	0.396	1913	0.132
59	Corona Avenue	Luona Avenue	Sycamore Avenue	Wood	Continuous		16.72			16.72	2,902	0.006	1913	0.002
60	Court Street	Atlantic Avenue	Hamilton Avenue	Wood	Continuous	87.55			15.19	102.74	11,820	0.009	1913	0.003
61	Fifth Avenue	25th Street	39th Street	Wood	Continuous	168.15	145.28	169.78		483.21	6,966	0.069	1913	0.023
62	Fifth Avenue	39th Street	60th Street	Wood	Continuous		74.20			74.20	10,782	0.007	1913	0.002
64	Flatbush Avenue	E. 26th Street	Nostrand Avenue	Wood	Continuous	72.34		296.41		368.75	4,182	0.088	1913	0.029
65	Flushing Avenue	Navy Street	Washington Avenue	Wood	Cont. & plain		3,162.84			3,162.84	6,990	0.452	1913	0.151
69	St. Johns Pl. & E.N.Y.	Ralph Avenue	Rockaway Avenue	Wood	Cast weld	478.53	144.48	920.89		1,503.90	5,340	0.282	1913	0.094
70	Third Avenue	Flatbush Avenue	Hamilton Avenue	Wood	Cast weld	1,920.16	1,765.94			3,686.10	16,796	0.221	1913	0.074
71	Third Avenue	39th Street	60th Street	Wood	Continuous	42.21				42.21	10,526	0.004	1913	0.001
72	Vanderbilt Avenue	Atlantic Avenue	DeKalb Avenue	Wood	Cast weld		221.00			221.00	5,360	0.041	1913	0.014
73	Church Avenue	New York Avenue	Brooklyn Avenue	Wood	Cast weld	22.14		5.57		27.71	1,885	0.015	1913	0.005
76	Fifth Avenue	Bay Ridge Avenue	65th Street	Wood	Cast weld		15.26	6.68		21.94	2,241	0.010	1914	0.002
77	St. Johns Place	Albany Avenue	Ralph Avenue	Wood	Cast weld		12.81	1,224.77		1,237.58	8,994	0.138	1914	0.069
79	Broadway	Ralph Avenue	Jamaica Avenue	Wood	Cast weld	86.33			119.76	206.09	14,966	0.014	1914	0.007
80	Myrtle Avenue	Broadway	Boro. Line	Wood	Cast weld	41.13		41.02		82.15	12,459	0.007	1914	0.004
81	Greene Avenue	Fulton Street	Franklin Avenue	Wood	Cast weld	100.62	31.60	174.76		306.98	8,788	0.035	1914	0.017
82	Flushing Avenue	Broadway	Knickerbocker	Wood	Cast weld	100.99				100.99	7,372	0.014	1914	0.007
83	Grand Street	Flushing Avenue	Juniper Avenue	Wood	Cast weld	229.72		212.85		442.57	2,560	0.174	1914	0.087
84	Hamilton Avenue	3rd Street	Colymbia Street	Wood	Cast weld	408.82		6.33		415.16	9,685	0.043	1914	0.021
88	Franklin Avenue	Eastern Parkway	Mall one Street	Wood	Cast weld	303.52		4.54		308.06	4,710	0.065	1914	0.032
89	Nostrand Avenue	Flushing Avenue	Putnam Avenue	Wood	Cast weld	29.00	450.26			479.26	9,257	0.052	1914	0.026
90	Flatbush Avenue	L. I. R. R.	Kings Highway	Wood	Cast weld			1,534.59		1,534.59	7,958	0.191	1914	0.095
91	Berzen Street	3rd Street	Flatbush Avenue	Wood	Cast weld		50.70			50.70	8,988	0.006	1914	0.003
92	Broadway	Hoffran Blvd.	Corona Avenue	Wood	Continuous			95.76		95.76	1,945	0.049	1914	0.024
94	Gates Avenue	Franklin Avenue	Reid Avenue	Wood	Cast weld	17.21	10.09	38.00		65.30	14,243	0.005	1915	0.005
98	Berzen Street	Nostrand Avenue	Kineston Avenue	Wood	Cast weld	19.12				19.12	4,496	0.004	1915	0.004
99	Washington Street	Myrtle Avenue	Tillary Street	Wood	Cast weld	10.84	2.77			13.61	1,361	0.010	1915	0.010
104	Avenue 'N'	Flatbush Avenue	E. 49th Street	Wood	C. w. & Plain	4.17	315.03	4.10		323.30	2,220	0.145	1915	0.145
105	Jay Street	High Street	Concord Street	Wood	Cast weld	28.83				28.83	948	0.030	1915	0.030
108	Nostrand Avenue	Stockton Street	Willoughby Avenue	Wood	w. & cont.		65.86			65.86	1,564	0.042	1915	0.042
Totals and averages						\$86,760.04	\$58,014.01	\$21,073.02	\$384.16	\$166,231.23	Average 152,605	for a 0.367	Love it years	ems 0.0938
Length of sections on which no work has been done since reconstruction										67,721			1.75	Non- Ex- pense
Total and averages, including non-expense track										520,326	0.319		3.66	0.0871

There are a total of 111 sections of standard track covered by the investigation, with a total length of 520,326 ft. or 98.5 miles of single track. Of these sections some expense is reported on eighty-two, having a total length of 452,605 ft. or 85.7 miles of single track. Hence there were found twenty-nine sections on which no money had been spent. These had a total length of 67,721 ft. or 12.8 miles of single track, which in turn is 13 per cent of the total trackage.



TRACK MAINTENANCE DATA—FIG. 5, GRAPHICAL REPRESENTATION OF ASSIGNMENT OF MAINTENANCE CHARGES

The average annual cost per foot of single track for the same track was 9.38 cents. The average age of non-expense tracks was one and seventy-five-hundredths years. The total cost per foot of single track for all tracks (both expense and non-expense) was 31.9 cents for tracks having an average age of three and sixty-six-hundredths years. The average annual cost per foot of single track for all tracks was 8.72 cents.

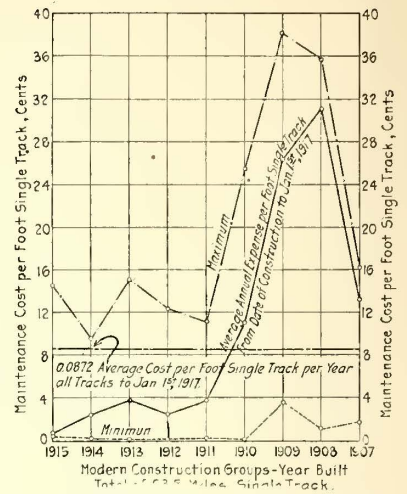
Fig. 5 gives a graphical illustration of the segregation of the principal expense charges from Table I.

TABLE II—ARRANGEMENT OF DATA FROM TABLE I TO SHOW COSTS FOR EACH ANNUAL TRACK CONSTRUCTION GROUP

Year Laid	FEET OF SINGLE TRACK			AVERAGE ANNUAL COST PER FOOT SINGLE TRACK			
	Non-Expense Track	Expense Track	Total Length	Max.	Min.	Av. on Expense Tracks	Av. on All
1907		8,251	8,251	\$0.163	\$0.018	\$0.132	\$0.132
1908		4,936	4,936	0.358	0.011	0.313	0.313
1909	748	43,969	44,717	0.392	0.036	0.265	0.263
1910	525	37,855	38,380	0.255	0.001	0.112	0.110
1911		66,499	66,499	0.111	0.002	0.037	0.037
1912	3,560	71,384	74,944	0.123	0.001	0.025	0.024
1913	11,579	94,956	106,535	0.151	0.001	0.042	0.037
1914	9,134	99,923	109,057	0.095	0.002	0.026	0.024
1915	42,175	24,832	67,007	0.145	0.004	0.020	0.007
	67,721	452,605	520,326	.....	.....	Average 0.0938	Average 0.0872
	12.8	85.7	98.5			Average \$495 per mile per yr	Average \$460 per mile per yr.
	miles s. t.	miles s. t.	miles s. t.				

It will be noted that joint maintenance represents 52.1 per cent, pavement 34.8 per cent, and corrugation 12.8 per cent of the total maintenance expenditure. Incidentally it has been found that about 26 per cent of the pavement expense is due to pavement repairs at joints following repairs to the latter.

Table II gives another arrangement of data from Table I wherein the average annual cost per foot of single track is given for each annual construction group. It should be remembered that the costs shown are not for any particular year, but are the averages for the several construction groups for varying years of service. No attempt is made to show the expenditures arranged for years in which the expense occurred. Fig. 6 is a graphic presentation of data from Table II. It indicates even more clearly the effect of the changes from steel to wood ties and from riveted to cast-weld and continuous joints.



TRACK MAINTENANCE DATA—FIG. 6, CHART OF MAINTENANCE COSTS FOR TRACK OF DIFFERENT AGES

Table III presents further data indicating high expense due mainly to type of ties and joints. The striking features brought out are that while the mileage showing the highest expense is only 11.4 per cent of

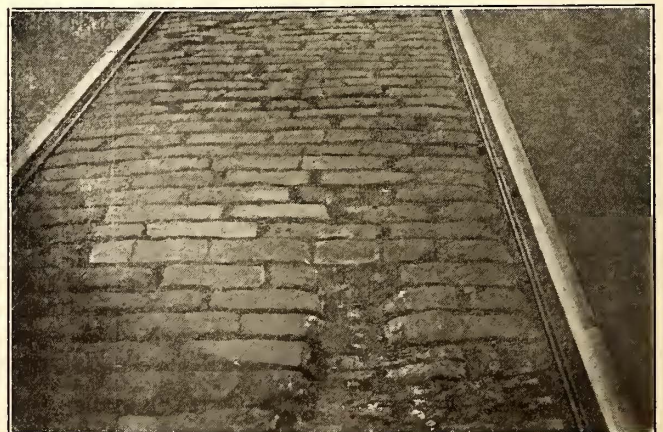
TABLE III—TOTAL EXPENSE TO JAN. 1, 1917, ON FIFTEEN SECTIONS WHICH HAVE PRODUCED THE HIGHEST UNIT COSTS

Sect. No.	Length Ft. S. T.	Year Laid	Total Expense	Cost per Ft. S. T. to Date	Reasons Assigned for High Expense
2	6,509	1907	\$9,564	\$1.468	Slag brick pavement. Rivetted joints, steel ties. Rivetted joints, steel ties. Rivetted joints, steel ties. Rivetted joints, steel ties. Rivetted joints, steel ties. Rivetted joints, steel ties, location under L structure, poor roadway contour, excessive street sprinkling. Rivetted joints. Rivetted joints, steel ties, wood pavement and poor drainage.
4	4,326	1908	12,428	2.869	
7	1,394	1909	1,404	1.006	
9	5,832	1909	10,092	1.732	
10	4,450	1909	4,711	1.058	
11-18	21,953	1909	60,230	2.748	
24	6,212	1910	9,512	1.532	
27	1,156	1910	1,493	1.291	
Totals...	51,842 9.8 miles s. t.		\$109,434	Av. 2.11	

NOTE.—Total length is 11.4 per cent of total expense trackage. Expenditure is 65 per cent of total expense.



TRACK MAINTENANCE DATA—FIG. 7, SLAG BRICK PAVING SHOWING DAMAGE NOT CAUSED BY RAILWAY



TRACK MAINTENANCE DATA—FIG. 8, GRANITE BLOCK PAVING SHOWING DAMAGE NOT CAUSED BY RAILWAY

the total expense mileage, the expenditure on this small mileage is 65 per cent of the total expense for all trackage. No doubt age has something to do with this, and it is also realized that the car traffic on these sections is the heaviest on the system. With one exception, however, the greatest items of expense have been for joint repairs, and in all but one instance the joints in these sections were originally of the riveted type and the ties with one exception are steel. Only one section in this table indicates a high expense for pavement as the principal occasion for the heavy expense, and this particular pavement was an unfortunate experiment, on a rather extensive scale, with slag brick as a paving material on a street carrying a heavy vehicular traffic as well as heavy car traffic.

In further explanation of the high costs for certain sections it should be stated that in 1915 the sum of \$43,000 (almost 25 per cent of the expense to date) was expended in a replacement of all riveted joints by arc weld repair joints on sections 9, 11, 12, 13, 14, 15, 16, 21 and 24, in an effort ultimately to reduce general maintenance charges. Similarly in 1916 there was an increase in expenditure of \$3,000 over the previous year in the item of grinding corrugation, due to an effort to minimize the effects of a rather sudden increase in the amount of corrugation which accumulated in 1915. It will be noted that in the 1915 group, section No. 104 indicates a high cost for pavement. This is due to the fact that the section is not up to full standard, since the granite pavement was laid on a sand bed with sand joints. This was done because there were no sewers in the street and no pavement in the roadways outside the track. Within a very short time a large oil plant began to operate 5-ton delivery trucks over this pavement causing the expense indicated.

The data in the tables also furnished an opportunity for a study of the effect of the volume and weight of

car traffic upon maintenance costs. There seems to be a prevailing impression that volume and weight of traffic are elements which greatly influence track maintenance charges, but from the study made thus far the records do not indicate that car traffic *per se* has such a definite relation to maintenance costs that a reasonable measure of its destructive force can yet be determined.

On the contrary, there is some evidence to substantiate the writer's belief, as previously stated in the columns of the JOURNAL, that within a very wide range the conduct of transportation, or in other words the number of cars or wheels operated, does not have the important bearing on track maintenance costs usually ascribed to this factor, except as it increases costs for actual work. For instance, it will be seen from Table I that sections 57 and 58 were built in the same year, with exactly the same type of construction, and one section is a continuation of the other. The car traffic is the same, 555 cars per day each way. Nevertheless, the average annual maintenance cost for one section is 1.2 cents per foot per year while for the other it is 13.2 cents, a difference of 12 cents. The serious trouble on one section in this case was occasioned by corrugation.

Another comparison may be made between sections 61 and 62. These were also built the same year on the same street, though not contiguous, and they have the same type of construction. The car traffic on section 61 is 303 cars per day each way, while the unit expense is 2.3 cents. The car traffic on section 62 is 374 cars per day each way, while the expense unit is only 0.2 cent, a difference in unit expense of 2.1 cents, with the higher unit on the section of lesser traffic. These instances serve to illustrate how impractical it is to assign definite values to the destructive effects of car traffic as a productive agent of regular maintenance expense.

C. E. R. A. Appoints Military Committee

Concluding Session of Annual Convention—Officers Were Elected and Two Past-Presidents Spoke—Papers on Wrought Iron and Standardization Were Presented

AT the final session of the Central Electric Railway Association annual convention, March 9, two other past-presidents of the association, in addition to the ones who had spoken at the Thursday meetings, addressed the association. These were W. S. Whitney, Springfield, Ohio, and A. W. Brady, Anderson, Ind.

Mr. Whitney confined his remarks largely to conditions surrounding traffic matters and remarked that at the close of his term as president of the association the total mileage of the lines of members of the Traffic Association and parties to the joint interline passenger tariff was about 3000 miles. At the present time it is about 4500 miles and this mileage will be represented in the joint interline passenger tariff now in course of publication and expected to issue the latter part of this month to become effective May 1. This increase in mileage, he said, was an additional asset to every line, since it opened up new territory for the interchange of long-haul passenger business.

Referring to freight traffic, he said that it was only a few years ago that this source of revenue was looked upon with scant consideration by numerous operating officials who thought then to confine it to a semi-express business and handle small packages on passenger cars only. A great deal of eloquence was in some instances necessary to convince officials of the value of this branch

of traffic, but that time is past and freight revenue is now an item that sometimes spells the difference between an operating profit and red figures. While the freight earnings of member lines may not in all cases show a very large percentage of gross earnings, Mr. Whitney continued, it was his observation that in most instances this was not for the lack of prospective business, but rather for lack of equipment and freight facilities to care for that which might be secured. Congestion now existed in every city in the territory and business was being turned away daily because of these conditions. The prophecies of freight officials which in the past had often been considered illusions of a disordered imagination, had been more than verified.

Mr. Whitney referred to the completion of the joint time-table folder, the first issue of which appeared in January, and said that he considered this one of the big accomplishments of the association. This, with the official map and the joint interline passenger tariff, he said, from a traffic standpoint, constituted a trinity that rounded out to completeness the information necessary successfully to solicit a share of competitive business.

Mr. Brady addressed the association on the international situation and the need for the railways to prepare themselves in advance of the call in order to be of greatest service to the government. He said that it was evi-

dent from the manner in which the association had received the talks of C. L. Henry and Harry B. Smith, adjutant-general of the Indiana National Guard, that the railway men were loyal to the administration in the present serious situation, about the gravity of which there could be no doubt. He thought that the association should co-operate with the government to put the individual railways in a position to be of greatest service, should the government have occasion to call upon them. In this connection, he suggested the appointment of a committee which would take up with the military authorities and the government officials plans for the preparation of the electric railways in advance and for their efficient utilization if a crisis arises. The steam roads are badly congested and it might be that the electric roads would, therefore, offer an especially important assistance in the movement of troops and supplies.

In view of Mr. Brady's recommendation, the association passed a resolution creating a committee of eight members to be known as the "Committee on Military Efficiency and Defense" to co-operate with the army department, and President Wilcoxon appointed the following members of this committee: A. W. Brady, An-



A. W. Brady, George Whysall, C. N. Wilcoxon, H. A. Nicholl,
C. L. Henry and E. B. Peck

FIVE PAST-PRESIDENTS AND MR. WILCOXON, THE PRESENT EXECUTIVE OF THE C. E. R. A. THE SIXTH, W. S. WHITNEY, WAS ALSO PRESENT THE SECOND DAY OF THE CONVENTION

derson, Ind., chairman; J. F. Collins, Jackson, Mich.; Frank R. Coates, Toledo, Ohio; William A. Carson, Evansville, Ind.; George Whysall, Marion, Ohio; W. H. Bloss, L. G. Parker and S. D. Hutchins.

The association then listened to the paper by Mr. Broomall on "The Value of Standards to the Railway Industry," which appears in abstract on another page. Owing to the lateness of the hour and the further business to come before the association, President Wilcoxon requested that discussion on the paper be omitted.

The report of A. L. Neereamer, secretary-treasurer, was then read to the association and approved. An abstract of this report appeared in last week's issue of the JOURNAL.

The committee on nominations reported the following names for officers for the ensuing year, and the association gave them a unanimous ballot: President, C. N. Wilcoxon, president and general manager Chicago, Lake Shore & South Bend Railway, Michigan City, Ind.; first vice-president, F. W. Coen, general manager and purchasing agent Lake Shore Electric Railway, Sandusky, Ohio; second vice-president, John F. Collins, vice-president and general manager Michigan United Railways, Jackson, Mich.; and secretary-treasurer, A. L. Neereamer, Indianapolis.

The members of the executive committee appointed were as follows: F. D. Carpenter, Lima, Ohio, chairman; H. A. Nicholl, Sam W. Greenland, W. A. Carson, R. A. Crume, Frank R. Coates, E. J. Burdick, A. Benham, E. B. Peck, A. Oberding, W. H. Bloss and O. A. Small.

President Wilcoxon appointed the following committee on hotel arrangements: W. H. Bloss, chairman; S. D. Hutchins, L. G. Parker, and J. G. MacMichael. The joint folder committee, of which E. B. Peck of Indianapolis was chairman, was also continued.

Revival of Pure Wrought Iron*

The Author Discusses the Reasons for the Recent Return to Popularity of Wrought Iron in Railway Service

BY G. G. ROBERTS

Of Brown & Company, Inc., Chicago, Ill.

AMONG the vexatious problems with which practical railroad men are constantly confronted—probably outstanding all others—is that of breakage of various metallic parts of the operating equipment under the stress of working conditions. Fractures persist in occurring when, and often where, least expected, and far too frequently they occur with disastrous results.

For our purpose it will suffice to eliminate all except that insidious, progressive, structural derangement commonly known as "crystallization." This term, though hallowed by usage, is a misnomer, because the process of disintegration intended to be described by it is the opposite of crystallization. It is, in fact, the destruction of the crystalline form—the decrystallization of the metal. The condition is really a breaking down of cohesion, through motion, which causes the crystals by grinding upon one another to assume a more spheroidal or granular form in which cohesion, on account of the reduced area of contact, can be but inefficiently exerted.

Under practical working railroad conditions, three destructive forces are ever at work on the metal parts of equipment, namely, shock, jar and vibration, the latter being the effect of the other two. There is agitation, more or less violent, upon every crystal composing the metal, and since all are not of equal strength or cohesiveness, it would seem wholly plausible that the least efficient should yield. This usually occurs at or near the surface where cohesion ceases and the escaping vibratory waves exert their greatest force. From this point of incipient fracture the process continues toward the center, because the bottom of the fracture will have become the nearest point of exit and the least resistant, and the cleavage will progress transversely in a practically straight line until a sudden excess of strain completes the severance. Proof of this is the well-known fact that where a piece of steel is nicked or scratched fracture will always begin.

It should be borne in mind that all steels, of whatever kind, are crystalline in formation, and are, therefore, most susceptible to granulation.

In the effort to reduce breakage from this cause, the entire gamut of steels has been run with varying though unsatisfying degrees of success. Increasing the section or size merely tends to delay the date of final reckoning. The use of various foreign substances known as alloys, increasing strength and rigidity, serve only to retard the process and, perhaps, render more difficult the detection of incipient, or even advanced, fractures, and experience has shown that this class of material has not requited the hope inspired by its advent.

We thus are brought to consider the almost forgotten plebeian which has heroically done duty from remote antiquity, the commonest, basest—because most plentiful—the most useful of all the metals—pure wrought iron.

Pure wrought iron is a thoroughbred. It is fibrous, tenacious, ductile, uniform and, though not so strong as its lusty offspring, steel, its character will be shown to

*Abstract of a paper presented before the Central Electric Railway Association at Indianapolis, March 8, 1917.

meet the difficulty of granulation by vibration more nearly than any other known material with anything like its availability. On the other hand, steel is a hybrid—a carbide of iron. It is strong, rigid, crystalline, friable, but it cannot withstand the shaking, the vibration, that iron can. However, as before stated, the question is not one of tensility, but rather of ductility, or, as it might be stated, conductivity.

Load limit excepted, a steel of, say, 100,000-lb. tensility will withstand granulation better than one of 50,000 lb., but the evidence is that pure wrought iron of the lesser strength will survive far longer. As a matter of fact, the higher tensility as expressed in steel has been exacted in the false effort to combat granulation rather than because of its necessity in load carrying. True, a fibrous material of 100,000-lb. tensile strength would be highly desirable, but it cannot be had. About 50,000 lb. is the limit of pure wrought iron, which is the best expression of a fibrous metal. Beyond that we encounter the presence of a hardener or stiffener, and enter at once upon the domain of steel. When it shows below about 46,000 lb. we may expect to find adulteration affecting its purity, like scrap or residual deleterious constituents of the ore, which latter are ever present in the natural state.

Corrosion is another factor, aside from its own destructive effect, that leads to granulation by reduction of the metal to its natural state of ore. It is well established that pure wrought iron exposed to the elements in every-day working conditions is far less susceptible to corrosion than any steel. Instances are plentiful, as in the wrecking of old buildings, bridges and other structures. In general, this may be ascribed to galvanic action.

Iron, due to its greater phosphorus content than steel, is cathodic and the steel anodic when the two are brought into close contact. This accelerates corrosion in the negative element. The fact may readily be demonstrated by fastening steel plates with iron rivets. In a very short time the rivet heads will project appreciably and the steel plate will show excessive corrosion.

It should be said also that sudden changes of temperature have less effect on iron than steel, due again to the fibrous character of the former, as in the case of a locomotive piston rod passing from a hot steam chamber to perhaps 40 deg. below zero, which is always a more or less dangerous trial for steel. About the only objection to iron for this purpose (its softness causing seams to develop under the packing) has been due to carelessness in providing iron unfit for the purpose like piled or "bushel" iron, whereas for this and other like strenuous duty only the best pure wrought iron from hammered blooms should be used.

CHARACTERISTICS OF COMMERCIAL WROUGHT IRON

Bloom, piled and box-piled iron are terms that are properly used to express the various methods of making iron. All may be and are to-day made of various combinations of scrap or junk. Originally they referred only to pure wrought iron, but now they are carried along through the scrap heap and junk pile as catch phrases to entrap the unwary. Please bear in mind that now I am trying to describe pure wrought iron puddled wholly from new metal. "Common," "merchant bar" and like products have their uses, but not in high duty.

With this understanding, in the order of effectiveness the blooms come first, box-piled next, rerolled-piled next and straight-piled last. It is rather a fine distinction as to the proper application of each to its particular sphere, but speaking generally they represent what may be termed high duty, medium duty and low duty. They will show strength and durability in the order given.

Norway or Swedish irons are so-called, as indicated, from the regions of their origin, where ore is found containing all elements necessary to the production of good iron. Ore deposits in most other sections of the globe are lacking in the important red hematite. This, however, may be readily obtained in other sections and added to local ores. In addition to this, the Scandinavians are noted for conscientiousness in the production of their irons. However, in our own and other countries there are produced irons which, in many respects, excel the Norway or Swedish.

All forging metals have what is known as a critical point of heat usually expressed as "short." Thus steel is cold short and hot short, and must be worked at a red or medium heat—pure wrought iron, per contra, is red short, that is to say, when the directions of its fiber are to be changed, as in bending, punching or twisting, it should be white hot or black.

In this connection, it may be noted that the more carbon in the piece the lower the heat at which it can be worked, and the less the carbon the higher the heat, until the point of no carbon is reached as in pure wrought iron a white or "snowball" heat is best about 2200 deg. Fahr. Many blacksmiths, not knowing this law of metals or from force of habit or otherwise, persist in spoiling good iron by trying to compel it to work like steel at a red heat. It is significant that they do not attempt to work steel at a white heat, when it flows readily under the hammer.

In conclusion, to the gentlemen of higher authority in the railroad industry it may not be amiss to invite attention to the wisdom of the expression as applied to railroading, "the best is none too good." I am impelled to this remark by the not uncommon misconception of the term economy. Permit me to repeat, economy in the purchase of material is not necessarily represented in the number of pounds of material a dollar will buy, but rather by how much car mileage the dollar purchases. Pure wrought iron cannot be produced as cheaply as the steels which are ordinarily in competition with it, and upon this fact, perhaps more than upon any other, rests the cause of its partial, though temporary, eclipse.

This faithful old servant of man, this Rip Van Winkle of the metallic world, comes back not as a mendicant, not as its human prototype, incapacitated for further useful effort, but still imbued with all its lusty vigor. However, I am constrained again to say that the quondam stranger before us is not "any old iron," but pure wrought iron.

Railway Progress in Spain

The first annual report of the Barcelona Traction, Light & Power Company, Ltd., Barcelona, Spain, for the calendar year 1915, contains a special report dated Oct. 3, 1916, by H. F. Parshall, president of the Ferrocarriles de Cataluna, relative to the progress of construction and operation on the controlled tramway enterprises. In his opinion, the general tramway system in Barcelona, which is owned by the Tramways de Barcelone, a Belgian company, and is now managed and controlled by the Ferrocarriles de Cataluna, under an operating contract, has great possibilities of development, but this will necessitate a large expenditure if satisfactory results are to be obtained.

At the present time the tramways are being operated under several concessions with two gages of track, but a new concession has been granted by the municipality and is now before the government in Madrid for approval, under which the various concessions will be unified, the tramway system operated on one gage, and the lines extended into the outlying districts.

The Value of Standards to the Railway Industry*

The Author Outlines the Advantages That Obtain Through Reduced Costs and Simplified Maintenance of Standard Parts and Points Out That Standardization Does Not Bar Progress Because of the Possibility of Making Revisions When They Are Needed

By A. L. BROOMALL

Westinghouse Electric & Manufacturing Company

WHEN standards upset immediate plans, and force decisions contrary to those which seem to be the best for any specific case, one is inclined at the moment to feel that standardization is a handicap to progress and a waste of time and money. However, in nearly all instances a broad viewpoint will convince one that there is very little danger of too much standardization.

A great number of articles that are used almost daily have become standardized, thereby saving a lot of time and effort. For examples, the standard Edison lamp base, standard pipe threads, standard bolt threads, and the standard Brown & Sharp wire gage may be cited. One can easily imagine the inconvenience and loss of time brought about by even a small number of different types of lamp sockets, as well as the additional cost of manufacturing and selling lamps if the manufacturers and dealers were forced to carry a stock for two or three types of bases. If there was no standard gage for the railroads the additional time and expense required in handling freight and the personal inconvenience in traveling could not be estimated.

There is nothing new about standardization, but the need of it now is greater than ever before, because of the greater use of tools, jigs, and automatic machinery in manufacturing. It is particularly desirable wherever pressed steel parts are used, because the tools for forming pressed steel are expensive as compared to the cost of patterns for castings, and when these tools are once made they will last almost indefinitely. Stating this in another way, when standards are adopted and followed, manufacturers will then feel that they can afford to provide their shops with more elaborate tools—even in spite of their greater cost.

Standardization consists in laying down a definite plan as a guide for all future development, thereby eliminating small steps and insignificant differences in dimensions and materials. It may be divided into three general types: standardization of dimensions, standardization of materials, and standardization of processes.

STANDARDS REDUCE COSTS

Primarily, the adoption of standards permits the manufacturers to build in larger quantities, which in turn means production at less cost, thereby enabling the railways to purchase at a lower price. When small quantities are handled the time to set up the tools for many operations adds a large percentage to the cost of actually performing the operation. The workman who performs the same operation day after day becomes skilled in handling that special operation, but on the other hand if the operation is changed every few days it is necessary for him to spend time studying drawings or other instructions, changing tools and

asking questions of his foreman, all of which reduces his output and adds to the cost.

A good illustration showing the difference between the cost of a standard and a special article recently came to my attention: Requests were made from several steel companies for quotations on two grades of steel which would have practically the same physical characteristics. One steel was standard with the steel manufacturers, while the other steel was very special, both as to material and the method of handling. The price quoted on the standard steel was 8 cents per pound, while the price quoted on the special material was approximately 30 cents per pound. This great difference in cost was largely due to the fact that to have produced the special grade of steel, the steel manufacturers would have been required to have upset their regular scheme of production, causing delays in the manufacture of their standard steel and thereby increasing the cost of it also. The actual cost of the material and labor on these two steels if manufactured under the same conditions would have been approximately the same.

I am informed that Mr. Carnegie once said, "We will roll the standard shapes of structural steel and allow our competitors to make the special shapes," thereby implying that he would rather lose the business than handle the special material.

The selling price of the leading types of automobiles has been gradually reduced as the output has been increased. In the automobile trade production has been on such an extensive scale that the manufacturers could afford to equip their shops with the very best tool equipments, and by standardizing all their processes could enable their men to work most efficiently. The manufacturer of apparatus for the railways can hope only to approach the conditions in the automobile trade by a standardized product. But first the railways and manufacturers must mutually agree on standards, so as to eliminate requests from the railways for articles which the manufacturers are not prepared to furnish. The American Electric Railway Engineering Association standards serve as the medium through which this is being accomplished.

When these come into general use the delivery to the railways of all parts that are standardized will be improved, since the manufacturers of both raw material and finished apparatus will have more assurance as to the probable desires of the railways and will therefore provide for the manufacture of the standard parts in quantities as well as carrying an available stock. Also in the case of several railways that are united to form a large system the maintenance problems will be greatly simplified if all the individual roads have in the past followed the association standards. In this case many of the detail parts of the equipment may be interchangeable, and at least the variations in size will be such that the parts will perform different classes of service.

*Abstract of a paper presented before the Central Electric Railway Association at Indianapolis, Ind., March 8, 1917.

The interurban railways which now interchange cars will be particularly benefited by the more general adoption and use of standards. Repairs can then be made more easily to cars from other divisions or even to cars from other roads, not only on account of having interchangeable parts, but because the men will be more familiar with the methods of handling the apparatus.

STANDARDS CAN BE CHANGED

However, standardization is an ideal. The work can never be finished because the art will develop from time to time, and to suit the new conditions the standards must be changed or new standards added. For this reason a standardization committee must be always at work reviewing existing standards and suggesting new ones. As an illustration, in 1907 the Engineering Association adopted standard axles that gave wonderfully satisfactory results until the small, lightweight, ventilated motors were introduced. It was undesirable to put these motors on any existing axles, as the minimum standard at that time was $4\frac{1}{2}$ in. in diameter, and since the new motors are very short along the axle, if they had been located according to the existing standards the axle collar required would have been nearly as long as the motor. It was therefore necessary in 1916 to add two new axles to the list and to make a few minor changes in the old standard axles.

Previous to the time of adopting the association standard axles there had been no plan to which any of the manufacturers or railways were working. Each individual, in designing the axle or motor, was allowed to use his own judgment, so that an enormous number of axles were being made, each one differing only slightly from some other. In many cases, if an axle had been made for a certain type of motor a different motor could not be used. There was often confusion as to the type of gear key desired, and the location of the motor on the axle. Axle drawings were frequently sent to the motor manufacturer to have the location of the motor on the axle approved, and, altogether, a lot of expense was involved by the railways and manufacturers in fitting motor, axle and detail parts together. It is needless to say that a great number of errors and delays occurred because of some misunderstandings or mistakes in reading drawings.

After the standard axles were adopted, it became a simple matter to check up the application of any given motor to one of the standard axles. It is now unnecessary to refer the drawings of standard axles to the motor manufacturer, since the axle is completely identified by giving its number. The correspondence required has been greatly reduced, and nearly all the errors of application of the motor to the axle have been eliminated. I have looked at the advantages of the standard axles from a motor manufacturer's standpoint, but I am sure that the railways, as well as the truck builders, have felt the great benefit that was derived by having this one part of the car equipment standardized.

Carbon brushes, which have not been standardized, but which soon will be, illustrate so well the conditions that exist when there are no standards to guide the designer, and show so clearly the great advantages to be derived by having standards, that I will give you in a few words the history of the case.

Formerly, railway motor brush holders of different manufacturers required carbons having different tolerances from the specified dimensions. This meant that a carbon, say, $1\frac{1}{2}$ -in. x $1\frac{1}{2}$ -in. was not interchangeable in motors of different manufacturers, even though they both used carbons of the same nominal size. The tolerances permitted were also different for industrial and

railway carbons. By joint action of representatives of the Electric Power Club, the American Electric Railway Association, the carbon-brush manufacturers and the manufacturers of electrical machinery the same tolerance from specified dimensions has been agreed upon for carbons of all electrical machinery. In the future, when ordering carbons, it will be necessary only to specify the size and grade of carbon desired. Previous to the adoption of these standards it was necessary to specify the type of motor on which the carbon was to be used.

This cannot but greatly simplify the handling of carbon brushes and will be of great benefit to the electric railways, the carbon-brush manufacturers and the motor manufacturers. The adoption of this universal standard will permit the carbon-brush manufacturers and motor manufacturers to reduce the number of machining fixtures and gages required, and will permit them to carry a much larger available stock of carbons ready to ship. The possibility of errors has been greatly reduced, which in turn will eliminate many complaints and much letter writing. All of this tends to reduce the price of carbons, but as it has actually worked out it will permit the carbon-brush manufacturers to furnish a carbon with reduced tolerances from the specified dimension at about the same price. The electric railways will now obtain better carbons, more prompt shipment, and in many cases carbons which are interchangeable on several types of motors.

I have explained only two cases in detail, but I am sure that many of the other standards that have been adopted have been as beneficial. Standardization has for its ultimate object greater economy, and standards are good so long as they represent economy. Standardization can be overdone, but as a check on this, if the sacrifice in any given design in order to follow standards is too great, they will probably not be followed. In the same way it may be wrong to adhere to a standard when by neglecting it a far superior design can be made. For instance, some years ago 30-in. and 33-in. wheels were standard for city cars. Then the 24-in. wheel for low-floor cars was brought out. This, of course, required motors, trucks, car bodies, etc., quite different from the then existing standards. However, the small wheel has proved so satisfactory, I am sure we will all admit that it was a distinct advance in the art, and, therefore, a new standard was justified. It has, however, added to the cost of producing equipment; by this I mean that manufacturers of trucks, wheels, car bodies, motors, etc., are now forced to build apparatus to suit several sizes of wheels. Let me state this in another way: If all city cars used only 24-in. wheels, then the cost of the cars, including equipment, could probably be greatly reduced over what it is at present, under conditions where it is necessary to produce cars and equipment for several sizes of wheels.

STANDARDIZING PROCESSES

There is another type of standardization by which the railways could accomplish much in their own organizations. I refer to standardizing their processes. By this I mean having written rules or processes for many of the operations performed in inspecting and maintaining equipment. It is almost impossible for the man in charge to be sure as to the exact process that is being followed in the repair shop on the great number of simple operations that must be performed, such as babbitting bearings, banding armatures, repairing commutators, etc. Written rules will do much toward standardizing these operations. It will also teach the young workman the correct process to be followed.

It may require time and effort to develop a process,

but this, when once developed, will thereafter go along automatically. By the simple act of writing down rules better methods of performing each operation which otherwise would not be suggested will often occur. Most repair shops have worked out the various processes with satisfactory results, and from there on the information is passed along verbally from workman to workman, with the result that many important details are forgotten. The above is a type of standardization that is rarely referred to, but I believe it could be used to great advantage on many railway properties.

If standardization work is to be of value to the industry, we must all do our best in helping the standardization committee in its work, and when a standard is adopted, we must in every way possible strive to make use of that standard. There are cases when it is impossible to use the adopted standard on account of some special local conditions, but in this case the railways should adopt a design which differs as little as possible from the standard and they should work with the object in view that ultimately changes can be made in all details and actual standardization effected.

Office Routine and the Planning System

An Article Supplementary to One by F. P. Maize, Master Mechanic Portland Railway, Light & Power Company, Appearing in the 1916 Maintenance Issue

By H. C. BRUMBAUGH

Chief Clerk, Mechanical Department, Portland Railway, Light & Power Company, Portland, Ore.

NOWHERE is the need for a simple but comprehensive office system more apparent than in those shops in which there is a planning system. Without a suitable office organization and routine, well balanced and with the several functions co-ordinated, any planning system will operate with extreme difficulty or fail altogether regardless of the merits of the plan itself. In the issue of the *ELECTRIC RAILWAY JOURNAL* for March 18, 1916, F. P. Maize, master mechanic of this company, described in detail the planning system which had been installed a short time previously in our shops. The purpose of the present article is to present what might be called a progress report on the same subject, and to elaborate somewhat the detail of the office end of the system.

The office may be likened to a power plant. When all is running smoothly, with the working parts carefully watched and tended, the whole system is satisfactorily energized. When there is trouble at the power plant, friction results and gaps appear in the service. If the trouble is not soon located and eliminated the whole system is demoralized. Like the planning system itself, the office end of an electric railway repair shop operated under a planning system is different from almost any other enterprise, although the underlying principles are the same. To produce the desired results, such an office should be divided in its functional organization into three main sections, namely, the planning department, the accounting department and the statistical department.

In the planning department the following functions are performed: The planning, routing and following up of all work done in the shops; the obtaining and distribution of all material and tools; the preparation and distribution of instructions and orders; the receiving and reporting of reports from workmen when beginning or leaving jobs, and the keeping and reporting on the costs of the jobs.

The functions of the accounting department are to extend time cards; to enter, prepare and balance pay-rolls; to determine the proper operating accounts to which the different jobs are chargeable, and to prepare recapitulations of all shop jobs, giving the distribution to the different ledger accounts of all labor and material expended.

The duties of the third division, that on statistics, include the recording of all changes of parts of equipment; the keeping of data cards of equipment owned; the recording of the mileage made by each car daily;

the keeping of individual records of all parts of equipment, showing dates of application and removal; the mileage made while in service, and the name of the responsible workman, and the compilation of all periodical reports.

At first glance it may be difficult to see why all of these functions are necessary and how they can be brought into working relationship with each other. Experience in the shops of this company has shown that not only is it feasible but that it is absolutely necessary for the proper planning of shop activities.

DEVELOPMENT OF THE OFFICE SYSTEM IN THE PORTLAND SHOPS

About ten years ago when the writer first became identified with this company the office force of the mechanical department consisted of one clerk. His duties were to answer the telephone, check time slips, write the few letters necessary and issue orders for any special work to be done in the shops. No orders were issued for the routine car work.

Each workman was furnished with a time slip, with the operating accounts printed thereon, and at the end of the day he was expected to put down as many hours opposite each of the accounts as he remembered having worked on during the day. His principal care was to see that the total was ten hours. The only accounting done in the department at that time was thus performed by the mechanics themselves. Records of changes of the principal parts of equipment, such as armature or wheels, were kept in a haphazard manner. Although mileage on the cars was kept at the general office of the company, it was utilized principally by the auditor in the preparation of his financial statements and reports and was very seldom referred to by anyone in the mechanical department.

The first improvement consisted in the installation of a complete system of records of all changes of all parts of equipment. As a consequence the frequent use of the mileage records for the purpose of determining the relative merits of material naturally followed. This added a great deal of clerical work and necessitated the addition of one clerk.

The next step was to change the time slip system so that the responsibility for the distribution of shop labor to the several operating accounts would be placed on a clerk familiar with the accounting system. A time card was devised with space for the workman to write in detail a description of the work he had performed

during the day, and a column for the time worked on each job. The clerk with this information was enabled to classify the work and distribute it to the proper accounts.

The above plan had been in operation but a short time before the head of the department began to ask for details in comparing the monthly statements of operating expenses with similar figures for the previous year. He also desired from the mechanical department office an explanation of any increases or decreases in the amounts of expenditure. To supply this information required the accumulation of considerable data and, as the correspondence had been increasing for some time also, a combination stenographer and statistical clerk was added to the force.

Shortly after this innovation the present master mechanic took over the management of the department, and from that time dates the real progressive develop-

the mechanical operation of the system was concerned.

The details of the change to the planning system and the development of this system itself were fully described in the article in the *ELECTRIC RAILWAY JOURNAL* already referred to and need not be repeated here. However, it may not be amiss to describe one important development of the system which has been put into effect since the publication of the article. One of the primary objects of any system of so-called "scientific management" is to determine the efficiency of the individual workman, then to endeavor to increase this by making his compensation contingent upon and commensurate with the efficiency attained. To this end we have for the past two years been making a careful study of time records on any operation pertaining to our standard work. We have succeeded in a great many instances in establishing standard time for the performance of the operation. We have also for some

PRODUCTION RECORD														Mechanical Department			
NAME				NUMBER				RATE				RATING					
WORK PERFORMED																	
OPERATION No.				STANDARD TIME: HOURS				RATE				AMOUNT					
Date	Hours	Amount	%	Date	Hours	Amount	%	Date	Hours	Amount	%	Date	Hours	Amount	%		

HEADINGS OF RECORD CARDS USED IN DETERMINING THE EFFICIENCY OF WORKMEN IN PORTLAND (ORE.) SHOPS

ment of the office system. The result was that when the time came to inaugurate the planning system, described in the article referred to, the change was effected overnight and without disorganizing either the office or the shop forces. With the introduction of new shop methods the office records became more and more important, and the necessity for centralizing all of the clerical work pertaining to the mechanical department in the departmental office became apparent. The mileage clerk, with all of his records, was moved from the general office to the mechanical department office, and the payroll clerk soon followed. Overhauling of equipment was started on a mileage basis, and the mileage made by parts of equipment was used to determine the relative merits of material and the quality of the work performed by the shop men.

The need of data regarding comparative costs was soon developed, and a fourth clerk was added to the office force. A crude cost system was first installed, which was gradually improved upon as the need developed. This was the real beginning of the planning department, insofar as the office was concerned. For the endeavor that produced reliable and active cost data resulted in the endeavor to standardize working methods.

From the above it will be seen that all the essentials for intelligent management of the shop were provided. The mileage record furnished the basis for the bulk of the shop work, the overhauling of equipment, and gave a graphic picture of the quality of materials and workmanship. The records of changing of parts of equipment fixed the responsibility for work performed and furnished a check upon the mileage records. The cost data gave the time and cost of the work, and furnished the basis for determining the efficiency of the workman. The monthly statistical reports showed every phase of the shop activities in condensed and tabulated form. As a consequence of this preparation the transition to the real planning system was easy in so far as

time past considered certain rates of pay standard for certain kinds of work. With this information, that is, standard time at a standard rate, we have developed a system for gaging the efficiency of the workman.

For this purpose we use a card record form, 5 in. x 8 in. in size, with the printing shown on the accompanying illustration. It will be noted that the card gives the workman's name, his number, his rate, a description of the work performed, the operation number, the standard time, the standard rate and the standard amount. Columns are provided for the entry of the date, the time taken, the amount of money involved and the percentage of the time taken to the time allowed. In the heading of the card is also a space for "rating." This is obtained by dividing the workman's rate by the standard rate. It indicates by the resulting percentage the average of time it must take him to perform this particular work if he is to be considered 100 per cent efficient.

As an example, suppose that a workman's rate is 45 cents per hour and the standard rate is 50 cents per hour. His rating is then obtained by dividing forty-five by fifty; that is, it is 90 per cent. If the average of the percentage column is ninety, the workman is said to be 100 per cent efficient. If the average happened to be eighty, the workman is only 88 per cent efficient. This method has the merit of being absolutely fair both to the workman and to the employer, as it takes into consideration the time element and the cost element.

Whatever scheme of compensation may be adopted, whether it be a task and bonus system, a profit-sharing system on a percentage basis, or a straight day's pay based on the workman's value to the employer, it is certain that the application of this principle will result in the workman receiving just compensation for his services based on a scientific determination of his value. His compensation will not depend on the opinion of his foreman, who may, consciously or unconsciously, be prejudiced.

Regulating Materials and Supplies

Pittsburgh Railways' System, Similar to That Used for 90 Per Cent of Steam Railroad Mileage, Is Economical and Efficient—Plan Is Based on "Stock-Book" Record and Monthly Count of Stock on Hand, with Data as to Orders and Receipts

By B. J. YUNGBLUTH

General Storekeeper, Pittsburgh (Pa.) Railways

WITH the constantly increasing prices of material, the rising cost of labor and the more exacting service demands from the public, economy in the electric railway industry is to-day more necessary than ever before. Electric railways invest large sums of money in unapplied materials and supplies, and appreciable savings can be made in connection with the regulation of such items if useless red tape is eliminated.

The regulation of materials and supplies even in normal times requires a well thought-out plan which shall be adequate and yet not expensive. Many electric railways, however, have not given the matter sufficient thought, and are continuing such records and systems as were in use when horse cars were operated. This phase of operation is about the only one which, generally, has not kept pace with the rapid development of the art of transportation. The operating units are now so much more extensive than the early city passenger railway that the methods now must be broader and more efficient.

DISCREPANCY BETWEEN STOCK AND RECORDS IS NATURAL

The problem of electric railway stock maintenance and stock records generally is not wholly unlike that in a department or other large retail store. I venture to say that if a department store were to attempt an accounting of every item of stock as most electric railways are doing it to-day, it would increase the expenses of operation to such an extent as to make the business unprofitable. This feature of electric railway operation is only an incident, or the same thing would result. It is easy to understand that in operating a store of any kind errors will be made in weights, measures, descriptions, prices, etc., so that at the end of, say, a year, some discrepancies will exist between the stock actually on hand and that shown by the books. No grocer ever re-tailed sugar from a barrel and got from it just exactly what the barrel actually contained. This is a natural condition and cannot be entirely overcome even with extreme care.

Suppose that these discrepancies in a railway store-room amounted to one-quarter of 1 per cent of the stock

handled, or, say, \$2,000 a year. Would the company be justified in establishing a system of records costing \$2000-\$3000 to enable it to know on what particular items the error occurred? The system would not reduce the number of errors. In fact, it would increase them, because in handling a large volume of clerical work, errors must be made which would have the same effect as if the material were incorrectly handled. Yet many companies are to-day doing exactly this, i.e., maintaining ledgers or perpetual inventories that cover each of the 5000 to 10,000 items which are carried in stock. They show, for instance, that 437 1/16-in. x 1 1/2-in. spring cotters (value, 11 cents) were purchased; that these were issued in lots of from ten to one hundred, and that when all were used seventeen more or less had been given out than were purchased—the difference in value being 1 cent.

RECORDING SYSTEM IS OFTEN MORE EXPENSIVE THAN DISCREPANCY

The cost of recording such matters in infinite detail on the ledger basis amounts in many cases to more than the actual value of the material itself. Yet some railways go to the extent of maintaining a triplicate record—bin cards, a ledger at the store and another ledger in some other office, each covering essentially the same details. One company requires that each entry on the ledger be checked by two different clerks. In many cases these records disagree with one another and all of them disagree with the stock. Usually if it is desired to know absolutely the amounts of material on hand at a given time, the records are not consulted, but a count of the actual material at the time is resorted to. This, of course, is the only way to get information that is absolutely correct. The accounting for materials must not be confused with stock regulation.

Illustrating this condition, a general manager tells how his engineer of way one morning informed him that some ties should be purchased at once for immediate delivery, there being not enough on hand to complete the work for the next thirty days. Reference to the record showed that there were plenty of ties on hand—

STOCK BOOK No. 26 Page 1 Department D 0 PITTSBURGH RAILWAYS COMPANY. EDINBURGH STORE.		MONTHLY RECORD OF NEW, OLD AND SCRAP MATERIAL.												PURPLE LINE - Year 1917													
		JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		Average Monthly Qty. Previous Year	
NAME AND DESCRIPTION OF ARTICLES	Bin No.	Class	Number	Purpose	GENERAL INFORMATION	On Hand	On Order	On Hand	On Order	On Hand	On Order	On Hand	On Order	On Hand	On Order	On Hand	On Order	On Hand	On Order	On Hand	On Order	On Hand	On Order	On Hand	On Order		
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VARNISH, STUCCO AND DRYING.	CAR	582535	36	1/4	30																						
IN 1 GALLON CANS.																											
SPENDING VARNISH COMPANY.																											
CAR BODY TO PREVENT																											
REPAIRS, TRANS FROM																											
VARNISHING.																											
LACQUER, TRANSPARENT.	CAR																										
IN 1 PINT CANS.																											
FRANK & LAIBER.																											
CAR BODY USED IN PLACE																											
REPAIRS OF OLD WAY																											

PITTSBURGH RAILWAYS—SPECIMEN PAGE FROM STOCK-BOOK RECORD

in fact, enough to complete the year's work. On account of the conflicting statements, an actual count of the ties on hand that day was made. The records were found to be wrong, and some ties had to be secured at once. If the accounting for the use of the ties was wrong and the jobs on which they were used were not charged properly, that was a matter of grave concern in itself; but to allow the stock of ties to run down to such an extent, owing to the same error that produced the other condition, was a catastrophe.

HOW STEAM RAILROADS HANDLE THE PROBLEM

Recognizing this fact, the steam railroads, which perhaps have invested more in materials and supplies than any other industry in the country, years ago adopted a plan for recording stock that is being used as a standard on possibly 90 per cent of the mileage in this country. This plan has the approval of the Railway Storekeepers' Association, which is made up of men who are at the head of the business of handling stocks of material. The basic idea of a stock-book record was originally conceived in 1887 by S. F. Forbes, then general storekeeper of the Chicago & Northwestern Railroad. With various improvements from time to time it has been in use continuously since then.

The stock-book plan attacks the problem from just the opposite angle. Instead of providing a ledger which shows each item removed from stock as a credit to the amount previously on hand, the plan contemplates an actual count each month of all the materials on hand, together with information as to what had been ordered and received. The amount on hand this month, deducted from the amount on hand and received the previous month, equals the issues during the period. Stock regulation must be based upon knowledge of issues during various periods in the past, plus one's knowledge of other conditions and circumstances which affect the future demand. Only three entries are necessary for this information, as compared with a great number of entries where each individual issue is recorded.

MONTHLY COUNTING OF STOCK IS NOT STUPENDOUS OR COSTLY TASK

At first thought it seems to be a stupendous task to count the stock each month. Nearly every one expresses himself so upon first hearing of the idea. With material kept in proper shape, as it should be regardless of the record that is kept, the work of counting a stock valued at \$600,000 costs \$100 a month. Compared with the cost of running a ledger record, this amounts to about 20 per cent. The facts as they are arranged are so condensed that a glance is sufficient to read the record for a year. It closely approximates a graphic chart.

Since with the stock-book plan it is necessary for the storekeeper to give his attention each month to each and every item of stock in order to ascertain whether it will be necessary to order material for replenishment, the fixed minimum-and-maximum scheme, which has proved itself during times of retrenchment and times of prosperity to be wholly inadequate, is not used. If they are to be reliable and actually serve their purpose, the figures for minimum and maximum must be corrected so frequently to keep pace with the changing conditions, that it is better to have a capable man determine the facts each month.

HOW THE PITTSBURGH RAILWAYS USE THE PLAN

Our stores are apportioned with one stock clerk in charge of each section. The stock clerk, one of whose duties is to count all his stock each month, must necessarily become more familiar with the stock and take a greater interest in determining its condition, what is active, what is sluggish and what is obsolete, all of

which compels him to work more intelligently. At the same time it does not require a man of any higher caliber than is usually employed at such work. The counting of our stock is done at a regular period each month. Beginning the first of the month, the counting must be completed by the twelfth. During the interval, the stock clerks must perform their regular duties the same as at all other times.

Errors in counting are sometimes made, of course. One of the points of strength of this record is that such errors need not stand indefinitely. At the time of each count, the storekeeper has an opportunity to detect them when going over the books to order what is necessary to replenish the stock, or the stock clerk himself corrects them at least in the following month.

PITTSBURGH RAILWAYS COMPANY STORES DEPARTMENT	
INSTRUCTIONS GOVERNING THE USE OF STOCK BOOKS	
1—	These books form the most important record used in the operation of the Stores Department, since this record is the basis for determining the quantities of material to be purchased. All persons handling them are requested to use extreme care in keeping them in proper condition and to follow faithfully the instructions below.
KEEP THE BOOKS CLEAN.	
2—	The names of the articles should be entered as nearly as possible in the same order as they appear on the shelves; the noun appearing first, the description after.
3—	Material of the same nature should be grouped on the shelves as much as possible for convenience.
4—	Items manufactured by the Company at the point where stock books are maintained should be written in red ink; it is not necessary to maintain separate books for this material.
5—	Blank lines should be left where there is a possibility of additional sizes or additional material of the same nature being required.
6—	Stock books should be numbered consecutively, each stock book should be indexed on the outside front cover and an index made for all books at each store.
7—	Counting material; material "On Hand" should be counted and entered in the stock books in the space "O. H." (use indelible pencil) immediately preceding the writing of the monthly requisition, the date counted and initials of counter shown at the top of the "Counts" column in the space provided. If there is nothing "On Hand," an "O" should be shown. All material on hand, including new tools and machinery, until put in service, and material held for disposition, should be shown in the stock books.
8—	"Back Ordering";—Before entering the material to be "Ordered," material previously ordered and not received should be entered in the "Due" space in red ink together with the requisition number covering each such item. Any items which were ordered or shown due in the previous month which have since been received, should be indicated by placing a red check mark in the "Due" space for the current month.
9—	"H. O."—Holding Orders for. Immediately after the stock books are "Back Ordered" a summary shall be made of all items ordered on the Storekeeper which have not been furnished and the total quantity of each article shall be shown in the space "H. O." This information must be taken from uncompleted requisitions, draw offs and back orders and used as a guide in ordering material to replenish the stock.
10—	"Monthly Requisition." On the date designated by the General Storekeeper a requisition shall be made at each store each month for all material and supplies which may be necessary to replenish the stock for a period of 30 days unless otherwise specifically instructed.
11—	"Ordering." The amount ordered on monthly requisitions should be shown in black ink in the "ordered" column. The person ordering will show his initials and date at the top of this column on each page whether or not any material on that page has been ordered.
12—	"Ordering—Special Requisitions." In the event that it becomes necessary to order material at other than the regular period the amounts desired will be entered in the "ordered" column in red ink.
13—	Writing requisitions.—All items and the quantity required to be ordered must first be entered in the stock book and the requisition or shop order, etc., must be written exactly as it appears in the stock book, a separate sheet for each classification number. Requisition number must be shown above item at the time the requisition is checked with the stock book.
14—	Surplus Material. Material on hand which is actually surplus should be shown in the "On Hand" column enclosed in a square. Surplus reports must be written from the stock books.
15—	Surplus or obsolete material sold, or otherwise disposed of should be indicated by writing the letter "S" before the quantity involved together with reference to the number of the requisition, manifest or shipping order. This is to distinguish these transactions from ordinary issues.
16—	Usable material recovered from scrap or received from any other source and not covered by requisition or Stores Department shop order, will be entered in the "Ordered" column, enclosed in a circle, showing reference to the receiving card number.
17—	Loose material; namely, nuts, nails, rivets and washers, stored in bins may be estimated when counting stock, excepting at the time of the annual inventory, but in no case is this permissible with other material.
18—	The general information column should contain information and instructions as to quantity to order, date to order seasonal material, number of cars or other places in which the item in stock book is used, reason for ordering, or authority. No information should be shown in this column that is required on requisition.
19—	The "Average Monthly Consumption" for each year will be figured and shown in the proper space. The formula is: to the amount on hand in January add the amount "Due" at that time plus the amounts ordered or received from other sources, from the date on which the stock was counted in January to the date on which the stock was counted in December. Deduct from that total the sum of the amount "On Hand" and the amount "Due" on the date of the count made in December, also deducting the amounts sold, etc. (see item 15) during the interval. The result divided by 11 gives the average monthly consumption.

B. J. YUNGBLUTH, General Storekeeper.
NOVEMBER 7, 1916.

PITTSBURGH RAILWAYS—INSTRUCTIONS FOR THE USE OF STOCK BOOKS

Since our stock is counted between the first and twelfth days of each month, our requisitions on the purchasing agent, except specials which cannot be anticipated, are made within a period of ten days, between the fifth and fifteenth. All material of a like nature is, therefore, ordered at one time, enabling the purchasing agent to place his business on a quantity basis with consequent advantages over buying small lots of the same kind of goods every few days.

The time of making the count and of ordering the goods to replenish the stock may, of course, be varied to suit the requirements. At one time we did count a portion of the stock each week, so that at the end of the month all of the stock had been covered. The plan will lend itself readily to any change of this nature that might be found desirable on account of local sentiment.

With this form of record an annual inventory is taken as of one certain date. This work, which is done under

the supervision of the auditor, has repeatedly been performed for a stock of \$600,000, without employing additional help or without working extra hours, in three and one-half days. The inventorying, therefore, is absorbed along with the other work and costs practically nothing, while the inventory plan used to keep the ledger record in balance would consume the time of two men all year long at a cost of not less than \$2,000. We have had this plan in use at our stores since 1910. The results have been eminently satisfactory.

EXPERIENCE OF A SMALLER STORE

The statement of the performance at one of our smaller stores might be of interest to some of the smaller companies, which do not have such large stocks of material. In 1909, before using the stock-book record, at this particular store the amount invested in material and supplies was \$35,000, with monthly receipts and disbursements of about \$10,000. The second year after the record was used at the same store, we were operating with a stock valued at \$29,000, while at that time we were disbursing an average of \$14,000 per month. Therefore, the disbursements increased 40 per cent, while the stock on hand was reduced about 17 per cent. If we were operating under the same conditions as in 1909 in the later year, an increase in the investment of nearly 40 per cent would have been justified on account of the increased disbursements. Therefore, our stock investment had actually been reduced \$20,000, the saving on which at 12 per cent was \$2,400 a year; (12 per cent is figured as the cost of carrying a stock of materials and supplies, considering the interest on investment, risk of obsolescence, cost of storage and handling, rents, etc.) Our total pay roll for the year at that particular store amounted to \$1,860.

A few days ago, after having discussed this subject with the general storekeeper of one of the large properties of the East, I was told that the plan was a radical departure from his practice, being different from anything he had heard of previously. He said, however: "The plan is unquestionably worthy of study; I am glad I heard of it, because I would not want our general manager to ask my opinion without being fortified with the facts."

Presented, herewith, is the form of sheet used for the stock-book record, together with a set of instructions covering its use. Sample items have been recorded on the form as an illustration. The sheets are written on the typewriter and afterward bound into units of twenty-five pages, which make a thin, flat opening book very convenient to handle.

Laborers and Contentment

In these days of great demand for labor in the industrial plants it is next to impossible to keep men on track maintenance and construction work, and it becomes essential that cognizance be taken of some of the things which go to make labor contented to stay on the job in the face of the \$6 a day offers from the neighboring foundries. There are a few things other than the daily wage which enter into the inventory of requirements for the contentedness of even the "hunkies" and "wops"—for example, the camp they live in and the food they eat. Last year the president of one of the principal electric railway properties of the country was out over the line and happened to be at the location of the camp of a large track maintenance gang at noon time. Out of curiosity, we presume, he climbed into the box-car quarters and took dinner with the rest. The laborers, of course, were nonplused. There were flies by the thousand and the food was not palatable.

The president went back to his office and next day issued orders that the cook should be "fired" and screens

provided for the doors and windows. He saw to it that a young fellow who also acted as timekeeper, should be made commissary because he would take pride in the provisions for the men. The new cook got the spirit of the change and the laborers made evident their approval of the better food and surroundings. And what was the result? A feeling of interest in their president and of contentment with their job was engendered such as is measured only in substantial returns to the company. While it may not be expected that many presidents will commune with democracy to the extent of our example, yet is it not worth while to make the living conditions of the laborers such as will breed contentment and make less luring the higher wage but uncertain industrial jobs?

One-Man Operation*

The Author Discusses Present Opinion on One-Man Cars and Advocates Their Extended Use to Forestall Future Automobile Competition

BY RAYMOND H. SMITH

Vice-president Eastern Wisconsin Electric Company

AN inquiry recently made among forty-eight companies operating one-man cars reveals the fact that one company began this mode of operation in 1895, two in 1901, one in 1906, three in 1910, three in 1911, four in 1912, nine in 1913, eleven in 1914, twelve in 1915, and two in 1916. These cars, in about 95 per cent of the cases, replaced cars operated with two men.

The answers also indicate that in a great majority of the cases one-man cars have been resorted to merely because of their appeal to the business judgment of the railway operators, and not because of jitney competition. Apparently the one-man car has not developed any new class of accidents, and it is generally conceded that the undivided responsibility of the motorman is conducive to the reduction of accidents. The absence of the second man to secure witnesses in case of accident is not regarded as important.

As to the bug-bear, public opinion, it appears that thirty-six companies report public opinion to be favorable; two companies report the public prefers one-man cars; four report no complaints; three report some objection at first which has now disappeared; two report the public indifferent; one that the public tolerates this kind of operation; and one company reports that the public is opposed to it. To another set of questions a favorable attitude is reported by thirty-six companies; five companies report the public as indifferent and eleven companies report "no complaint." Criticism at first, which later changed to approval, is reported by eleven companies, while opposition is reported by five companies.

In the last-mentioned inquiry, a population of less than 10,000 was reported by thirteen companies, and a population above 10,000 was reported by thirty-four companies. The maximum population was 68,000, and the minimum 10,000. Jitney competition was reported by only three companies.

Although a number of companies use dead-man's handles, this is not generally regarded as necessary. The question of providing a seat for motormen depends largely upon whether air brakes are used. In one inquiry air brakes are reported by nineteen companies, hand brakes by forty-five companies and magnetic brakes by two companies. In another inquiry thirteen companies report air brakes, while thirty-four companies use hand brakes.

The use of fare boxes is reported by fifty companies, nine companies report the registration of fares, and

*Abstract of a paper presented at a meeting of the Wisconsin Electrical Association, Milwaukee, March 15, 1917.

twenty-three companies report collecting fares under the pay-as-you-enter system. In another inquiry thirty-six companies out of forty-nine report the use of fare boxes.

In twenty-five cases it is reported that motormen are permitted to start car before collecting fares, and in twenty-four cases this is not permitted. It would seem that the best practice in this regard must be determined by conditions. What would be bad practice in a congested district might be considered good practice in districts where the street traffic is light.

There has been practically no objection on the part of the motormen to performing the duties imposed. Nineteen companies report that motormen receive a slight increase in wages, while twenty-eight companies report no increase.

As to flagging steam railroad crossings, nine companies report having flagmen at these crossings; nine companies report the flagging of crossings by the motormen; two companies use special derail and six companies report the adoption of a safety stop. From another inquiry it appears that flagmen are employed by seven companies, flagging the crossing by the motorman is reported by nineteen companies; derail is used by two companies, while merely bringing the car to a stop and observing that the crossing is clear is reported by thirteen companies. The writer is of the opinion that where an unobstructed view of the track may be had in both directions, ample safety is secured by the motorman flagging the car and that one-man responsibility at a railroad crossing is preferable to two. The best practice in each case, is determining by conditions. Trolley guards should be used at all crossings used by one-man cars.

Thirty-three companies report that transfers are issued when passengers leave cars, while nine companies issue transfers to passengers boarding cars. The former method is much preferred by the writer.

The best size of car can be decided only with the reference to the conditions under which it is to be used. The average length of car reported by sixteen companies is 30 ft., the maximum being 40 ft., and the minimum 21 ft. The average weight is reported as 22,300 lb., the maximum 30,000 lb., and the minimum 11,000 lb., with average seating capacity of thirty-five, maximum fifty-two, and minimum twenty-four.

The writer's experience has been with rebuilt single truck cars, and all steel one-man cars of the latest type, the latter cars weighing about 12,000 lb., 24 ft. overall, and seating twenty-six people. These cars were equipped with hand brakes and with 24-in. wheels, and their operation has been entirely satisfactory.

One-man operation in Jackson, Miss., was started shortly after the beginning of jitney competition, although this mode of operation would have been adopted even though there had been no such competition. The attitude of the public was favorable from the start, as the new cars were a credit to the company and to the community. The saving to the company in this case was marked and the cars did much toward the elimination of the jitney competition, which is now a thing of the past in that city. The writer is very partial to small car wheels. Cars so equipped are better liked by the public, as traveling close to the ground at a fair rate of speed is the nearest approach to an automobile ride obtainable.

From all data obtainable there can be no doubt but that one-man cars are a success when intelligently applied to a situation favorable to operation of this kind. Obviously there are cases where they would be a complete failure. To attempt their operation in the busy streets of Chicago would be as ridiculous as the operation of the heavy Chicago cars in the streets of a small

city. Clearly there must be a line of demarcation between these two extremes.

The publicity attendant upon the elimination of one man from the operation of a street car is so great, and two-man operation is of such long standing, that the first impression of the public is that the company is requiring one man to undertake the work of two busy men, whereas, as a matter of fact, it is merely requiring one man to work to his reasonable capacity. This first impression is made more lasting by the constant designation of this type of car as a "one-man car." The sooner this designation is eliminated the better. As to safety of operation, the writer has heard of no instance where the use of but one man has resulted in an accident.

While in general, the one-man car should be of light construction, capable of quick acceleration, and easily controlled, there is much danger of going too far in the desire to secure light equipment. All equipment should be purchased with due regard to the kind of track over which it will be operated. A feather-weight car which would operate without damage to itself for a number of years over first-class track, will naturally go to pieces in a short time on a track with poor joint conditions. To permit the greatest flexibility of operation the car should be built for either one- or two-man operation. In most cases where it is necessary to put a second man on a car during rush hours, the conductor is stationed on the front platform and there is no change in the method of entrance or exit, this avoiding confusion to passengers.

In general, the one-man car must be made to look to the public like a development, an advanced idea, and something to be admired. Many an operator has made the mistake of beginning one-man operation with improper equipment, and as the first impression is always the most lasting, a mistake of this kind is unfortunate.

The writer does not believe that the popularity of one-man operation will wane with the disappearance of the jitney. However, street railways have not seen the last of the jitney, or at least of organized automobile competition. This competition may not take the form of the recent craze but may appear in the form of 10-cent fare conveyances which will cater to that portion of the street railway company's patrons who are willing to pay a bonus for rapid transit. The reappearance of the jitney will depend largely upon the service rendered by the railways and upon the exigencies of the labor situation.

While street railway earnings have generally improved in the last two years, the continued and further use of the automobile will place the street railways, especially in the smaller cities, in a position where every economy must be exercised, and where the advantages of one-man operation will have a strong appeal. The extended use of private automobiles has thrown upon the street railways a new burden, that of very light traffic on fair days and of heavy traffic in bad weather. It is safe to assume that the party who uses his own machine in fair weather and complains of the crowded condition of cars in stormy weather does not realize that he himself has contributed to this condition, and that it is unfair to expect that the street railway can satisfactorily take care of the army of automobile riders who use the street car service only during this period of natural congestion. This brings up the thought that in the street railway business, as well as in the electric business, there is such a thing as a load factor. The writer believes that many of the elements which now enter into electric rate making, must ultimately find a place in the establishment of railway rates.

Economic Aspects of Franchises*

Franchise Providing Maximum of Service for Rate Paid Is Based on Sound Economics—Franchises Have Evolved Through Periods of Misunderstanding Into One of Recognition of Mutual Interests of City and Utility—Salient Points of Typical Co-operative Franchises

By F. W. DOOLITTLE

Consulting Engineer, New York, N. Y.

THE use of the term "economic" in discussing franchises is perhaps not entirely justified by the nature of the following remarks. The writer is not a technical economist and has therefore refrained from the use of terms which have a significance peculiar to that science. No theory is proposed except that the franchise that provides in the long run the maximum of service per dollar paid therefor is sound public policy and sound economics or, quite as aptly, good engineering.

In the development of public utility franchises there appear to be four fairly well defined periods which may be characterized as follows: (1) a period of general misunderstanding as to facts; (2) a period of general misunderstanding as to motives; (3) a period of attempted arbitration by governmental agencies, and (4) a period of understanding of mutual interests involved and of the economic status of public utilities. Naturally no precise limits to these periods can be pointed out, as they overlap.

GENERAL MISUNDERSTANDING OF FACTS

In the early days it was customary for cities to vie with one another in the number of franchises which they should grant to public utilities. For example, it appears that in St. Louis street railway operation was authorized by forty-eight franchises, the earliest in 1867 and the latest in 1899. Forty-one of these franchises expire during nineteen different years from 1904 to 1948, and in seven cases the franchise does not fix the date of expiration. Franchises granted during this period were carelessly drawn, and many attempts were made by cities to induce the investment of capital in public utility enterprises and to hasten the date at which these utilities should be in operation.

Much of the difficulty experienced in later days may be traced directly to two errors, which appear now to have come from undue optimism on the part of those seeking franchises and from short-sightedness on the part of those granting franchises. The future appeared full of promise to the early investor, and the present worth of future business entered too largely into his calculations. The cities doubted the wisdom of monopoly and did not trust to the expansion of small beginnings to meet later needs when the service desired could be self-supporting. The first period, therefore, appears to have been one in which neither the municipality nor the corporation understood what could or should be done in the matter of rendering service, and there was no proper understanding of the economic fallacy of competition.

GENERAL MISUNDERSTANDING OF MOTIVES

The second period may be described as one of failure to understand the reasons for the unsatisfactory conditions which rapidly developed. In this period, as in the first, ignorance of the economic factors at work was evident in the things done both by municipalities and

by owners of public utilities. This ignorance gave rise to the most serious and regrettable phase of the whole situation, mutual distrust and suspicion. The bitterness of that period has not yet entirely passed, but happily a new generation is now thinking more calmly and seeing more clearly, and though the years of loss and waste cannot be recovered, there is hope of better things for the future.

This period of misunderstanding and distrust can best be examined in the light of the following facts: The municipalities had encouraged competition. The utilities had invested beyond the needs of the times. Some utilities had contracted to render certain contributions to public funds, either in cash or in non-utility services such as paving streets, beyond their power of performance. Other utilities had made no such contracts originally but were later subjected to such requirements through ordinances passed by cities in retaliation for real or fancied dereliction. Certain hard-pressed utilities had sought to better their condition by consolidation but had found that the burden of unproductive investment could not be avoided in this way.

In the last connection it may be of interest to cite the case of the United Railways of St. Louis. This company consists of about thirty-three lines, a number of which were originally competitors. When these lines were consolidated, a good deal of duplication was found to exist and elements of value in the original lines disappeared. At the present time an appraiser would doubtless fail to find property to account for the present capital. The published reports of the company show that it is earning a return on only a part of the capital. Last year about 140,000,000 transfer passengers were carried. Suppose that half of these rides on transfers were rides which would have cost an additional fare if the consolidations had not taken place. These 70,000,000 rides represent \$3,500,000 in fares—and \$3,500,000 would pay 7 per cent. on \$50,000,000, surely an amount greatly in excess of the difference to-day between the capital of the company and the value of its property.

In this second period, therefore, with the service in many cases not what it might be and with the utilities not prospering as their promoters had anticipated, there came about more or less serious antagonism between the communities and the utilities. Frequently this was artificially maintained for political purposes, but in many cases it was equally true that the city was rightfully dissatisfied with the service received and the utility was dissatisfied with the burdens imposed upon it.

DEVELOPMENT OF STATE REGULATION

The third general period was marked by the development of state regulation by commissions operating under powers reserved by the state to itself. These commissions have as their function the arbitration of disputes which have grown out of the misunderstandings previously pointed out. The work of state commissions has not been altogether satisfactory. They have, however, been more stable and in general have

*Abstract of paper presented before the Engineers' Club of St. Louis, Mo., on March 7, 1917.

been more equitable courts of appeal than have local bodies. When cities have undertaken to arbitrate the disputes which they have had with public service corporations, they have been placed in the position of being judges as well as advocates and the results have not been entirely satisfactory. Without imputing to state bodies any greater intelligence or justice than in the case of municipal bodies, it has nevertheless come about in a number of jurisdictions that the state commissions have been able to see more clearly the economic status of public utilities and have been able to point out the principles that must govern the permanent settlement of the problems that have retarded alike the growth of cities and their utilities.

GROWING UNDERSTANDING OF MUTUAL INTERESTS

After the period of misunderstanding as to fact had been succeeded by the period of misunderstanding as to motive, and this in turn had been succeeded by an attempt to arbitrate difficulties, the recognition that the interests of the utilities and the communities are mutual has emerged as the principal present-day tendency in franchise matters. It has come to be seen that a utility cannot permanently give more service than its revenues will pay for, and it is also generally realized both that it ought not to give less, and that it cannot expect to preserve its rights if it continues to give less. Moreover, it is generally recognized that the city should prescribe the service it desires and then see to it that the revenues of the utility are sufficient to render this service. It is the function of the community to say when and where service shall be extended, and because it cannot thrive when its utilities are moribund, it must in its own interest, in view of economic laws not subject to repeal and automatic in their penalties, so adjust the relations between itself and the utilities that the latter may be vigorous agencies for public service. Some of the provisions recently developed to accomplish this purpose will now be examined.

It is apparent that in spite of a wide variation in detail the agreements more recently entered into have represented attempts to secure certain well-recognized advantages. These may be briefly stated as follows: (1) Service of such a nature as the city may decide upon; (2) extension of this service when needed, and (3) the minimum charge consistent with the service desired. The third of these presents unusual difficulties. It is not a simple matter to fix a rate of return just sufficient to provide that capital will flow freely into the business as desired, to determine a normal cost of operation that will be in keeping with the service desired, and to provide for these things in an agreement that must be automatic and as applicable to conditions twenty years hence as to those existing to-day.

STREET RAILWAY PROBLEM MOST DIFFICULT

By far the most difficult problem whose solution has yet been undertaken by utilities and municipalities is that which has to do with the rates of fare and standards of service of street railways. Next to water companies, it is probable that street railways are the most important factors in city development, and it is worthy of note that those city districts and people most greatly in need of street railway service are frequently those least able to pay the cost of rendering that service.

The street railway business is not one of decreasing costs, inasmuch as to a considerable extent each increment of traffic tends to increase the average length of ride and as a usual thing also tends to decrease the load factor. Riding during the rush hours is very largely habitual riding, that is, it represents movements of traffic which occur with great regularity from day to

day. With the growth of cities and the development of outlying residential districts, it is found that the riding during the rush hour is increased by a greater percentage than is the riding during the rest of the day. For these reasons, street railway costs have increased in spite of certain factors which have tended to decrease them. This burden of increasing costs, together with the complexity of the operating problems involved, has made the work of devising a satisfactory agreement between street railways and the communities one of great difficulty.

A very interesting problem in connection with the operation of street railways is suggested by the increasing percentage of traffic moving during the rush hours. Electric companies have had a similar problem, but by adjusting rate schedules and by developing types of business which did not put any considerable demand upon the plant at the time of the maximum load, they have been able to overcome to some extent the extraordinary costs occasioned by a poor load factor. If some scheme could be devised whereby the riding on street railways could be more evenly distributed throughout the day, not only would the service be much improved, but the necessity for the very large investments occasioned by construction of rapid transit lines would be avoided and the urban transportation business would be placed on a much sounder financial basis than it is at present. Some years ago it was the custom and still is in a few smaller cities to give reduced fares during rush hours under the guise of workmen's tickets. The economic fallacy of this, however, has of later years been known, and certain operators are now seriously considering the advisability of charging lower fares during the middle of the day for the purpose of diverting as far as possible rush-hour traffic to a period when there is a less heavy burden placed on the transportation system. Serious efforts have been made to have large industrial and commercial establishments begin and close their day at varying hours so that the traffic would be more uniformly distributed. Very little progress, however, has been made. It is doubtful that under modern competitive conditions the larger stores can be persuaded to open and close at different hours, but there is no reason why factories and many offices should not assist in the solution of this problem.

Some figures recently made indicate very plainly the extent of the advantage which might be realized by such a plan. The operating records of a typical road were analyzed, and the costs of operation at different periods of the day were determined. The company operates normally about 50,000 car-miles or 6000 car-hours per day. The maximum number of cars in service, 640, is between 5 p. m. and 6 p. m., and between 6 a. m. and 8 a. m. there are 480 cars in service. On the basis of cost to the company 190 of the car-hours operated between 5 p. m. and 7 p. m. and 160 of the car-hours operated between 6 a. m. and 8 a. m., or 350 car-hours in all, could be replaced by 890 car-hours between 8 a. m. and 4 p. m., a net gain to the riding public of 540 car-hours per day or 9 per cent of the total. On the basis of uniform operation throughout the twenty-four hours the present number of car-hours, 6000, could be increased to more than 8000. It is a matter of indifference to the company, as the cost is the same in either case. The problem is purely one of community advantage. The patron is entitled to a dollar's worth of service for each dollar paid to the utility, and the big problem involved is how to give that dollar the greatest purchasing power.

The three principal examples of street railway franchises drawn with a view to realizing the benefit to be secured from co-operation between the utility and the

municipality are the franchises now in effect in Cleveland, Chicago and Kansas City.

The franchise provisions which have usually been considered essential in the past may be classified generally under four heads. The first of these serves as an identification of the parties involved. The second division serves to define the rights granted. The third prescribes the duties of the organization, and the fourth general division of the usual franchise contains provisions defining the supervisory or regulatory relation of the community to the utility. In the past efforts have occasionally been made to incorporate in franchises provisions which would alter the regulations between the utility, its patrons and the municipality as the utility developed. Such provisions have usually been unsuccessful in practice although sound in economic theory, owing to the fact that marked changes in the art of rendering utility service have come about rapidly and in a way entirely unforeseen by those granting the original franchise. One of the most difficult matters that any body of men charged with the granting of franchises has to face is the estimating of what the future may bring forth, and it is along this line that both utility operators and communities have frequently been seriously in error in the past.

THE LIFE OF THE FRANCHISE

One of the principal contentions of authorities on franchise matters has been that no franchise should have a life covering a period longer than that within which the future could be readily estimated. This point of view is obviously correct if a franchise is so drawn as to define completely the conditions under which the utility shall operate and the price to be charged for its service. On the other hand, since the cost of capital is a large factor in the price which must ultimately be paid for service, and since long-term financing can be accomplished at a lower cost than short-term financing, it is not wise to attempt to make the life of the franchise unduly short. The dilemma here is that of increased costs of short-term security issues, and unknown conditions likely to be encountered before the expiration of long-term franchises. The solution of this appears to be in making the terms of the franchise sufficiently flexible to preserve the balance of rights and duties through periodic revision of the conditions imposed. The Chicago 1907 franchises have a life of twenty years. The 1909 Cleveland franchise has a life of twenty-five years, and the 1914 Kansas City franchise has a life of thirty years. Each of these franchises provides for termination at an earlier date upon certain conditions and also for extension on a prescribed basis. Obviously the length of life of these three franchises, varying from twenty to thirty years, is sufficient to place the conditions of operation beyond the knowledge of those who granted and accepted the franchise, and in view of this the franchises were made rather flexible in their operation. It is not clear but that additional economies might have been effected by naming a longer life, although had this been done it might have been necessary to make more elaborate provision for maintaining the original balance between the equities of the community and the corporation. Since long-term obligations in general command lower interest, however, it is evident that the advantage of the patrons will be served, other things being equal, by franchises of relatively long life.

RECONSTRUCTION AND EXTENSIONS

In each of the franchises referred to a program of reconstruction and remodeling of existing facilities is specified. In Kansas City this was carried into greater detail than in the other cities, although the provision of a Board of Supervising Engineers made it unnecessary.

in the case of the Chicago franchise to set forth all details as in the case of the other franchises.

One of the most important things to be considered from the standpoint of the community is the matter of extensions to meet growing needs. This is a particularly difficult problem to solve when the demand for service is not sufficient to make extensions pay for themselves. The Chicago franchise provides that the city has the right to require the company to make extensions totaling not more than 4 miles of double track or 8 miles of single track in any one calendar year. In the case of Cleveland, no special provision as to extensions was made in the franchise, but the officer of the city who represents the Council in its dealings with the Cleveland Railway confers from time to time with the officers of the company on this particular matter. Between them a program is made out and the company thereupon petitions the Council for authority to make these extensions. The Kansas City franchise gives the city the right to require the company to construct in any one year, on the average, 4 miles of single or 2 miles of double track, and any additional extensions which the Board of Control shall determine to produce an income on the investment of not less than 6 per cent per annum over the expense of operation.

During the last few years, owing in part to the developments undertaken in New York City, there has been a growing tendency for municipalities to finance expenditures for rapid transit facilities and certain types of extensions. Under the Chicago franchise, the city reserves the power to require the company to join with other street railways to defray the cost of subways as a downtown terminal, participation of all being limited to \$5,000,000. There is no provision in the Cleveland franchise for city aid in financing rapid transit expenditures of this sort, but on Jan. 25, 1917, the street railroad commissioner addressed a communication to the City Council, proposing certain remedies for congestion in the Public Square—(1) the removal of all vehicular traffic, and (2) the removal of the street cars. The provisions in the Kansas City franchise allow the city, under the supervision of the city engineer, to construct additions to the company's lines, to be operated as a part of the company's system—when so certified by the Board of Control, these to be owned by the city.

SUPERVISION OF ADMINISTRATION

It is obvious that the more flexible the provisions of the franchise, the more necessary it is to have their administration supervised by far-seeing and capable men. It is in work of this sort that engineers in the past have been of most conspicuous service to their communities. Necessarily a technical problem, the administration of the relations between the city and its public utilities falls in the province of engineering practice, and it is to be hoped that the future will see an increased recognition of the necessity of employing engineers in such supervisory capacities.

The administration of the franchise provisions in Chicago is in the hands of the Board of Supervising Engineers, which has comprehensive power. In Cleveland the administration is by the street railroad commissioner, who maintains a technical staff. The Kansas City franchise provides that the company is to be organized with eleven directors, five of whom are to be designated by the city. A Board of Control of three arbitrators is also provided, one to be selected by the city, one by the company, and the third by the two so chosen or by a majority of the Kansas City Court of Appeals.

In addition to general supervision, there is provision in the Chicago ordinance covering the supervision of construction and the certification of capital additions.

The Cleveland franchise provides that additional extensions or permanent improvements proposed by the company must be approved by the Council. The Kansas City franchise provides that all extensions and additions shall be made under the supervision of the Board of Control. It is naturally highly important to fix the capital account as of the date of the beginning of the ordinance period. In each of the three cities this was done by engineers who considered both tangible and intangible elements of value, together with certain adjustments which were necessary, due to the fact that the franchise became operative at some little time after the date as of which the value had been determined.

SERVICE AND FARES

Each of the three franchises contains a certain provision concerning the service to be rendered. The details under the Chicago ordinance are left to the Board of Supervising Engineers, and it is interesting to note that the State of Illinois recently handed down a decision which was in conflict with certain rulings previously made by the board. This is but another example of the difficulty of foreseeing the future. One provision in particular in the Chicago ordinance is worthy of comment, *i.e.*, "Every electric car must be under the control of two competent men, motorman and conductor, and must be operated singly." This provision restricts the service to an extent which the city did not originally contemplate. There are a number of places on outlying lines where it is entirely feasible to operate cars under the control of one man, and it has recently been recommended that trailer operation would considerably increase the capacity of tracks in the downtown districts during rush hours. The Cleveland franchise reserves to the city the entire control of the service, including the right to prescribe schedules and routes. The Kansas City franchise specifies the use of two-man cars, except when otherwise ordered by the Board of Control, this provision having been based upon the experience of larger cities in effecting desirable economies in the cost of service.

The three franchises prescribe rates of fare, and with the exception of the Cleveland franchise no variation in the rate is contemplated. While the provisions of the franchises which define the obligations of the utilities contemplate changing economic conditions, there has been relatively little thought given to the adjustment of fares to meet these changed conditions. In the case of Cleveland the automatic regulation of fares has not been satisfactory, owing to the reluctance of the city to permit the company to take care of operating deficits, now accumulated to more than \$1,000,000.

The provisions for upkeep of capital investment are also important. In Chicago the allowance for maintenance and repairs is at least 6 per cent of the gross receipts, and for renewals and depreciation 8 per cent of the gross receipts. In Cleveland a specific allowance expressed in cents per car-mile has been provided. In Kansas City the cost of maintenance, repairs, renewals and depreciation is required to be paid out of earnings and to be charged to a maintenance and renewal reserve, this is to be not less than 16 per cent of the gross earnings for the preceding year. The unusual provision in this franchise is to the effect that the accumulated amount representing the unexpended portion of the depreciation reserve shall be held in trust for the city in case of purchase of the property. The marked increase in the cost of materials and labor during the last ten years have made entirely inadequate in many cases provisions for depreciation based on revenue and estimated to be sufficient on the basis of prices prevailing in the past.

One of the most important and necessary provisions is the basis of purchase of utility property by the city or its licensee. Each of the three franchises provides in detail how this shall be brought about. Each of the three franchises also provides definitely for the disposition of any surplus which may exist from the operation of the utility. In Chicago there is deducted from the gross revenue all operating expenses together with the amounts accrued with the approval of the Board of Supervising Engineers to cover depreciation and renewals. From the balance thus obtained there is then deducted 5 per cent of the capital value, and the remainder is divided on the basis of 45 per cent to the company and 55 per cent to the city. The Cleveland franchise provides that there shall be set up an interest fund fixed initially at \$500,000. To this fund there is credited monthly gross receipts after deducting allowances for operating expenses, maintenance, renewals, depreciation, taxes and bond interest. Out of this fund there is to be paid to stockholders an amount not to exceed 6 per cent on the balance of the capital value. In Kansas City it is provided that there shall be deducted from gross earnings all expenses of management and operation, all taxes and public charges, and an amount equal to 6 per cent cumulative upon the capital value. The city shall be owner of an equity interest in the property to an extent of the surplus which shall be used to pay for extensions and additions up to \$6,300,000. Beyond this figure two-thirds of the surplus income goes to the city and one-third to the company.

CONCLUSION

Without further analysis of these and similar franchises, it is apparent that for the most part they have been drawn with the idea of providing a continuing adjustment to changing economic conditions. It is not so evident that the provisions have always been subjected to proper engineering scrutiny as to their effects on cost. Franchise writing is not greatly different from the drawing of specifications and should therefore have devoted to it the best engineering skill. In fact, many of the past difficulties have arisen from the fact that franchises have displayed more the handiwork of politicians and lawyers.

The problem seems to be one in applied economics and one in which the engineering profession is capable of rendering real service to the community. There must be determined a proper and just balance between costs, service and obligation of the utility and its patrons with respect to community funds. Future costs must be so estimated as to give due consideration to changing markets, changing standards of service, changing volume of business, and the credit of the company as determined by the length of its franchises and the conditions under which it will find itself at their expiration. Where changing conditions are likely to make this too difficult a matter, to take care of indefinite franchise provisions some method of adjustment at the hands of able and far-sighted men must be provided.

The industrial world has found that large advantages are to be obtained by the adoption of general profit-sharing plans, and it is suggested that whatever form franchises take, some provisions should be made so that able management and conscientious service may be rewarded. The proportionment in which the various parties should participate in the savings resulting from efficient management it is not easy to determine, but it has been suggested, and with apparent propriety, that the savings may be divided, say, 20 per cent to the employees of the utility, and the balance equally between the municipality and the stockholders of the public service corporation.

How the Pacific Electric Solves Surface Drainage Problems

Standard Redwood Culverts Used Under Interurban Track—Culverts of Concrete, Reinforced with Old 20-lb. Rail, for Paved Streets

By CLIFFORD A. ELLIOTT

Cost Engineer, Maintenance of Way Department, Pacific Electric Railway, Los Angeles, Cal.

THE average rainfall during the rainy season in southern California from November to March is about 15 in. Rainstorms of two or three days' duration are not uncommon, and result in a total rainfall of from 2 in. to 5 in. This creates a serious problem for the railways in protecting interurban lines from damage, especially where large quantities of water are directed toward the right-of-way and roadbed by drainage systems of adjoining ranches, public highways and the real estate subdivisions which are constantly being developed throughout this territory. The peculiar topography of the country makes it particularly difficult to cope with the situation.

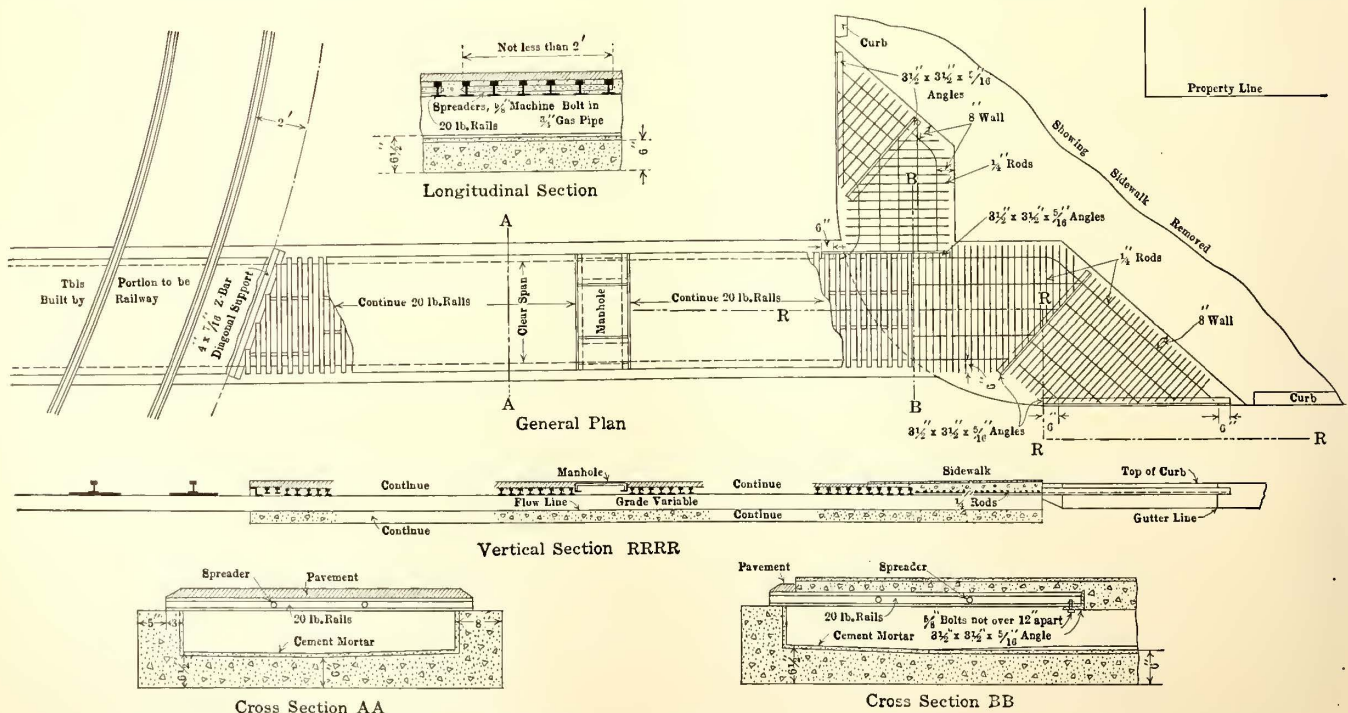
The lines of the Pacific Electric Railway radiate from Los Angeles to the mountains on the north and east, and to the ocean on the south and west. The land gradually slopes from the mountains to the sea. The lines traversing the mountain district, foothills and adjoining valleys have a firm soil favorable for their construction and maintenance, as it offers more resistance to storm waters than the sandy roadbeds and soft, yielding, sandy subsoil characteristic of the territory near the ocean. However, farther inland the slope of the land is greater, and in consequence of its greater velocity the water damages the tracks and roadbed more there than near the sea. Although the most severe and immediate damage is done in the foothill and valley district, the water ultimately reaches the track on sandy roadbed near the ocean. This, especially the unballasted track, is endangered and requires

protection. These lines run through country with a low elevation, and the water, coming from both sides, collects on the sandy roadbed and forms water pockets as it moves slowly down the tracks endeavoring to find an outlet.

During the summer months before the period of heavy rainfall, numerous studies of drainage conditions are made by the railway engineers in conjunction with municipal and county officials, various civic bodies and storm drainage committees usually consisting of ranchers. When improvements are made by installing culverts, constructing draining ditches, etc., with a view to proper handling of the water during the stormy season, each party interested assumes its proportion of the expense according to the amount its property is benefited. At public highway crossings grade changes are often occasioned by paving improvements on the highway which usually gives rise to new drainage problems. In this event the company co-operates by providing adequate culverts under its right-of-way, or track, of sufficient capacity to join those placed by other interests. Frequently the need for such improvements is observed by the railway, and it proceeds in the same spirit of co-operation seeking concessions from the other party for improvements beyond the company's property.

SMALL WOOD CULVERTS FOUND EFFICIENT

In order to meet some of these difficulties, standard types of wood surface culverts have been adopted.



STANDARD CONCRETE CULVERT REINFORCED WITH OLD RAIL FOR PAVED STREET INTERSECTIONS IN LOS ANGELES

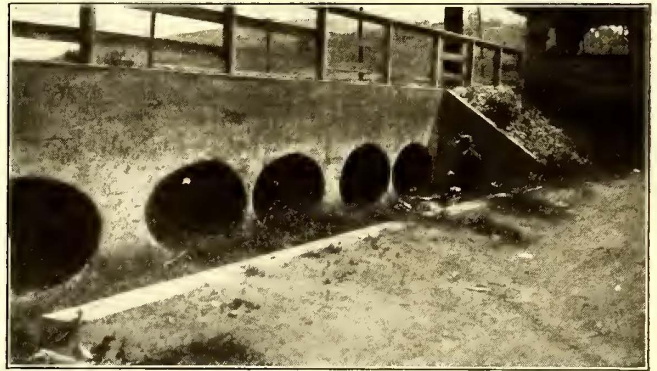
These are constructed of redwood from 1 in. to 3 in. thick, are made 12 in. deep, and from 4 ft. to 16 in. wide, to suit various conditions. Twelve-inch planks are placed across the top and bottom, the bottom planks being spaced 3 ft. apart. In some instances, depending upon the amount of water it is necessary to handle, and where the damage is likely to be great, Armclo iron culverts of suitable dimensions are installed, with concrete end walls. The gage of a culvert of this class is determined by the depth of its location below the surface of the ground and the probable weight it will be required to carry. However, in most cases, the more economical redwood box culverts are suitable for solving the surface drainage problems. Often during a storm period the division roadmaster finds that a new water course has been established, and, from his observations of the drainage area involved, he can readily determine with the standard drawing in his possession the size of culvert required to remedy the situation. No time is lost in making expensive field engineering studies necessary to calculate the drainage area involved, and immediate action can be taken by an order on the bridge and building supervisor who perhaps has on hand at the shops the particular type of culvert requisitioned, or it can be made within a day or so for shipment to the roadmaster for immediate installation. Such prompt action prevents heavy damage to the track, affords proper protection, and minimizes maintenance expense for excessive surfacing and aligning after the storm.

At the close of each rainy season the engineers and roadmasters make a general inspection of the damage done during the past season in order that recommendations may be made for the program of culvert improvements during the summer. Of course, each rainy season works different hardships. In one season the installation of numerous culverts may be necessary at points which were not affected during the previous season, and others already installed may require enlargement to provide additional drainage.

Culverts of the surface type are very economical to provide and maintain. They prevent damage to the roadbed at the time of the storm as well as largely eliminate repairs to the roadbed by providing adequate drainage. However, it must be borne in mind that in creating an opening under the tracks for properly draining the roadbed, precaution must be exercised in order not to turn storm waters onto adjacent property and thus invite possible damage claims from land owners. The lines are, therefore, provided and maintained with suitable side drainage ditches which carry the additional water along the right-of-way to the streams or to outlets at public highways.

On the lines near the ocean where the land is extremely flat, the water collecting on the roadbed, as

mentioned above, softens the unballasted track, which accelerates general deterioration and necessitates considerable surfacing and aligning after the rain. This is especially true in cases where the water approaches the roadbed from one side, follows the tracks, crosses over, and then returns from the other side. This situation is very troublesome, and has been met by the extensive use of a small wood culvert made of three 2-in. redwood planks 16 ft. long. They are constructed either with top or without, as conditions warrant, are easily cleaned and handled, and are more economical than tile drains. When made of redwood lumber they last from seven to eight years, and are not subject to breakage, as in the case of tile pipe, when removed for cleaning, readjustments and relocating, or from the use of track tools in making track repairs. Good results can be obtained on a bad section of double track by installing ten of these small drain boxes to the mile, staggering the installation, that is, putting them under tracks and between the two tracks to follow the course of the water. Of course, some sections of track are more troublesome than others, and the number of culverts necessary in those cases may exceed this estimate. Where the company operates four-track lines, the small culvert has given excellent results in handling



OBLIQUE BATTERY OF 42-IN. IRON CULVERTS UNDER TRACKS OF PACIFIC ELECTRIC RAILWAY

the surface water, and the drainage of a four-track line in this flat country is a serious problem. The drain boxes are also invaluable in draining ballasted track, interlocking plants, special work layouts and switches. In either buried or unburied track with dirt roadbed, the installation of the culvert under the track is done simply by respacing the two ties displaced by the drain box. These small drain boxes have also proved very effective in adequately draining filled approaches to bridges, where the surface water collects, by carrying the water directly to the streams or side drainage ditches.

RAILWAY CO-OPERATES WITH CITIES

In the city of Los Angeles where the tracks are on streets undergoing improvements, when grade changes are required to meet the official established grade, and it is necessary to provide surface drainage after the street is paved, the company co-operates with the city according to its franchise obligations, and installs culverts of dimensions and type similar to those placed by the city in the portion of the street for which it may be obligated. A reinforced concrete culvert, as shown in the line drawing reproduced herewith, has been adopted as standard for paved street intersections. Culverts of this type, when installed under the track according to the company's plans, successfully hold up under the load and prove entirely satisfactory for the purpose intended. The company has an available stock

TABLE GIVING DATA ON CONCRETE CULVERT DESIGN BASED ON A STRESS OF 13,000 LB. PER SQ. IN.

District	Load per Wheel	Culvert Number	Clear Span	Spacing of Reinforcing Rails	Length of Reinforcing Rails	Weight of Metal in Lb. per Linear Ft. of Culvert, Lbs.
Wholesale or industrial	12,000 lb.	1	2'	3"	2'6"	71 0
		2	2'6"	3"	3'	84 3
		3	Double 2'	3"	4'11"	139.7
Residence	6,000 lb.	4	2'	6"	2'6"	37 6
		5	2'6"	5"	3'	52 3
		6	3'	4"	3'6"	74 3
		7	4'	3"	4'6"	124 3
Hilly	4,000 lb.	8	2'	6"	2'6"	37 6
		9	2'6"	6"	3'	44 3
		10	3'	6"	3'6"	51 0
		11	4'	5"	4'6"	76.3

of scrap 20-lb. rail released from abandoned lines or from tracks reconstructed with heavier rail to meet the exigencies of traffic. This old steel is utilized to good advantage in the construction of culverts of this class. In the plan adopted by the city, the company is permitted to deviate from the standard to meet its needs. To have the construction of sufficient strength to withstand the heavy loads of traffic, double culverts are used, with the compartments reinforced in both the top and bottom slabs, the middle section between the compartments being vertically reinforced, and vertical reinforcement being also put in each side wall. The result is that the reinforcement is complete in every unit of concrete involved in the culvert. This improvement in this particular standard has resulted in a first-class job and in no instance have the culverts failed when constructed according to this plan.

In some of the smaller cities the company has been instrumental in having the municipal authorities alter similar plans or standards, or accept this same standard. The city thus obtains better results for its own culvert improvements, and the railway also is able to adhere to its standard when considering permanent drainage systems for handling the surface storm waters that it is required to carry beneath its track.

Connecticut Company Awarded Brady Medal

Pacific Electric Railway and Interstate Public Service Company Also Come In for Honorable Mention

AT a meeting of the trustees of the American Museum of Safety held on March 13 the recommendations of the committee on award were unanimously approved. The medal was awarded to the Connecticut Company, New Haven, Conn., L. S. Storrs, president. The silver replica of the medal was awarded to S. W. Baldwin, assistant attorney in charge of the claims department of the Connecticut Company, and the bronze replica to W. J. Flickinger, assistant to President Storrs.

The recommendation of the committee that honorable mention be accorded to the Pacific Electric Railway, Los Angeles, Cal., Paul Shoup, president, and to the Interstate Public Service Company, Indianapolis, Ind., Chester P. Wilson, president, was also approved.

In making its recommendations the committee stated that the work of the Connecticut Company in the safety movement had impressed it not only for the excellent record made as far as statistics were concerned, but also on account of the efforts made to enlist the co-operation of the public. Of special interest was the successful effort to interest school children through essay contests, although other activities were of equal value. This company operates its lines in more than a dozen cities of moderate size. In some of these the operating difficulties are considerable on account of congestion of population and narrowness of streets. Operation has also been rendered more difficult due to the influx of population along the lines of the company, which has resulted from the expansion in manufacturing occasioned by the European war. The neighborhoods of Bridgeport, New Haven, Waterbury, Hartford and other sections are centers of activity in munitions and related industries.

The award of the silver replica was made to Mr. Baldwin in recognition of his campaign to impress upon the public the need for the more careful use of the highways and more caution in the use of street cars; as well as his success in obtaining co-operation among all departments of the company. It also recognizes his careful study of the causes of accidents and the outlin-

ing of plans for their prevention. The bronze replica is given to Mr. Flickinger because he successfully directed the campaign among employees to promote closer co-operation among individuals in departments, and studied the general subject of accidents, preparing data thereon and originating forms for collecting data.

The Museum of Safety committee on award of the Brady medal this year comprised the following: Bion J. Arnold, chairman, Halford Erickson, Frank R. Ford, Will S. French, A. Hertz and James H. McGraw.

Bringing the Man on the Inside and the Man on the Outside Together*

The Basis for Co-operation Must Be Recognition of
the True Status of Private Property
Devoted to the Public Use

BY FRANK H. SOMMER

Dean New York University School of Law

THE differences of opinion between the managers of public utilities and the public regarding the operation of public utilities are due to the differences in conception regarding the status of private property devoted to public use. On the one hand the public utility men are apt to consider their property as similar to other private property, while on the other hand, there is a tendency for the public to consider the utility property as public property. It is private property, but owing to the fact that it is devoted to the public use and that, therefore, the public has a peculiar interest in it, public utility property is essentially different from other private property.

Because public utility property is devoted to the public use, the public is concerned with its administration in two particulars; first as to the service which is to be furnished and, second, as to the charges which can be made for that service. In prescribing limitations in these matters, however, it is necessary for the public to realize that it is dealing with private property.

PUBLIC UTILITY PROPERTY IS ALWAYS PRIVATE

The investment of private capital in a quasi-public enterprise does not impair the right to protection as private property, but by reason of the connection between the use of the property and the public welfare it becomes peculiarly subject to regulation by the state. There are two fundamental constitutional provisions that act to safeguard this property; the one relating to the prohibition of the enactment of laws by the state impairing the contractual obligations between the state and the corporation and the other prohibiting the taking of private property for public use without just compensation.

"The man on the inside" must remember, however, that while he is handling private property this property is dedicated to the use of the public upon which he is dependent. On the other hand the "man on the outside" must be brought to realize that the owners of the property are entitled to a fair return upon their actual and reasonable investment. If we can find a common ground upon which both of these men, the one on the inside and the one on the outside, can meet, then many of the serious difficulties that now arise will disappear.

PRACTICAL CONSIDERATIONS AFFECTING THE RATE OF FARE

From the practical standpoint we must realize that the concept of the nickel as the proper rate of fare has become fixed in the public mind. Even if legislative

*Abstract of address delivered before Public Service Company Section, American Electric Railway Association, March 1, 1917.

enactment should permit the charging of a 6-cent fare or the abolishing of special fares lower than 5 cents, such an enactment could be carried into effect only with difficulty, with serious friction. This would be reflected in the action of municipal bodies which would refuse to grant the needed secondary franchises for the extension of existing facilities except upon contract terms which would restore the former conditions if legislation permitted.

But suppose that it is found, after careful investigation by an administrative tribunal, that the rate of fare is too low and may be raised, there is still the possibility of competition. If, say, the jitney bus can compete with the railway at a lower fare the authority to increase the rate might as well not be given. Nothing can be accomplished unless all of the enterprises affected with the public interest are equally regulated.

There is another side to the matter. If on a certain railway line the flow of travel increases so as to demand increased service the state has a right to require this service. But if unregulated competition is allowed to bring down the net return on the investment in the railway then the state is not in a position justly to demand the added service. The fact that the man on the inside has not only to operate his property to provide a reasonable return but also so that fresh capital can be obtained for needed extensions and improvements indicates that the man on the outside, for whose benefit these improvements are to be made, has a vital interest in both aspects of the problem.

THE UTILITY MUST GO TO THE PUBLIC

I am glad that the public utilities have awakened to the necessity for going directly to the public. The use of the press and of representation in legislative halls is entirely commendable. But as a member of the legal profession I would call attention to the danger of legalism. It will not do for any of us to stand at all times upon our technical legal rights. The question ought to be as to what from the standpoint of sound business judgment is right, rather than what from the technically legal standpoint is right. If the law accords with sound business principles, the utilities should take their stand upon it. Every effort should be made to square the law with sound business principles. The lawyer, especially one with a narrow point of view, without business training, out of touch with the trend of public opinion, without a full realization of the reaction of public opinion, when settled, upon the development of the law, is an unsafe adviser of those who deal on behalf of public utility enterprises with the public.

The utility must use the utmost caution in making changes in operating conditions which will antagonize the public. Public opinion when it has time to gather itself together is generally fair but sometimes, when aroused to white heat by the demagog who seizes upon every pretext, fair and unfair alike, calculated to arouse unreasoning prejudice and passion, it is ruthless and unfair. If, however, duty to the investors requires that a change be brought about, a complete disclosure of the facts should be made to the public and a campaign of education, at once, entered upon.

SUMMARY AND CONCLUSIONS

In conclusion I wish to express appreciation of the part that transportation plays in our nation. Transportation in all of its phases has made us a nation in fact as well as in theory. It is, therefore, vital to the life of a community that sound fact and good common sense, with the sinking of legalism and mere technical rights, be made the basis for solving transportation problems, both on the part of the public and the part of

the utilities. If we are to put off the day when the public will exercise its right to take over the properties affected with a public interest, this must be done. I trust that this day will not come until we have raised up, through the civil service, a body of public servants as capable of managing these properties as are those who have managed them in private interest.

If the views which I have outlined, which are by no means new, were entertained by our people generally, all of the unreasoning antagonism which crops out in connection with questions presented before municipal bodies, legislative commissions and legislatures would, I think, disappear. Then problems would be solved on a business basis in the joint interests of the people served and the investor.

COMMUNICATION

Uniform System of Truck Classification

TERRE HAUTE, INDIANAPOLIS & EASTERN TRACTION COMPANY

INDIANAPOLIS, IND., March 14, 1917.

To the Editors:

I have read S. A. Bullock's article on a uniform system of truck classification published in the *ELECTRIC RAILWAY JOURNAL* for Feb. 3, 1917, and I believe that the suggested plan would be desirable both from the standpoint of the truck builder and the railway company. The system that Mr. Bullock has proposed appears to be a simple one and at the same time sufficiently comprehensive.

The next step is, obviously, to devise a means of securing the approval of those who are most interested to the end that they would adopt some uniform classification, but it appears problematical whether it would be better to take this question up direct with the truck manufacturers, or to depend upon some political railway representative to "start the ball rolling."

L. M. CLARK, Superintendent Equipment.

Westchester Has 99.3 Per Cent of Trains on Time

During the period from May, 1916, to October, 1916, inclusive, the New York, Westchester & Boston Railway operated 38,790 passenger trains. Of this number, 284 were late into terminals. Of the 284 late into terminals, 242 were delayed either by congestion of traffic on the Harlem River branch of the New Haven Railroad, or by the drawbridge over the Bronx River, principally the latter. The other forty-two delays were from causes directly traceable to failures of the equipment of the New York, Westchester & Boston Railway, such as the breaking down of motors, etc.

Reduced to percentages, of the 38,790 trains run during the above mentioned six months' period, 99.3 per cent were on time, including the 242 trains delayed by causes beyond the control of the Westchester. If the trains delayed are considered only by causes within the control of the Westchester, the total number of which delays was forty-two, it is only one-tenth of 1 per cent of the total. In other words, over a six months' period, of every 1000 trains operated, 999 came through to terminals without being marked up late due to any failures of operation or equipment on the part of the Westchester, and 993 trains out of every 1000 were on time, regardless of all delays.

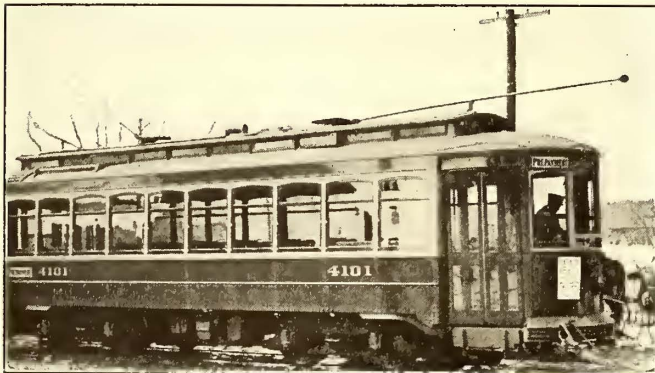
Practical and Economical Solutions of Problems in EQUIPMENT AND ITS MAINTENANCE

Every live shop, track, line and power plant man is doing something that others would like to know about. Such men have a splendid opportunity to assist the industry by notifying the editors of this paper of new things that have been done. Information may be sent in the form of rough notes or short articles, and special rates will be paid for all accepted material.

Bay State Car Remodeling

Inclosed Vestibules and Pneumatically Operated Doors and Steps Added to 200 Cars in City and Suburban Service

Two hundred semi-convertible cars of the Bay State Street Railway are now being reconstructed into the completely vestibuled type with the installation of fare boxes, pneumatically operated doors and steps, and a buzzer signal system. In the main these cars have 28-ft. and 30-ft. bodies, four-motor equipments, and cross seats, with longitudinal seats at the ends. The completion of the reconstruction job, by adding these cars to the 200 new rolling stock units which were lately purchased, will virtually give the company a total of 400 up-to-date car units to meet the traffic demands with which it has to contend.

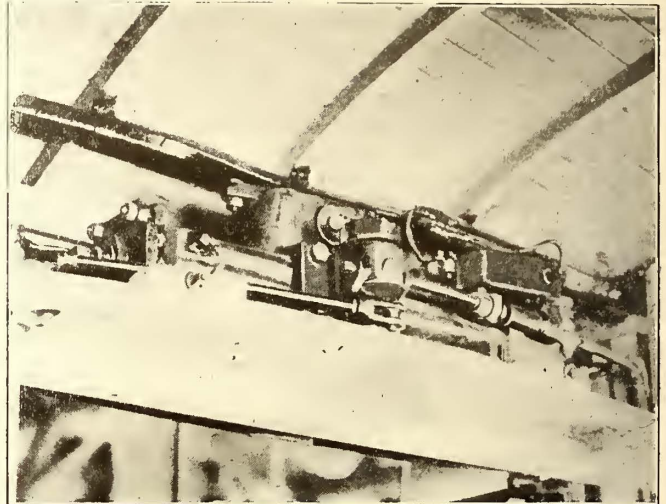


VIEW OF BAY STATE REMODELED CAR WITH INCLOSED VESTIBULES AND PNEUMATICALLY OPERATED DOORS AND STEPS

The work includes the removal of the bulkheads inside each car, with consequent increase in the passageway width. The reconstruction also covers the complete overhauling of each car, including repairs to trucks, bodies and motors where necessary, and repainting. Improvements in the insulation of the motor contactor boxes are also features of interest.

The cars being remodeled are of five classes, having been manufactured in the St. Louis and Cleveland shops of the J. G. Brill Company and in the shops of the Laconia Car Company in New Hampshire. Work was begun in the fall of 1916, and it is expected that all the cars will be remodeled in time for participation in the summer traffic of the present year.

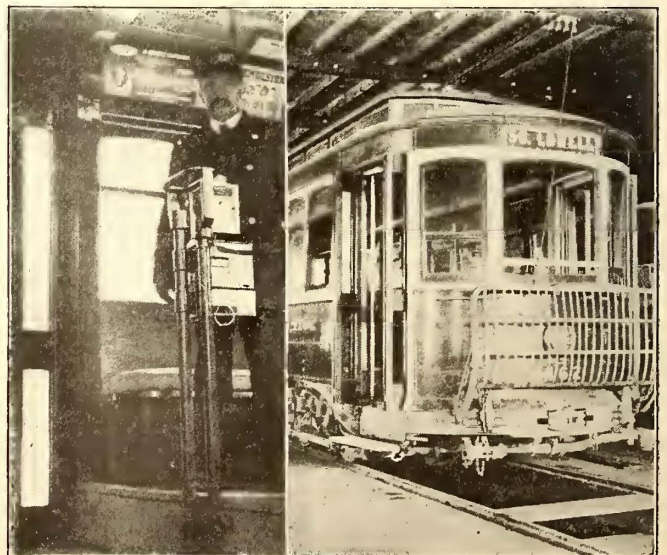
Johnson fare boxes and National Pneumatic door and step control are being installed in the cars. The widths of the outer vestibule doors are being kept virtually unchanged. The inside width at the bulkhead arch, however, in a representative completed car, is now 5 ft. 10 $\frac{3}{4}$ in., and the corners of the longitudinal seats have been rounded. This affords more clearance between the central fare box standard and the end posts, and adds



DOOR ENGINE MOUNTED IN RECESS ABOVE DOOR

much to the passengers' convenience in entering and leaving the car.

At the conductor's station beside the fare box are two valves with wooden handles. These valves control the door and step operation for the rear doors on both sides of the car. At the front of the car on each side of the motorman's air brake valve are two similar valves for the operation of the front doors and steps. The door panels are supplied by the Laconia company, and have rubber anti-moisture diaphragms interlocking at the vertical center line. There are two upper sashes of clear glass and two wire-glass lower sashes in each door.

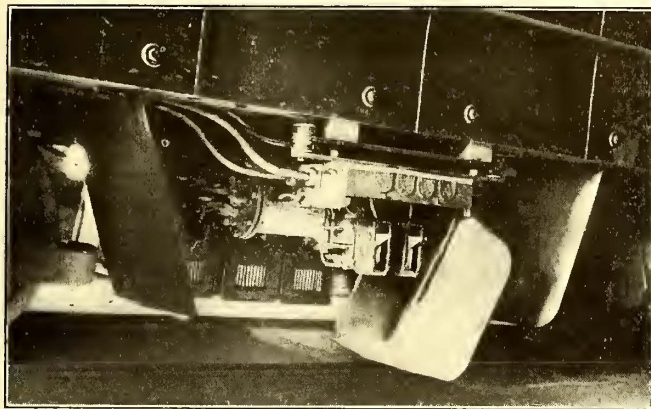


INTERIOR VIEW OF REAR END SHOWING CONDUCTOR'S CONTROL STATION; NEAR VIEW OF FOLDING DOORS AND STEP

An electric switch is connected mechanically with the pistons of the door engines in such a way that the closing of the door closes the switch which interlocks with the control circuit. This makes it impossible to start the car until all the doors and steps are closed. Furthermore, through this interlock, the opening of a door while the car is in motion will automatically cut off the propulsion current.

Each pneumatic door engine is mounted in the recess above the door header which it controls. Owing to its compactness the recess is large enough to afford easy access to all parts of this equipment.

The new shelf headers and door jambs which were required because of the change to folding doors were naturally adapted to take care of the pneumatic equipment. The doors are operated on ball-bearing supports. Inside the vestibule, on each side, a pipe stanchion runs from the floor to the roof framing for grab-handle service. The door opening is 33 in. in most cases, the clearance between stanchions being 30 to 31 in., according to the car class. New thresholds are being installed between the car body interior and the vestibule, the old thresholds being designed to accommodate sliding doors. With the rounding of the seat corners at



MOTOR CONTROL CONTACTORS MOUNTED UNDER CAR AND PROTECTED BY MUD GUARDS

the ends, the company is also placing a dasher-iron bulkhead below the seat projection to protect the seat support from abrasion. The rounding of the seats means practically the reconstruction of the seat top, and this is being handled at the shops of the Heywood Brothers & Wakefield Company.

The 34 1/4-in. x 10-in. oak step is supported from the vestibule sill and operated by two-arm step devices, the height of the step above the rail being from 15 in. to 17 in. A rise of 13 1/4 in. occurs from the step to the vestibule, with a further rise of 11 in. from the vestibule floor to the car floor proper. Dasher iron toe guards are being installed behind the outer step.

All the remodeled cars are being equipped with the Consolidated Car Heating Company's buzzer signal system, eighteen push buttons being installed in each car. With each car four sets of mudguards are installed, as illustrated, to protect the contactor box, rheostats and air compressor. These are all mounted in a central location beneath the car floor and between the trucks, the guards each consisting of a steel plate, 30 in. x 28 1/2 in. x 1/16 in., inclined at an angle of about 50 deg. from the vertical and clearing the rail by 8 in.

The control contacts which were already installed were adapted to work with the interlocking feature of the pneumatic door and step control, as already noted. The wiring is carried into the contactor box in conduit terminating in insulating bushings seated in the wall of the box. The box, as shown by one of the illus-

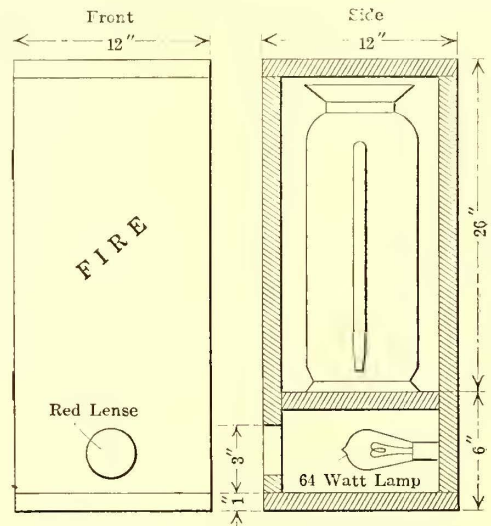
trations, is attached by bolts to two iron straps carried horizontally by General Electric insulating bolts from two similar iron straps attached by bolts to the cross sills. Inside the box and between the contactor arc chutes and the box frame a sheet of transite 1/4 in. thick is placed to prevent any arc from a contactor communicating with the box proper. This arrangement insulates the entire contactor box from the car body and ground.

Inexpensive Improvements Will Reduce Insurance Rates

BY W. H. BOYCE

Superintendent Beaver Valley Traction Company, New Brighton, Pa.

No doubt there are many railways which are paying needlessly high fire insurance rates. Even though the shops are not new and of the most modern fireproof construction, the insurance rate can be considerably reduced by complying with certain of the recommenda-



ANTI-FREEZE BOX FOR FIRE EXTINGUISHERS

tions of the Fire Underwriters' Electrical Bureau. This was done in our shops, with the result that the yearly saving in the cost of insurance is greater than the expense which was necessary to make the required improvements.

The following table shows our insurance rates before and after the improvements were made:

	Rate	Amount
1907-1908	0.8391	\$252,590
1908-1909	0.8391	261,475
1909-1910	0.8940	275,000
1910-1911	0.8940	275,000
1911-1912	0.68035	300,000
1912-1913	0.6761	300,000
1913-1914	0.59807	317,000
Total saving per year on \$300,000 of insurance as below:		
1911—\$300,000 at 0.8940		\$2,682.00
1913—\$300,000 at 0.59807		1,794.21
Total saving per year at new rate		\$887.79

The yearly saving of \$887.79 was the result of improvements which cost only \$650, including the cost of one 40-lb. chemical extinguisher. The other improvements included placing the wiring in conduits and complying with the minor recommendations of the Fire Underwriters. None of these were expensive, and we followed them through and made sure that we got a reduction in rates for all improvements made. This is best done by securing from the bureau a schedule of the rating of the different items. This will show the basic rates and an itemized list of the extra charges which are made for deficiencies. Many of the deficiencies are

easily remedied, and the extra charge thus eliminated.

To protect the fire extinguishers during cold weather, anti-freeze boxes such as shown in the accompanying illustration have been made. These are built of 1-in. wood lined with asbestos. A 64-watt lamp located under the extinguisher as shown furnishes heat enough to prevent freezing. The red lense in the front of the box is illuminated by this lamp. This calls attention to the location of the extinguisher and provides a means of readily seeing if the lamp is burning.

Sidestepping High Cost of Materials and Labor in Repair Shop

Economical Method of Repairing Plush Cushions—Use of Cast Iron in Place of Brass for Certain Car Fixtures—Details of Home-Made Resistance Box for Headlights

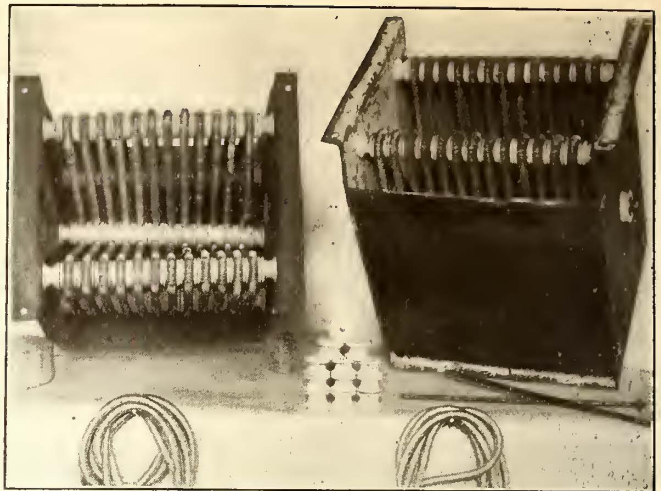
BY F. J. FOOTE

Master Mechanic Ohio Electric Railway, Columbus, Ohio.

In common with most electric railway companies we have been obliged to practice all kinds of economies. In a way this has been a good thing for us, as we have discovered several efficient ways of cutting down expenses without appreciably lowering the standards of quality. Having discovered and tried these out, we are likely to continue the use of them even in times of greater prosperity.

We have always been put to considerable expense in repairing arc headlight resistors. About a year ago we began experimenting with a home-made resistor. This has been developed, improved and finally standardized, and we find it is cutting down our expense for this item about 50 per cent. Details of this resistance box are given in the accompanying drawing and bill of material.

The cost of plush for recovering seats in coaches has increased considerably. Formerly, when the edges of the plush on seats became badly worn, we replaced the old plush with new. Recently, one of our men took two of these old seat backs, trimmed off the worn portions and sewed the remaining parts which were in good order together in such a way as to make one very good seat back. The only thing that indicates that this has been

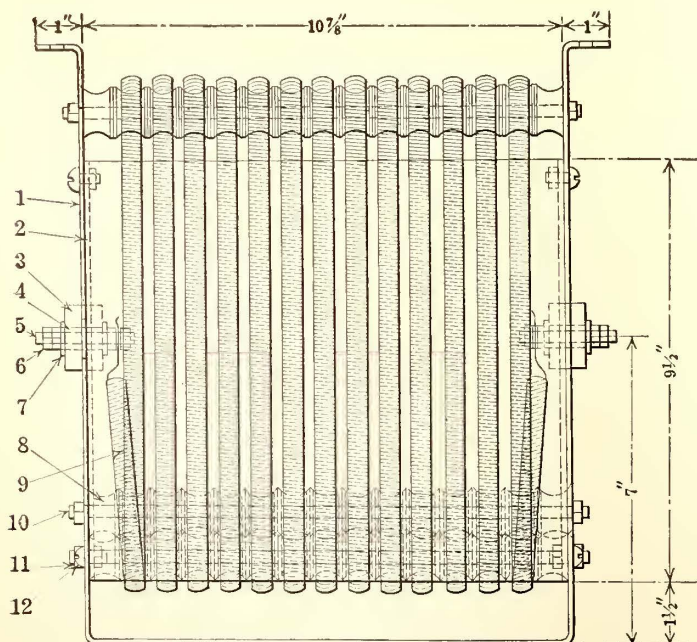


VIEWS OF ARC HEADLIGHT RESISTANCE BOX

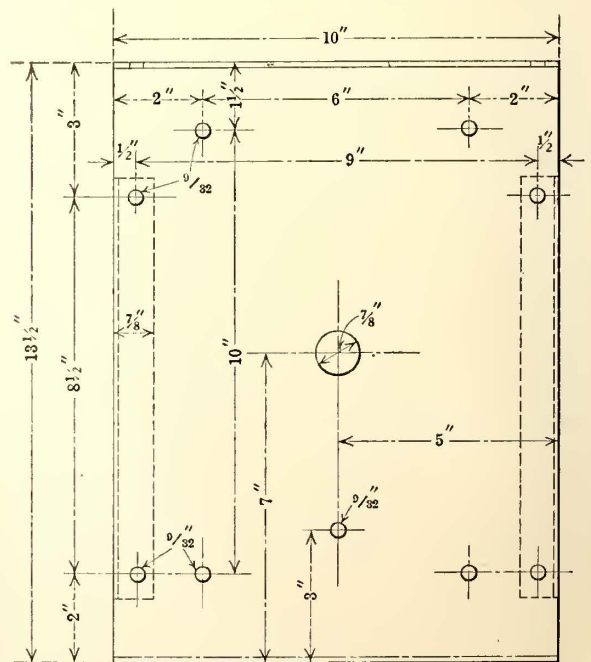
done is one vertical seam running up the center of the back. As the sewing together was done on a machine, the labor involved was but little more than would be required to recover the seat with new plush. We now have several cars with the plush seats repaired in this way.

BILL OF MATERIAL

Ref. No.	Number Required	Name	Material	Size of Stock	Remarks
1	1	Main frame	Sheet iron	No. 14x10 in.x39 ⁷ / ₈ in.	
2	2	Side shield	Sheet iron	No. 14x9 ¹ / ₂ in.x12 ⁵ / ₈ in.	
3	4	Bushings for terminal stud	Porcelain		Manufactured by Crouse-Hinds Co. Cat. No. HL 2796.
4	2	Insulating tube	Mica	1/4 in. I. D. 1/2 in. O. D. x7/8 in. long	Manufactured by Crouse-Hinds Co.
5	2	Terminal stud	Brass	1/4 in.x2 in.	24 threads per inch.
6	8	Nuts	Brass	1/4 in. hex.	24 threads per inch.
7	4	Washer	Brass	1/4 in. I. D.x1/2 in. O. D.	
8	75	Insulator	Porcelain	Height 1 1/8 in. Diam. 1 1/8 in., hole 1/4 in., groove 1/2 in.	Stand. No. 11, Trade No. 042, Union Elec. Co., Pitts., Pa.
9	5 coils	Resistance wire		No. 20. (23) ohms per coil	Marked 15-75 ohms for heater "31-K" manufactured by Consolidated Car Heating Co.
10	5	Tie bolts	Cold rolled steel	1/4 in.x1 1/2 in.	Threaded 3/4 in. on each end.
11	10	Nuts	Iron	1/4 in. square	20 threads per inch.
12	8	Stove bolts	Iron	1/4 in.x1 1/2 in.	Round head.



Side View

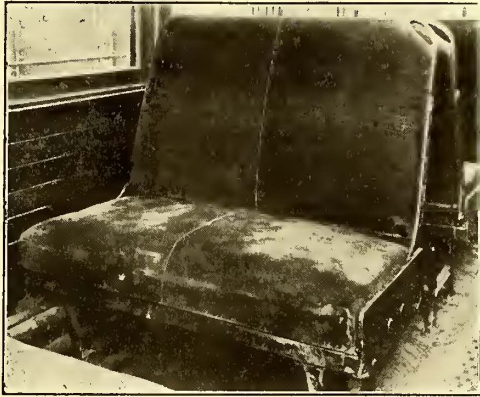


End View

DETAILS OF ARC HEADLIGHT RESISTANCE BOX. NUMBERS REFER TO THE BILL OF MATERIAL GIVEN HEREWITH

On some of our plush seats having end arm rests and roll-top backs, the plush was in good order with the exception of that on the roll top. These seats were repaired by renewing the plush on the roll top only. If only one seat here and there is thus repaired, it makes a bad appearance, but if all the seats in any compartment are changed, the appearance is pleasing rather than otherwise, since they all look alike and the new plush on the top roll gives the impression that new seats have been put in.

On nearly all passenger coaches there are many parts now made of brass or bronze which could just as well



PLUSH SEAT REPAIRED, SHOWING SEAM IN THE MIDDLE

be made of malleable iron. The basket racks have generally been made of brass rod and castings. These look very fine when carefully polished and lacquered, but when they become tarnished they do not look as well as painted or enameled work. On account of the heavy cost of repolishing and lacquering these basket racks, we simply have them painted or enameled, and in ordering new racks we have had them made of malleable iron castings and cold rolled steel rods, covered with baking enamel which will stay in good condition for years. This enamel is easily renewed if desired.

Peculiar Brooming of Poles

In some alkali regions a waterproof coating is necessary in the treatment of poles to prevent them from brooming at the ground surface. Due to the expansive action of the alkali a pole of Western cedar brooms to twice its natural size. It is found that cedar is more susceptible to this action than pine or cottonwood, probably due to the relative porosity of the woods.

Chicago Safeguards for Drawbridges

Details of Recently Installed Interlocking Derail Device and Cushion Barrier Gate Designed to Stop Surface Cars

BY F. H. AVERY

Engineer in Charge of Bridge Repairs, Chicago, Ill.

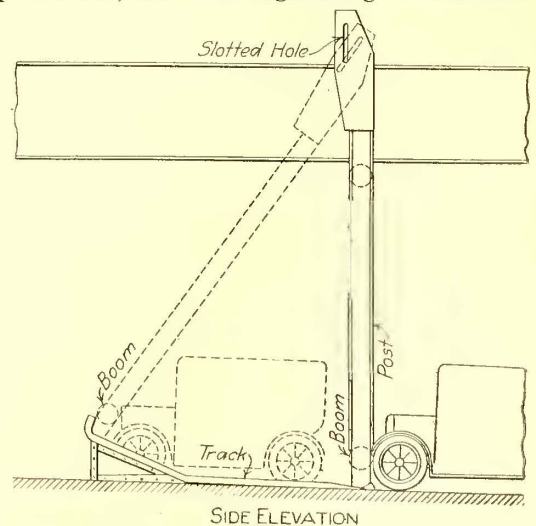
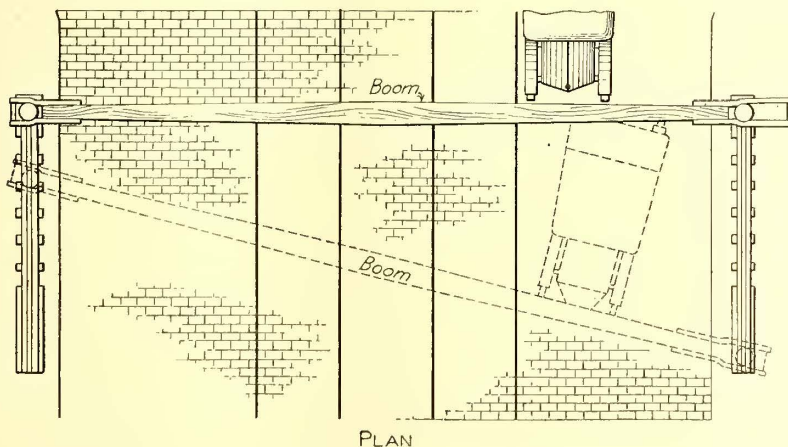
Chicago is striving to safeguard her traveling public by installing barrier gates, derails and stop signals at approaches to drawbridges. The most recent device, that of a cushion barrier gate, is designed to withstand the impact of a surface car or a 4000-lb. automobile traveling at 30 m.p.h. To protect the surface cars, derails are also being installed which interlock with the end lock of the span and prevent its release except when the derail itself actually opens.

The first gates were air-operated and could not be reversed quickly once they were started down, nor operated at all by the bridge tender in the case of a drawspan. The electrically operated gate avoids these two serious faults. In this gate, contactors consisting of wheel contacts that wipe against copper strips on the abutment are placed at the end of the center truss. This works very well, for after the bridge tender lowers his gates and makes his swing, he reverses his switches while waiting for a boat to pass, and as soon as the bridge is again centered on the abutments the gates rise automatically from the action of the contactors. The present gate arm is provided with a hinge and wooden pin at the curb line, so that when hit, the pin shears off and allows the arm to swing around without breaking.

CUSHION BARRIER GATE, LATEST DESIGN

The writer has designed and is installing at Lake Street Bridge a gate of the cushion barrier type, consisting of a boom which travels vertically on two posts at the curb line. These posts are free to swing at the top and slide at the bottom. When the boom is struck by a machine, the post rolls backward about a foot on a wheel placed at the bottom of the post. The motion then changes from rolling to sliding by means of a track which picks up the post on two bearings outside of the wheel. The post slides horizontally for 10 ft. and then climbs at an angle of about 45 deg. for 5 ft. more. To provide for the lengthening of the post which this motion requires, the support at the top on which the post turns has a slotted hole.

The boom is of Douglas fir, 16 in. in diameter, and it has forked ends so that when struck by a machine close to the curb, the post on that side can start independently of the opposite one, and the lengthening of the boom



BOOM LOCATED AT DRAWBRIDGE AND DESIGNED TO STOP STREET CARS AND AUTOMOBILES

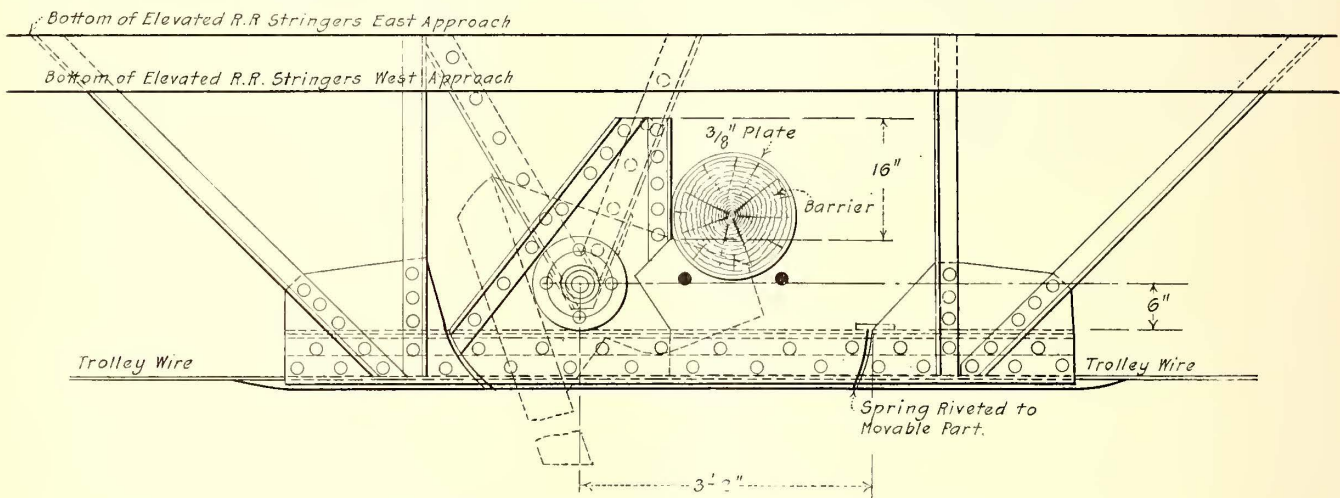
which this requires is provided by having the forked end made of 3-in. x 4-in. x 1/2-in. angles. The boom weighs 1000 lb. and the two posts with counterweights 3000 lb., making a total of 4000 lb. which must be put in motion when struck by a machine. The boom can spring 18 in. without breaking and the tires furnish additional cushion, so that the rolling motion should take place without damage. The resistance then increases, with the change to sliding friction, and the stopping action is still further augmented when it becomes necessary to lift the boom and posts a distance of 2 ft. vertically in the last 5 ft. of travel. There would still be left the 18-in. deflection in the boom. The gate is designed to stop a 4000-lb. machine going at 30 m.p.h. without injury to its occupants.

MOVABLE SWITCH FOR PASSING TROLLEY WIRES

When the boom is raised it must pass the trolley wires, which is accomplished by means of a switch that is operated by the motion of the boom. The movable portion of the switch is not dead at any time, so that a car cannot be stalled in case it stops with the trolley on the

The most troublesome point in the pipe line of such a derail is at the abutment. It is hoped, however, to overcome some of the difficulties by using a spring at this point which maintains a constant pressure of about 300 lb. against the casting on the end of the push rod at the end floor beam of the span. This will take care of expansion and does not require unlatching or unhooking the pipe line at the abutment when a swing is made. If the operator closed the derail while his span was open, it would cause the breaking off of the castings at the abutment spring box. This is prevented by the bar between the end lock and derail levers in the operator's house, which is cross-connected to the derail lever, so that when the end lock is pulled after pulling the derail the derail cannot be pushed back again until the end lock is pushed back.

A signal should be so wired that it interlocks with the controller to the bridge motors. At every span in Chicago the bridge tender has to push in his vibrating-bell and stop-sign switch before he can get current to his controller to operate the main motors. However,



MOVABLE SWITCH TO ALLOW BOOM TO PASS TROLLEY WIRES

switch. The boom is fastened to the counterweights at each end by two cables so that the breaking of one will not allow the boom to drop on the traffic below. The boom is designed to withstand the impact of a street car, and has no springs, cylinders, or brake wheels to get out of adjustment. The cushion gate is just back of the electric gates which are lowered first, after which the barrier comes down.

A rigid gate would be much cheaper than a cushion barrier gate. However, a gate should prevent loss of life or injury if possible, which is not likely if a machine going at 25 m.p.h. is instantly stopped.

DERAILS PREVENT ACCIDENTS TO CARS

The street car on a swing or vertically lift span should be protected by a derail operated by the bridge tender and interlocked so that the span cannot be opened unless the derail is open.

The Clark Street derail in Chicago is so interlocked with the end lock of the span that the operator cannot pull out the end lock until the solenoid located in the operator's house raises the dog on the end-lock push rod. This solenoid is energized when the derail is open by an electrical switch located at the curb opposite the derail. This insures that the bridge end-lock is released only when the derail actually opens, as otherwise the operator, not being able to see the derail or its target, might throw the derail lever and, due to a broken rod, proceed to open the span with the derail untouched. The dog on the center lock is under a glass cover, but may be raised by hand in an emergency.

provision has been made for the operator to still get current if the signal fails to work.

VARIOUS STOP SIGNS TRIED AT CHICAGO

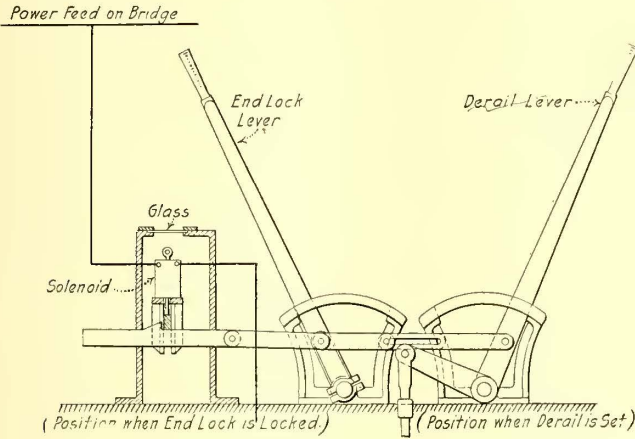
In Chicago a land bell is rung as a warning to the traffic to clear the span so that it can be opened. Then a vibrating electric bell is rung, two electrically lighted signs are started on each approach and finally the gates are lowered before the span is opened. This should cause the oncoming traffic to stop, so that the only time lost is that required for the traffic to pass over the span, generally about one and a half minutes. However, several cases have occurred where machines have climbed a bascule leaf after it has started up. It is evident, therefore, that the stop sign must be very compelling in its effect on the public and of such a nature that people not familiar with it or not knowing where to look for it will see it instantly when it is displayed.

If signals were standardized all over the country the drivers would know a stop sign when they saw it. All automobile magazines and clubs should aid in this, and it must be impressed on the driver that "STOP" means cease moving.

FLASHING SIGNAL PLACED ON GATES

The writer evolved the idea of placing the signal on the gate itself where it could be seen at any distance or position. The actual working out of the details of the first signal of this type was done by Mr. Harrington of the city bridge division.

The present stop sign is very substantially made of cast iron and placed so that it cannot be knocked down. A new type shortly to be installed will have the shape of ornamental pylons in accordance with the "city beautiful" idea. Four red lights placed on each arm are so arranged by means of a flasher that one light burns "STOP" at the curb. The signal then runs across the gates and the opposite stop sign lights up, after which



INTERLOCKING LEVERS FOR DERAIL AND END LOCK

the procedure reverses, thus giving the impression of a waving signal. Lights begin to flash while the arms are still in the up position. The visibility of the new signal is vastly superior to anything that has been produced for use at night, one of the chief features being that it cannot be hidden by traffic.

The accompanying table gives the costs installed of a complete set of signals for one trunnion type bridge.

GATES AND STOP SIGNS	
Four gate posts at \$200.....	\$800
Four stop signs at \$70.....	280
Four gate controllers at \$35.....	140
Two flashers at \$75.....	150
Two vibrating bells at \$20.....	40
Eight light sockets at \$2.50.....	20
Total material.....	\$1,430
Installation, seventy-five days at \$6.....	450
	\$1,880
EMERGENCY LIGHTS	
Two emergency lights at \$5.....	\$10
Two resistance plates at \$10.....	20
Total material.....	\$30
Installation, ten days at \$6.....	60
	\$90
CHANNEL LIGHTS	
Four swinging lights at \$37.50.....	\$150
Four pier lights at \$7.50.....	30
Total material.....	\$180
Installation, twenty-five days at \$6.....	150
	\$330
Total complete.....	\$2,300

The work is being installed under the direction of Thomas G. Pihlfeldt, city bridge engineer, and city engineer, John Ericson.

Twenty-Five Dollars for a Safety Poster

The National Safety Council has announced that it will pay \$25 for the best suggestion or illustration for a safety poster to popularize the International Safety Exposition which is to be held in New York during the week of Sept. 10, 1917. Any employee in the plant of a member of the council is invited to participate. Drawings and suggestions should be sent to W. H. Cameron, 208 South LaSalle Street, Chicago, Ill. The contest will close April 15.

A-Ladders Popular with Shopmen

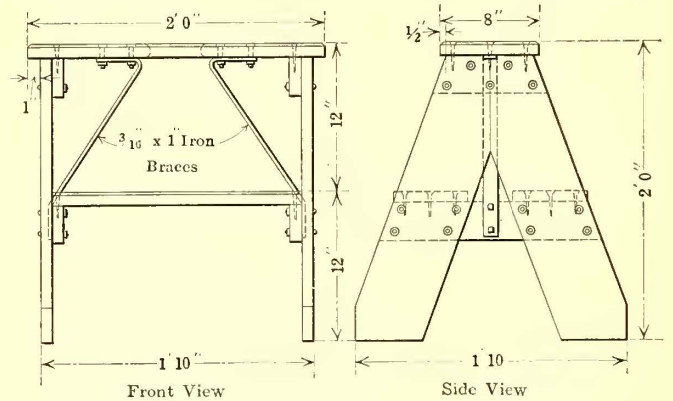
Found Useful in Carpenter, Paint and Truck Shops—
Cost \$2 Each

BY F. L. HINMAN

Master Mechanic New York State Railways, Syracuse Lines

In order to meet the demand for a portable device upon which a man could stand when working on parts of the car not easily reached from the floor of the shop or pit, a rigid A-ladder was designed and put into use about a year ago. This single ladder met with such popular favor that twelve additional ones were constructed at a cost of approximately \$2 each and distributed throughout the carpenter shop for the use of men of that department. About six months ago twelve more of these ladders were placed in the pits of the truck shop, and these have proved equally serviceable in this class of work. In fact, the men of this shop appreciated the value of these ladders before the writer did, and it was due to the fact that several of the pit men appropriated carpenter shop ladders to their own use that it was decided to make up some expressly for the truck shop. Recently their use has been extended to the paint shop also.

Prior to the introduction of these ladders it was a common occurrence for men to work from the top of an empty box or possibly place two or more 6-in. blocks in the position needed, with the result that considerable time was consumed in hunting up something on which to stand, and often the device used for this purpose came a long way from complying with the rules of safety first. Since the ladders have been put into serv-



DETAILS OF SHOP LADDER HAVING A-SHAPE AND RIGID CONSTRUCTION

ice, however, the employees have shown no tendency to use any other device for this purpose and, while no figures are available to show the actual time saved by the men, I feel safe in saying that during the first three months of their use the saving has been sufficient to pay for the cost of the ladders. Up to the present time there has been no maintenance charge whatever on the ladders placed in the carpenter shop, and these have been in service the longest.

In order to stop the practice of carrying the ladders

from one shop to another, the ladders of the truck shop were painted black with white numbers on each end, and those of the carpenter shop were made gray with black numbers on the ends, while the paint-shop ladders are yellow with black numbers. By using this color scheme, a foreign ladder is instantly recognized by the foreman and returned to its proper shop.

The material used in each ladder is given in the following table:

One top board $\frac{7}{8}$ in. x 8 in. x 2 ft.
 Four legs $\frac{7}{8}$ in. x 6 in. x 2 ft. 2 in.
 Two steps $\frac{7}{8}$ in. x 6 in. x 1 ft. 8 $\frac{1}{4}$ in.
 Two cleats $\frac{7}{8}$ in. x 3 in. x 1 ft. 6 in.
 Two cleats $\frac{7}{8}$ in. x 3 in. x 9 $\frac{1}{2}$ in.
 Two braces $\frac{3}{16}$ in. x 1 in. x 1 ft. 9 in., iron.
 Twenty-six $\frac{1}{4}$ -in. x 2-in. R. H. stove bolts
 Four $\frac{5}{16}$ -in. x $1\frac{1}{2}$ -in. F. H. stove bolts
 Four $\frac{5}{16}$ -in. x $1\frac{1}{2}$ -in. machine bolts.
 Eighteen $1\frac{3}{4}$ -in. No. 10 F. H. bright screws
 Fifty-two $\frac{1}{4}$ -in. flat washers
 Four $\frac{5}{16}$ -in. flat washers

Dump Cars Save \$1,600 Per Mile

In Renewal Work in Cleveland the Author Estimates This Saving Over Manual Method of Handling Materials

BY C. H. CLARK

Engineer Maintenance of Way Cleveland (Ohio) Railway

That labor and time, and therefore money, can be saved by the use of the modern dump car in track construction is indicated by the following data. This company has had in operation for two years past a train of Differential electric dumping cars along with other dump-car and flat-car equipment. As a result of this experience the savings given in the table were compiled to show the effect of replacing the work cars entirely by the electric dump cars on a 20-mile renewal job.

The following comments indicate the bases for the calculation of the savings shown in the table:

TABLE I—SAVINGS ON 20 MILES OF SINGLE TRACK RENEWAL DUE TO USE OF ELECTRIC DUMPING CARS

Item No.	Operation	Unit Costs	Total Cost
1	36,000 cu. yd. concrete loaded at job.....	\$0.05	\$1,800
2	36,000 cu. yd. gravel unloaded at job.....	.25	9,000
3	18,000 cu. yd. paving stone loaded at job.....	.05	900
4	18,000 cu. yd. paving stone unloaded at job....	.30	5,400
	Total		\$17,100
5	36,000 cu. yd. earth and concrete unloaded at dump.....	\$0.125	\$4,500
6	36,000 cu. yd. gravel unloaded at yard.....	...	...
7	18,000 cu. yd. stone unloaded at yard.....	...	900
8	18,000 cu. yd. stone loaded at yard.....	.05	900
	Total		\$5,400
9	Four crews for 200 days.....	\$5.50	\$4,400
10	Transporting labor for unloading cars.....	...	4,800
	Grand total		\$31,700

Item No. 1. On West Twenty-fifth Street, from Potter Court to Clark Avenue, the cost of loading concrete was 30 cents per cubic yard and of loading earth, 18 cents per cubic yard not including the crews. On June 29 the actual time taken in loading represented a cost of 25 $\frac{1}{2}$ cents per cubic yard for loading concrete on flat cars and 35.1 cents per cubic yard for loading concrete on dump cars of an earlier type. The electric dump cars are lower than the flats, hence there would be a still further saving. Five cents per cubic yard was allowed.

Item No. 2. The cost of unloading all the gravel for the stretch of double track from Potter Court to Clark Avenue was 30 cents per cubic yard for labor only, other than the time of crews. With the electric dump cars the crews alone unload the cars and hence the entire amount of 30 cents per cubic yard should be saved. Five cents per yard is allowed for distributing gravel after it has been dumped from the electric dump cars.

Under a different method of track renewal this might become an additional saving.

Item No. 3. On the same stretch of West Twenty-fifth Street it cost 27.8 cents per cubic yard to load stone on the older dump cars and 17.6 per cubic yard to load stone on the flat cars. The electric dump cars should load cheaper than either. Five cents per cubic yard saving is allowed.

Item No. 4. It cost 36 cents per cubic yard to unload stone on West Twenty-fifth Street by manual labor. The electric dump cars would be dumped by the crew only, hence the entire amount should be saved and only 30 cents was allowed. There may be some little distributing necessary after dumping.

Item No. 5. Flat cars are used largely for unloading earth and concrete at the dump. It is only fair to say that the saving might have been greater if the present practice of hauling laborers from the various field operations to the dump for unloading were abandoned. This might easily run as high as an additional 9 cents per cubic yard or for 36,000 cu. yd. at 9 cents, \$2,340.

Item No. 6. No saving is allowed for loading gravel at the storage yard.

Item No. 7. No saving is allowed for unloading stone at the storage yard.

Item No. 8. Five cents per cubic yard is allowed for loading stone at the storage yard. (See Item No. 3 for this saving.)

Item No. 9. There are from twelve to sixteen crews at work in Cleveland during the renewal season. Since the trains of electric dump cars have twice the capacity of the flat cars and need much less time at the dump, it is assumed that eight to twelve crews could do the same work with the improved trains.

Item No. 10. The cost of transporting labor to and from the dumps and placing labor at the point of unloading cars on the job depends largely on the length of the haul and the local conditions at the job. It is conservatively estimated in this case at 9 cents per cubic yard, and it is assumed that one-half of the unloading is done without having to transport labor at all. The cost stated is, therefore, conservative.

In connection with the above data it should be noted that the savings shown are due partly to the ease of loading of the electric dump car and partly to the rapidity and ease of the dumping operation. In both of these operations the labor cost is comparatively low. An incidental advantage of quick dumping is that the movement of other equipment and crews using the same track is not delayed.

Stock of Repair Parts Reduced by Use of Interpole Motor

Author Gives Table of Extra Parts Necessary to Maintain 680 Motors of the Interpole Type—None of the Fields Have Required Replacing

BY J. S. MILLS

Foreman Electrical Department, Morris Park Shops, Long Island Railroad

There is nothing that has been done in recent years that is paying better dividends to electric railroad companies than the selection of interpole motors for new equipment or the re-equipping of cars which had old-type motors with interpole motors.

As an illustration, this company has 680 Westinghouse No. 308 interpole motors, the first of which went in service in the spring of 1910 and the last in the early part of 1914. We carry in stock the parts for these motors as indicated in the table at the top of page 509.

This includes our working stock of repair parts in shop and stockroom. This amount of stock has not in

- | | |
|---|---|
| Two main field coils, one open and one closed. | Six sets of brush-holders. |
| Two sets of steel springs and brass shields for main field coils. | 100 to 200 brush-holder hammer tips. |
| One interpole field coil. | 100 to 200 flat steel springs for brush-holders. |
| Two sets of steel springs and brass shields for interpole fields. | 25 ft. to 100 ft. of brush-holder shunt copper braid. |
| Two complete armatures. | Six to twelve brush-holder stud porcelain insulators. |
| Two sets of armature coils. | Four brush-holder bases. |
| Three sets of armature coil clips. | 200 to 500 carbon brushes. |
| Three sets of armature bearings. | Twenty-five to fifty sets of axle bearings. |
| One armature bearing housing pinion end. | Six axle cap housing oil-box covers. |
| Six armature bearing housing oil box covers. | One complete gear case. |
| | Two bottom-half gear cases. |
| | Three pinions. |
| | Twelve gears on extra wheels. |

any way interfered with the efficiency in maintaining these motors, and we have never had any cars held out of service waiting repair parts for these motors. I might further state that the original extra main fields and the extra interpole field are still in the stockroom. It has been necessary to retape some of the fields but none of them have been replaced.

Motor Maintenance at Providence

Successive Steps in the Insulation of Field Coils—Method of Storing Motor Repair Parts

The headquarters for railway motor maintenance on the system of the Rhode Island Company is the Cranston shops, just outside the city limits of Providence. Various features of these shops have been described in former issues of this journal, but little or nothing has been published regarding the success attained by the company in reducing operating troubles due to field coil defects, especially with the older motors. Instead of impregnating field turns before the sections are assembled, these are treated with a compound of shellac and whiting, combined with shredded asbestos and applied with a brush. The mixture is prepared by adding enough whiting to make the shellac a thick paste, to every 3 gal. about 2 lb. of shredded asbestos being added. This material is used on both cotton-covered and asbestos-covered wires. The various steps taken in the insulation of field coils for various types of motors are given below:

INSULATION OF FIELD COILS, GE-57, WESTINGHOUSE-93 AND 101 (Flat Coils Used)

1. Wind coil sections with asbestos paper between turns.
2. Apply shellac-whiting mixture with trowel or brush.
3. Place terminals.
4. Apply layer thin 1-in. asbestos tape.
5. Dip in insulating compound.
6. Dry in electric oven.
7. Apply 1-in. oiled linen tape (half-lap) twice around.
8. Apply layer 1 1/2-in. field webbing.
9. Dip hot in heavy boiled oil.
10. Dry in oven and dip again.
11. Dry in air.
12. Apply brush coat of black insulating varnish.

INSULATION OF FIELD COILS, GE-800 AND WESTINGHOUSE-68 (Round Wire Used)

1. Wind coil in shellac and whiting compound, with a little shredded asbestos, brusa applied.
2. Apply terminal when dry.
3. Apply 1-in. asbestos tape over fresh compound.
4. Dip in insulating compound and dry.
5. Apply 1-in. oiled linen tape.
6. Apply 1 1/2-in. friction tape.
7. Apply 1-in. oiled muslin.
8. Apply 8-oz. canvas tape about 2 in. wide.
9. Apply 1.5-in. field webbing.
10. Dip hot in heavy boiled oil.
11. Oven dry and dip second time.
12. Air dry.
13. Apply coat black insulating varnish.

NOTE: GE-1000, 52, 80, 67 and Westinghouse-56 same as above but with No. 8 omitted. All tape is applied with one-half lap.

The foregoing construction prevents vibration between coil sections and is most effective in cutting down short-circuits between adjacent field turns.

All flat field coils for railway motor service and magnetic blowout coils for controllers are passed through two case-hardened steel plates to "iron out" the roughness of the copper edges and prevent short-circuits from the resulting scattering of fine copper particles through

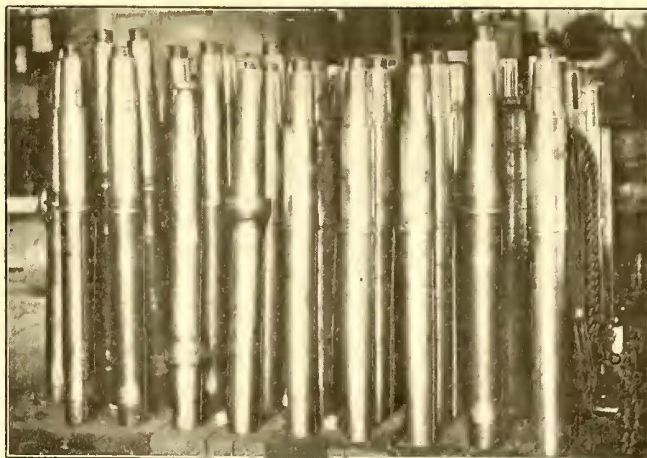


FIG. 1—ARMATURE SHAFT RACK, RHODE ISLAND COMPANY'S CRANSTON SHOPS

the coils, particles which cannot as a rule be seen with the naked eye.

The above methods have been important factors in reducing motor troubles, so that whereas formerly about ten armatures used to be brought into the shop for repair weekly on account of troubles due to unsatisfactory field conditions, at present only one or two armatures come in monthly. The number of spare field coils carried has been reduced about 50 per cent.

STORAGE OF MOTOR PARTS

At the Cranston shops three notable means of compact storage are in use in connection with motor maintenance and the repair of other electrical equipment. Fig. 1 shows a convenient rack for the storage of armature shafts. These are mounted vertically in holes drilled in a 7-ft. x 8-ft. platform. A capacity of 120 shafts is attained in this exceedingly limited space, the holes be-



FIG. 2—SCREW CABINET; FIG. 3—ARMATURE COIL STORAGE RACK UNIT. BOTH IN RHODE ISLAND COMPANY'S SHOPS

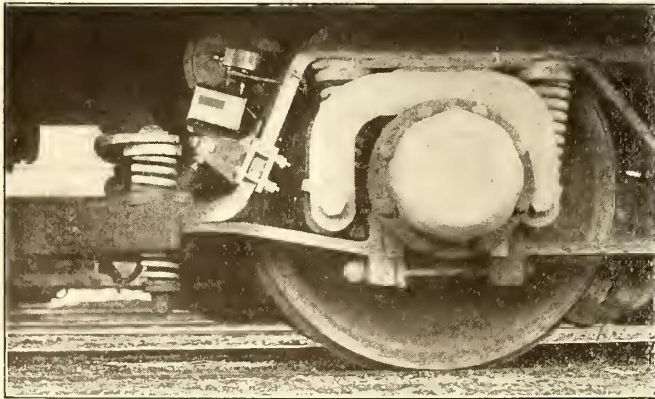
ing drilled in diameters ranging from 2½ in. to 4 in. Fourteen different types or sizes of shafts are carried in the platform under normal conditions of storage. The platform floor is of 1-in. planking and is mounted in the machine shop.

Fig. 2 shows a home-made cabinet for the storage of screws in the electrical repair shop to obviate the loss of time incurred in going to and from the main stockroom for these small supplies. The cabinet is an octagonal structure containing forty-eight triangular boxes with galvanized-iron sides, wooden bottoms and fronts, the drawers being 3 in. deep, 4½ in. wide at the base and with sides 6 in. long. When opened all drawers are held from falling out by a small vertical pin which projects downward at the apex of the triangle in each case, but which is short enough to enable a box to be taken out with ease by tilting downward from the front. The diameter of the cabinet is 14½ in., and the structure rotates on ball bearings, a hand-wheel for convenient manipulation being provided at the bottom. The cabinet holds from 10,000 to 15,000 screws.

Armature coils are stored at these shops upon unit racks as illustrated in Fig. 3. Eleven hundred coils can be stored in a space 15 ft. square and 12 ft. high. The unit racks consist in general of oak posts 3½ in. x 2¾ in. x 12 ft. high, provided with tapered oak cross-pieces ranging in diameter from 1 in. to 1½ in. from end to post seat, and extending outward about 30 in. on each side of the post.

Device for Measuring Car-Mileage Accurately

Among the new apparatus being perfected for railway work is a device for measuring the mileage traveled by a car wheel. It is known as the Ohmer odometer and is being developed by the Ohmer Fare Register Company of Dayton Ohio. This device, which is shown in



DEVICE FOR MEASURING THE MILES TRAVELED BY A CAR WHEEL

the accompanying illustration, is designed to give railway companies an accurate means for figuring car mileages, which means increased accuracy in maintenance statistics.

The odometer wheel is kept in contact with the tread of the car wheel by spring pressure. As the adjustment does not depend upon the size of the car wheel, inaccuracies due to the wear of the wheel are obviated. The odometer will indicate the miles traveled, no matter in what direction the car goes. It is expected that this device will serve a very useful purpose as the total mileage, including the travel in carhouse, on sidings, etc., will be included, thus rendering car mileage statistics really accurate. The device is not yet ready for the market, but is receiving severe tests preparatory to its manufacture.

Automatic Emergency Switch

A New Switch Designed for Use in Boston Subway to Insure Continuity of Throw-Over Service on Lighting and Auxiliary Circuits

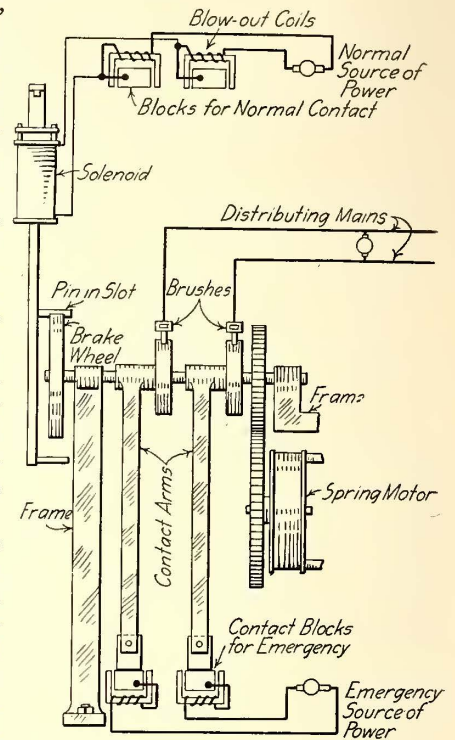
To provide a means of automatically transferring a lighting or power load to an alternative source of power in case of the failure or interruption of the normal source, John Hamilton, chief electrician Boston (Mass.)

Elevated Railway, has devised and patented the switch illustrated herewith. The development of this apparatus arose from the requirement in the Boston subway and tunnel systems of an automatic means of providing for the supply of electricity to lighting and pump circuits in case of an interruption of the normal service.

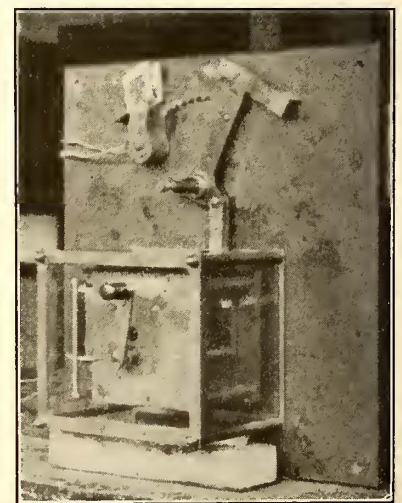
The aim of the inventor of this switch has been to provide an apparatus of rugged and simple design. The equipment is an improvement upon the usual "double-throw" knife

blade or lever type switch ordinarily used in connection with alternative power supply and generally operated manually. The operation of such switches manually requires time and, under some conditions, in the interval which may elapse before the attendant throws the switch, serious results may happen at the points of energy consumption, due to a loss of light in crowded inclosures, or a loss of power at critical moments on elevators, cranes, etc.

The new switch is designed to guarantee substantial continuity of electrical service at the point of consumption by operating automatically immediately upon the loss or failure of power supply from the normal points of contact. The switch automatically returns to its normal position immediately upon the re-energizing of the normal contacts and remains in position for repeated operation upon subsequent failures of power supply. The design also enables the switching transfer to be made automatically, if de-



SWITCH IN POSITION TO PROVIDE POWER IN EMERGENCY



SWITCH FOR TRANSFERRING TO ALTERNATIVE SOURCE OF POWER

sired, upon a fall of voltage to a predetermined limit, with automatic restoration of service at the normal contacts as soon as the rated operating pressure is again supplied.

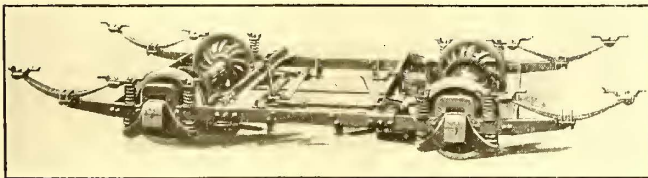
The apparatus consists fundamentally of a set of contact arms insulated from each other and mounted on a shaft rotated by a spring motor. The arms are arranged to transfer a load of lamps, or other power-consuming units, from one set of supply contacts to another, according to the position of a solenoid plunger actuated by a coil which is energized from the normal supply mains. If the normal source of power fails or if the voltage falls to a predetermined limit, the plunger falls, releasing a pin in the end of the plunger from a slot in the brake wheel and allowing the spring motor to rotate the arms. The fall of the plunger to the lower position causes another pin to engage the slot in the brake wheel, as shown in the accompanying diagram, when the arms (or single arm in some designs) reach the emergency contacts, locking them in position. In the direct-current equipment provision is made for the use of magnetic blow-out coils where the circuit is broken.

When the normal source of power is again established, the flow of current through the solenoid raises the plunger, which releases the pin above the brake wheel from the slot. The motor rotates the contact arm or the arms back to the normal source contacts, the lower pin being in a position to engage the wheel and lock the arms in contact in the normal position. The cycle may be repeated indefinitely. The winding of the spring of the motor becomes a regular duty of the attendant in the station or other locality where the apparatus may be in service. The operation of the switch is so quick that practically no change is noticed in the intensity of the illumination or the speed of motors in circuit with the device.

An installation of the switch is soon to be made on the Boston Subway system. On a test in the Boston Elevated wire department shop the switch easily broke a current of 150 amp. at 600 volts and was adjusted to operate on a pressure reduction from 550 to 450 volts.

Light-Weight Truck for Single-Truck Cars

The J. G. Brill Company is building a new light-weight truck for single-truck cars to supply the present demand for light-weight equipment. This is known as the "Light-Weight" 21-E truck, and weighs 3700 lb., which is about two-thirds the weight of the Brill



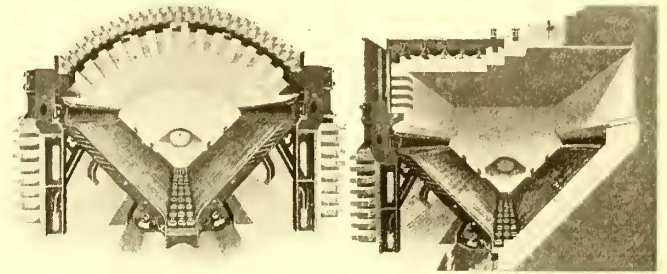
NEW LIGHT-WEIGHT TRUCK FOR SINGLE-TRUCK CARS

21-E truck of similar design. It is designed to sustain a load of 17,500 lb. The truck has 24-in. wheels and an 8-ft. wheelbase. The small wheels, besides tending to lighten the equipment, permit a wheelbase 6 in. longer than would be possible with 33-in. wheels. Other features contributing to the reduction in weight are smaller axles and motors, and lighter springs and side bars. These are possible because the weights of car body and passenger load are somewhat less than those for which the other Brill 21-E truck was designed. In

addition, a reduction of 300 lb. in weight was made by changing the brake rigging for inside instead of outside brakes.

Overfeed Inclined Grate Stokers

The V-type stoker shown in the accompanying illustrations is the latest development which the Detroit (Mich.) Stoker Company has made in the overfeed inclined grate type of stoker. Among the special features claimed for this stoker is the exceedingly large coking surface, which extends the full length of the furnace on each side and under the firebrick arch, producing an even distillation of the gases at a high temperature and eliminating the smoke. The stoker is operated on natu-



REAR VIEWS OF "V" SHAPE AND FLAT SUSPENDED ARCH-TYPE STOKERS

ral draft, which eliminates the necessity of fans or blowers and does not subject the stoker to a shut-down due to the failure of any of the auxiliary appliances. The steam required for the operation of the stoker is said to be less than 1 per cent of the total amount generated in the boiler.

In connection with this stoker the manufacturer has recently developed the Detrick flat suspended arch, which is said to have several advantages over the old type of sprung arch. Although the first cost is considerably more than for the sprung arch, the lower maintenance cost will offset this disadvantage, it is claimed. The suspension is of the pendulum type and permits of free expansion and contraction, which eliminates stresses and strains common to some types of arches. Repairs or renewals to the arch are easily made by replacing as many tiles as are necessary without disturbing the remainder of the arch. The side walls below the arch can be replaced or repaired without disturbing the arch or any of the iron work. The supporting beams and hangers are ventilated by the air, which is admitted through the stoker fronts, passing between the arch tile and the arch roof, thus preventing them from overheating.

Buckstays are not required, there being no side thrusts, as the whole weight of the arch rests on the stoker iron work entirely independent of the brick work. With this type of arch it can be placed at any height to supplement the boiler baffles in forming an unrestricted path for the travel of the gases. After being drawn in through the stoker fronts the air passes downward through the tuyere openings, where it mixes with the gases distilled from the coal. This mixture of combustible gas which, coming in contact with the highly incandescent furnace arch, is completely burned.

Coal is stored on top of stoker and feeds by gravity through the magazine on both sides to the grates. The fuel bed moves down toward the center of the furnace and the ash and clinker are ground through the clinker crusher and drop into the pit below. The continuous movement of the vibrating grates and the constant operation of the clinker crusher keep the fire clean.

News of Electric Railways

Traffic and Transportation

Financial and Corporate

Personal Mention

Construction News

Indiana Tornado Damage

Loss to Electric Lines Very Slight—Efficient Service by Them in Rendering First Aid—Their Mobility Demonstrated

Indiana interurban lines proved of inestimable value in bringing prompt relief to the stricken city of New Castle, Ind., which was devastated by a tornado on Sunday afternoon, March 11. The tornado struck the city from the northwest, and the severest blow was felt in that part of the city populated by employees of the factories and mills. More than two hundred homes, a rolling mill and many other buildings were destroyed. The number of dead was reported as twenty. More than one hundred others were more or less severely injured. The tornado swept through the town shortly after 3 o'clock, but the first intimation to reach the State authorities was a telegram received by Governor Goodrich shortly before 5 o'clock. The overhead lines of the Terre Haute, Indianapolis & Eastern Traction Company were blown down in a space of about four squares, but the company, which operates a branch line to New Castle from its Indianapolis-Richmond line, was operating to the city limits. The wreckage was cleared away and the line operated through to the interurban terminal by noon Monday. The Union Traction Company of Indiana, which operates a through line from Indianapolis to Muncie and Fort Wayne via New Castle, had the roof blown off its carhouse, but its lines being in the northern part of the town the property of the company did not suffer from the storm.

THE RAILWAYS HELP

Adjutant-General Smith of the Indiana National Guard received a call for State troops, physicians and nurses to aid the afflicted city. The Terre Haute, Indianapolis & Eastern Traction Company was requested at 6.45 p. m. Sunday to transport a company from Crawfordsville to Indianapolis and thence to New Castle. A special train was ready for loading at Crawfordsville at 7 p. m. The regular limited schedule from Crawfordsville to New Castle is three hours and forty-five minutes, but there is no regular through service. The special made the run in two hours and fifty minutes. A relief train over the Union Traction Company's line left Indianapolis at 7.20 p. m., carrying about eighty-five nurses and physicians. Battery A of Indianapolis was transported to New Castle at 7 o'clock Monday morning in a special over the Terre Haute, Indianapolis & Eastern lines, and this same system operated a through train from Terre Haute to New Castle Monday afternoon, conveying Company V of Terre Haute. Detached relief parties, supplies, etc., were handled continuously in the regular service operated over both the Terre Haute, Indianapolis & Eastern lines and the Union Traction system.

MOBILITY OF INTERURBANS DEMONSTRATED

The emergency which arose in the New Castle disaster, and was so promptly met by the electric lines, is a timely illustration of the sentiment expressed at the meeting of the Central Electric Railway Association in Indianapolis on March 8 and 9, when a message was sent to President Wilson offering the services of the interurban railways in case of war. It also demonstrated the inestimable advantage and mobility of the interurban lines in cases of necessity, and justified the hopes expressed by Adjutant-General Smith of the Indiana National Guard at a luncheon given to the Central Electric Railway Association membership at the recent meeting that in case of war or other necessity the interurban railroads would be of great advantage to the State and the Federal Government.

Strike in Washington

Washington Railway & Electric Company Issues Individual Contracts—Company Determined to Uphold Loyal Men

The employees of the Washington Railway & Electric Company, Washington, D. C., are on strike. They went out on Monday morning, March 12. The company was quick to fill the places of the strikers, and as far as it is concerned the strike is over. Still, the possibility of complications is present because of the peculiar political organization of the district, the government of which is vested by Congress in a commission of three members.

The strike followed the expiration of an agreement reached a year ago between the Washington Railway & Electric Company, the Capital Traction Company and other companies when the labor men organized the railway employees of the District of Columbia. Much of this agreement was informal. Certain questions involving the recognition of the union, on the part of all the companies operating in the District of Columbia, came up again as the main point, although they were supposed to have been settled a year ago.

The Capital Traction Company after a long period of negotiations made a collective bargain with its men. This the Washington Railway & Electric Company refused to do.

The demands of the Amalgamated Association were presented to the Washington Railway & Electric Company on Feb. 23. Among them, as stated previously, was one requiring all employees to join the Amalgamated Association. The company promptly rejected this. In a statement to the public the company said that it would be as false to its faithful employees as it would be untrue to the public and itself if it submitted to any such demands. The company was firm in the belief that the Amalgamated Association promoted disorder, disloyalty and lack of discipline. The company would never discharge from its employ at the behest of officers of a tyrannical association employees who had served the company faithfully for years. For this reason the company chose to deal direct with its individual trainmen. These men were asked to sign an individual contract for three years effective from March 12, 1917. The new wage scale as provided in the individual contract was as follows:

Men in continuous service less than one year, 24 cents an hour; second year, 25 cents an hour; third year, 26 cents an hour; fourth and fifth year, 27 cents an hour; sixth and seventh year, 28 cents an hour; eighth, ninth and tenth year, 29 cents an hour; ten years and thereafter, 30 cents an hour. The previous wage scale was 23½ cents an hour for the first year; 24½ cents an hour for the second, third, fourth and fifth years; 25½ cents an hour for the sixth, seventh, eighth, ninth and tenth years, and 27 cents an hour after ten years. Under the new individual contracts, therefore, the wage increase was as follows: First year increase ½ cent an hour; second year, ½ cent; third year, 1½ cents; fourth year, 2½ cents; fifth year, 2½ cents; sixth year, 2½ cents; seventh year, 2½ cents; eighth year, 3½ cents; ninth year, 3½ cents; tenth year, 3½ cents; ten years and thereafter, 3 cents.

The new contract provides for grievances to be taken up at the office of the superintendent on the second and fourth Tuesdays of each month. An appeal from the decision of the superintendent in any case may be taken on the third Tuesday of the month direct with the president of the company. Grievances not satisfactorily disposed of in the manner mentioned can be referred to the Public Service Commission of the district for final decision. The commission just mentioned will be a permanent board of arbitration in all questions referred to it under the provisions of the contract. The presentation of any grievances, however, is to proceed

under the direct charge of the complaining employee or employees or a committee of employees.

The company is determined to carry the question at issue to a conclusion. Clarence P. King, president of the company, has reiterated repeatedly the purpose of not giving in to the union. In a statement which he made on March 12, and which appeared in a local paper, Mr. King said:

"To recognize the union would be to surrender. It is easy enough to surrender. It simply means throwing all principles to the wind. We intend fighting for our loyal men as long as there is any energy in us. We intend to bring about a condition by which there will be no more strikes. We shall go right on protecting our loyal men and doing the many things that we have done for them. We do not intend to recognize the men who fomented the trouble."

Managers of connecting railways coming into Washington do not wish to become involved in any collateral issues which may grow out of the strike. It is understood that almost all of the employees of the Washington & Virginia Railway have signed the individual contracts which have been accepted by the men who are now operating the cars of the Washington Railway & Electric Company. The Washington, Baltimore & Annapolis Railroad has just signed a contract with its employees for three years.

Ouster Suit Begun

The city of Omaha, Neb., has brought suit against the Omaha & Council Bluffs Street Railway in the District Court at Omaha for possession of a large portion of tracks, cars and other property of the company under the reversion clause of the territorial legislative franchise of 1867 to the Omaha Horse Railway, which the city contends expired on Jan. 1, last. In the event that possession of the properties is refused the city asked an accounting of the use of its interest in them, since Jan. 1, a physical valuation of its interests and a money judgment for their value.

Counsel for the company reported recently to G. W. Wattles, president of the company, with respect to the claim of the city to the reversion of the property of the Omaha Horse Railway. In his conclusion counsel said that if the city should undertake to interfere with the property or franchises of the company the company should insist on the full limit of its rights under the street railway act of 1889, to wit: "to hold said property and franchise in perpetuity."

The reply of counsel for the company to the officers with respect to the demand of the city was referred to in the ELECTRIC RAILWAY JOURNAL of Jan. 20, page 131.

Dynamiter Sentenced to Sing Sing

Michael J. Herlihy, financial secretary of the local association organized by the Amalgamated among the New York subway employees, was sentenced on March 13 in the Criminal Branch of the Supreme Court to a term of from ten to twenty years in Sing Sing for dynamiting during the strike in New York last year. Herlihy was arrested on Nov. 3, 1916, as mentioned in the ELECTRIC RAILWAY JOURNAL for Nov. 11, 1916, page 1034, on a charge of having attempted to blow up the Lenox Avenue subway at the 110th Street station. The dynamiting resulted in the injury of two persons. It was testified at the trial on March 8 that statements made in speeches of the labor leaders encouraged acts of violence when arbitration seemed impossible. In passing sentence Justice Tompkins said the charge was a particularly serious one because Herlihy was well aware that many thousand people constantly used the subway. Six other members of the union were indicted on similar charges.

On March 14 James J. Merna and William Molsky, alias McCord, former subway guards, pleaded guilty before Supreme Court Justice Tompkins of participation in the bomb explosion in the 110th Street station of the subway last November. Merna told Assistant District Attorney Weller they also intended to place a bomb in the subway at Times Square and had received \$100 from Benjamin Hamilton, who is indicted, to buy the explosives for Times Square. Merna and Molsky were to be sentenced on March 19.

Herlihy turned State's evidence on March 15 and disclosed the details of the bomb explosion. The confession came at a dramatic moment. George Pollock was on trial for complicity in the plot. His attorney, Louis Fridiger, who was also counsel for Herlihy, moved on March 14 that the case be dismissed for lack of evidence. Justice Tompkins adjourned court until March 15 when he was to announce his decision. When the court opened, Assistant District Attorney Weller, who is prosecuting the case, asked permission to place a witness, who had not before been available, on the stand. Herlihy was the man. He testified that the conspiracy was hatched in union headquarters about a week before the explosion, and charged that the dynamiting was suggested by James J. Murtagh and a man he knew as James McCord, who was indicted under the name of William Molsky. As stated previously McCord and Molsky both entered pleas of guilty on March 14. Herlihy testified that the conspirators went to Pollock, who had charge of the funds collected for the striking carmen, and demanded \$50 of him. The plotters then went out of town and purchased dynamite, caps and fuses. Early on the morning of Oct. 25 they returned to New York with the dynamite in a suit case.

Railroad Improvement Storm Center

Sigfried Cederstrom, real estate expert for the Public Service Commission for the First District of New York, tendered his resignation on March 10, charging that the commission after receiving from him a preliminary report had refused to permit him to complete appraisals of land values involved in the New York Central Railroad's proposed changes and electrification on the west side. His preliminary report, Mr. Cederstrom asserted, had shown that the bases for the appraisal already made for the committee on port and terminal facilities of the Board of Estimate were misleading and grossly disadvantageous to the city.

Public Service Commissioners Hayward, Whitney and Hervey decided not to accept Mr. Cederstrom's resignation, but to dismiss him if he failed to make good some of the charges contained in his letter.

When he was cross examined on March 12 by Acting Chairman Hayward and other members of the commission, Mr. Cederstrom admitted that he had not understood all of the circumstances and that if he had known some of the facts brought out at the hearing on March 12 he might not have severed his connection with the commission. In view of this admission the commission made no attempt to discipline Mr. Cederstrom, but accepted his resignation without comment.

On March 12 Senator Brown told Controller Prendergast of New York City that Governor Whitman was preparing to call a conference of legislative leaders on the New York Central improvement matter. The request leading up to the proposed conference came, it is understood, from the New York City authorities. Mayor Mitchel and other members of the Board of Estimate are understood to be prepared to accept without protest an investigation of the entire matter by a legislative committee.

Taylor Franchise Renewal

Councilman Reynold introduced an ordinance in the Council of Cleveland, Ohio, on the evening of March 5, as the first step toward the renewal of the Taylor franchise. Although the franchise does not expire until 1934, it provides for renewal fifteen years before expiration if the city intends to retain control of rates of fare and operation. This renewal would have to be made by 1919 to comply with the provision. The Reynold ordinance authorizes the Council to fix terms and conditions of the renewal grant, regulate the rate of fare and transfers and terminate existing contracts. This may necessitate a revamping of the entire question before a renewal is made.

In order to settle the East Cleveland franchise matter, it has been proposed to enact legislation that will make the city limits the boundary line for low fare. However, East Cleveland has a contract that will give it the same rate as is maintained on this line within the city and this continues for about five years. The Hayden Avenue franchise expires within a few months.

Commission Opposes Court Review

Asks New York Legislature Not to Pass Bills Providing for Review of Commission Orders by the Court

The Public Service Commission for the First District of New York has sent to Chairman Charles D. Newton of the Senate committee on codes and to Chairman Frederick M. Ahern of the same committee in the Assembly a memorandum setting forth its objections to the Martin bills, which provide that the courts may review decisions of the commission. It is contended that a recent decision of the Court of Appeals was to the effect that orders of the commission should be final unless they violated some existing statute of the State Constitution. The memorandum of the commission says in part:

"These bills would set aside the decision of the Court of Appeals in that they specifically provide for a review of the facts, and are undoubtedly the answer of the public service corporations to that decision.

"The commission was established for the purpose of obviating the difficulties of court litigation and for securing remedies which the courts lacked either the power or the machinery to grant. It was, therefore, proposed that, without depriving any interested party of the right to review the commission's decisions, the procedure for such review should be limited so as to involve a minimum of interference with the enforcement of the just orders of the commission.

"This proposal aroused strenuous objections by the public service interests, and, as a compromise, the companies were left to every existing legal remedy for reviewing a decision by a quasi judicial administration board, such as is the Public Service Commission; but the Legislature was careful to provide that every order of the commission should continue in force, unless such order be unauthorized by this chapter or any other act, or be in violation of a provision of the Constitution of the State or of the United States, intending thereby that the judgment of the commission in making the order should be final, unless the order violated the statute or the Constitutions.

"In the litigation before the courts instituted by the companies to overthrow orders of the commission, there ensued a struggle, which continued for more than eight years, as to whether the judgment of the commission on questions of fact in matters confided by the Legislature to its regulation, or the judgment of the court, should prevail. Finally, on Oct. 3, 1916, upon an appeal involving an order requiring a gas company to extend its mains to a territory without gas service, the Court of Appeals reversed a decision of the Appellate Division of the Supreme Court and reinstated an order of the commission."

The opinion of the Court of Appeals is made a part of the memorandum, and then it reads:

ESTABLISHED SYSTEM THREATENED

"So fraught with danger to the established system of regulation of public service corporations in this State was the assumption by the lower court of right to substitute its judgment for that of the commission upon matters of fact, that the Court of Appeals finally and emphatically condemned this assumption. On the other hand, the companies did not underestimate the importance of this matter, for while the decision involved only one company, immediately after it was rendered all the large gas and electric light companies in this State combined to apply for a rehearing before the Court of Appeals and filed briefs in support of such an application. The motion was, however, denied, and the question finally settled as above indicated.

"The bills, as will be clearly seen, would reverse the decision of the Court of Appeals and vitiate the principle which it recognized as firmly established. In the language of the Court of Appeals, they 'will seriously hamper the commissions in the discharge of their duties, and go far toward defeating the efforts of the Legislature to establish agencies to regulate the great public service corporations.' Those who have an interest in just and effective regulation of public service corporations for the benefit both of the public and the companies themselves, should be aroused to the menace which the bills involve to such regulation."

Dallas Franchise Complications

Mayor Lindsley, a Candidate for Re-election, Attacks Grants He Helped to Prepare—Messrs. Strickland and Hobson Reply

The traction and lighting franchise situation in Dallas, Tex., appears to be more complicated than ever, instead of on a fair way to settlement, as was thought when the model service-at-cost franchises were drawn several months ago. Under the proposed new franchise two new companies were to be organized. One was to be headed by C. W. Hobson to take over and consolidate the street railway lines of Dallas and Oak Cliff under one management. The other was to be headed by J. F. Strickland to take over the Dallas Electric Light & Power Company, and furnish electric current for lighting, power, heating, etc., to the city. These franchises were drawn after the city had employed E. W. Bemis, utility expert, to fix valuations of the street railway properties and the electric lighting system, and after extended negotiations between the city and the men who were organizing the companies that were to take over the properties. These negotiations were carried to the point where an agreement for a lease contract by which Stone & Webster, owners of the Northern Texas Traction Company, would lease the Oak Cliff lines to Mr. Hobson's company. After an agreement had been reached the City Commission passed the ordinances granting the franchises as prepared and agreed on. The City Commission later arranged to submit the grants to the voters on April 3.

At first it appeared that all were agreed, and the franchises would be overwhelmingly approved. There has been a political shake-up, however, and Mr. Lindsley has become a candidate for re-election. The franchise situation has apparently changed. Mr. Lindsley, instead of supporting the franchises which he helped to draft and helped to negotiate to an agreement with the owners, has come out against them.

In order to present the issues as they appear to the properties involved under the franchises and from the standpoint of the men who had tried to effect the reorganization of these properties, Messrs. Strickland and Hobson have issued a statement in which the negotiations and the agreements thereunder are reviewed at length. They concluded this statement in part, as follows:

"If our commitments to reorganize and refinance the lighting and traction properties of this city had been made only to the Mayor, we feel sure, under existing circumstances, that our commitments with propriety might be withdrawn. The burden of financing these properties, with impending war conditions, is much greater than it was at the time the commitments were made. We feel, however, that our good faith is pledged to those members of the Board of Commissioners who have announced their intention of supporting the franchises on a referendum and to the people of Dallas to go forward with the enterprise of localizing the management of these properties, and we shall not withdraw unless the people of Dallas indicate their disapproval of the franchises.

"If there are influences in this city of sufficient power to prevent the settlement of these franchise problems, which for years have handicapped the growth of the city and ruined the credit of the properties, then those same influences are likely to prevent the successful operation of these public utilities under any franchise and we prefer not to assume the responsibility of inviting capital, either at home or abroad, to invest in them.

"Our attitude toward the settlement of these franchise questions has not changed from the time the Mayor invited us to undertake the reorganization of the public utility properties of Dallas.

"The Mayor would repudiate now the franchises which were drawn under his direction and agreed to by us. If the Mayor's present attitude is simply a change of mind upon his part, he certainly should do us the justice frankly to say so. If, on the other hand, he has all along been of the same mind and was, in fact, against the franchises, then the conclusion must be that he has been trifling not only with us, but the people as well.

"We are glad that on April 3 we shall have a commitment from the people of Dallas in which we can put our faith."

\$1,273,779 for Track Renewals

Cleveland Railway Seeking to Expend That Sum During 1917—Negotiating for Renewal of East Cleveland Franchise

At the regular meeting of the City Council of Cleveland, Ohio, on March 12, a communication from J. J. Stanley, president of the Cleveland Railway, was filed, asking for authority to expend \$1,273,779 on track renewals this year. This would cover the renewal of about twenty-eight miles of track. Chairman Reynolds of the street railway committee and several other members of the Council are said to be opposed to so great an expenditure at this time, because of the high price of materials. Fielder Sanders, street railway commissioner, has also expressed opposition to the program for the same reason.

EAST CLEVELAND FARES

The Cleveland Railway and the city of East Cleveland are negotiating in earnest over the renewal of the franchises in that place. The Hayden Avenue franchise expires within a few weeks, but the Euclid Avenue grant has some years to run. It is the desire to renew the grants together and also provide for the extension of the Superior Avenue line to Euclid Avenue. An agreement has been reached to the effect that the term of the franchise for the three lines shall be twenty-five years from the date on which it takes effect and that service shall be given according to a standard to be included in the franchise. President Stanley said he would agree to any one of the following provisions relative to the rate of fare: Five cents cash fare, free transfers, and 3 cents local fare in East Cleveland. Five cents cash fare, free transfers, or six tickets for a quarter with 1 cent charge for transfer on ticket fare. Five cents cash fare and free transfers, or five tickets for 20 cents with 1-cent transfers on tickets, the ticket arrangement to be abandoned and the universal fare to become 5 cents with free transfers at any time that the Cleveland fare goes to the highest rate in the Taylor franchise. Mayor Minshall of East Cleveland asked that an arrangement of this kind be made with the maximum fare at 4 cents.

Mr. Sanders suggested an initial rate of 4 cents for East Cleveland, with provision for a readjustment. He does not want the readjustment in East Cleveland to depend upon the increase in Cleveland. Mayor Minshall is endeavoring to secure Peter Witt as the representative of East Cleveland in arranging the rate of fare.

\$200,000 Strike Damage Sought

The Springfield (Mo.) Traction Company has filed in the Circuit Court at Springfield a suit against the city in which \$200,000 damage is sought. The Mayor and the chief of police are made defendants. The company alleges lack of protection to its property during the strike of its employees, the failure to settle which was reviewed in the *ELECTRIC RAILWAY JOURNAL* of March 10, page 452.

The company maintains in its allegations that upon the calling of the car strike on Oct. 5, 1916, it "became the duty of the city, through its officials, to afford the company adequate and complete protection under its franchise as a taxpayer of the city." It further asserts that not only should its property be protected, but that personal security should be given its employees with a view of instilling into the general public a sense of safety and security in riding the street cars. It is then charged that both Mayor Gideon and Police Chief Rathbone "utterly refused and failed to so afford said protection." Lastly, it is generally alleged that by the failure of the city to give police protection the operation of the street cars was interrupted, the cost of operating them was increased, the property was damaged and the value of the franchise depreciated. Judgment for the full amount is asked.

On Oct. 10, 1916, Judge Pollock of the Federal Court granted a writ of restraint preventing interference with the operation of the cars of the company. He said at that time it was evident that some of the members of the police department were in sympathy with the striking employees of the company and that the disciplining of these men was a matter for the city authorities.

Sympathetic Strike Condemned

President of Printers' Union Characterizes Effort in That Direction in New York as Disreputable, Dishonest and Illegal

Marsden G. Scott, president of the International Typographical Union, in an editorial in the March issue of *The Typographical Journal*, the official paper of the International Typographical Union of North America, charges that the contract between the International and the American Federation of Labor was "deliberately, flagrantly and wantonly" broken during the street railway strike in New York City last September when the general sympathetic strike was called. Mr. Scott said in part:

WHAT PRESIDENT SCOTT SAID

"That the contract between the International Typographical Union and the American Federation of Labor was deliberately, flagrantly and wantonly broken in New York in September last is established by the fact that a strike order was issued by the Central Federated Union without consultation with the officers of this International Union and without their having agreed to such action. There can be no argument as to the intent of Sec. 5, Art. xi, of the contract between the International Union and the American Federation. There can be no denial that the contract was violated when this illegal strike order was issued.

"President Gompers tells us that he personally attended a meeting of these Federation lawbreakers and contract abrogators, and that they told him to his face that they would not accept his recommendations. This meeting was held on Sept. 10. Thirteen days later the illegal strike order was promulgated. What steps had been taken meanwhile by President Gompers to compel the observance of the contract between the American Federation of Labor and the National and International Unions? He dictated a letter, and stuck a special delivery stamp on it! And for this inefficient service President Gompers receives a salary of \$7,500 a year and traveling expenses.

"Fortunately for the organized wage-earners of America, the men who hold the executive positions in the big international unions fully realized the disastrous consequences which would inevitably follow obedience to the illegal strike order. Since the president of the American Federation of Labor had failed to compel observance of the laws of the Federation, and since it was apparent that the executive officers of the Federation intended to take no official action to prevent an impending disaster, the executive officers of these international unions unhesitatingly issued the emphatic instructions which nullified the illegal strike order issued by the Central Federated Union.

"No, Mr. Gompers! The general sympathetic strike was not prevented by your letter with its special delivery stamp. This disreputable, dishonest and illegal sympathetic strike was prevented by the executive officers of the international unions, and not by the officers of the American Federation of Labor, who not only permitted the illegal strike order to be issued, but also permitted one of their salaried officers to act as chairman of the 'conference' which deliberately violated one of the fundamental laws of the Federation.

ANOTHER WORTHLESS SCRAP OF PAPER

"It is apparent that the constitution of the American Federation of Labor has become a worthless scrap of paper. The contract with the national and international unions has been violated, and the officers of the Federation apparently do not intend to give any assurances that they will even attempt to compel the observance of the law in the future. Once more the organized wage-earners will be compelled to pay dearly for the fruits of incompetent leadership. Meanwhile the executive offices of the International Typographical Union will continue to be located in Indianapolis. For the benefit of the soldiers of fortune, the political panhandlers and the mental cripples with which the trade-union movement is afflicted, it may be definitely and emphatically reiterated: There is no authority in the American Federation of Labor building in Washington, or under the hat of any American Federation of Labor officer, elected or appointed, to order members of the International Typographical Union to suspend work."

Increase in Wages Announced.—Advances in wages ranging from 7 to 10 per cent will go into effect on the lines of the Indianapolis, Columbus & Southern Company, Columbus, Ind., on April 1.

Bill for Center-Aisle Cars Passed.—Both houses of the Legislature of Ohio have passed the bill which provides that all cars on electric railways in Ohio shall be provided with a center aisle. The measure is now before the Governor.

Bill for Seats for Motormen Before Governor.—The Smith bill, requiring electric railways to provide seats for motormen and conductors, has passed both houses of the Ohio Legislature and is before Governor James W. Cox for his consideration.

Divided on State Constabulary.—The State Board of Conservation and Development of New Jersey divided on March 7 on the question of support for the bill creating a State constabulary. Four members favored the proposition, two were against it.

Employees Organize Social Fraternity.—The employees of the Public Service Railway at Trenton, N. J., have organized the Public Service Fraternity of the Trenton District, to promote good fellowship and bring the employees of the various branches of the service into personal touch.

Indiana Line Increases Wages.—The trainmen in the employ of the Bluffton & Marion Traction Company, Bluffton, Ind., received, effective on March 1, an increase in wages, the minimum being 20 cents an hour and the maximum 28 cents an hour. The maximum is paid after seven years of service.

General Goethals in Cleveland.—After making an address before the City Club in Cleveland, Ohio, on March 7, Maj.-Gen. George W. Goethals went over the route of the proposed freight subway under East Fifty-fifth Street with President O. C. Barber of the Cleveland, Akron & Canton Terminal Railway, which is to build the subway.

China and Japan Described to Massachusetts Association.—At the regular monthly meeting of the Massachusetts Street Railway Association, which was held on March 14 at the Engineers' Club, Boston, Charles B. Davis, district manager of the General Electric Company, described a recent trip made by him to China and Japan.

St. Louis Matters Still Under Consideration.—The matter of an answer to the proposal of the United Railways, St. Louis, Mo., to the city with respect to the mill tax and other matters is still under consideration by the public utilities committee of the Board of Aldermen. While it is not certain exactly what will be done, still the opinion prevails that definite action will not be taken until after the election, early in April.

Court Sustains Extension Order.—The Supreme Court in Brooklyn has entered an order directing the New York & Queens County Railway, Long Island City, N. Y., to begin construction of the extension of its line in Flushing Avenue, Queens, by April 1, 1918, to be completed not later than Aug. 31 of the same year. The commission directed the construction of the extension in 1914 and an appeal to the courts was immediately taken by the company.

Use of Gas-Electric Cars Proposed.—The Visalia Electric Railroad, Exeter, Cal., is said to be contemplating the use of a gas-electric car on several miles of line now under construction. W. P. Ballard, superintendent and electrical engineer for the company, who has returned from witnessing the trial of a gas-electric car on the San Diego & South Eastern Railroad, has reported favorably upon its operation, but proposes a car of a slightly different design as better suited to the needs of his own company.

Progress of New York Constabulary Measure.—The State constabulary bill was introduced in the Assembly of New York by F. H. Wells and in the Senate by Ogden L. Mills. The Wells, or companion of the Mills bill, rests in the ways and means committee of the Assembly. The Mills bill is on order of third reading in the Senate and comes up for final passage on March 20. When this bill passes it will go into the Assembly, where it will be substituted for the Wells bill. It must, however, be referred to the ways and means committee first, and then reported out.

Workmen's Compensation Agitation Increases Accident Claims.—Fielder Sanders, street railway commissioner of Cleveland, Ohio, stated recently that the agitation for workmen's compensation was responsible in part for the outlandish accident claims being made on the Cleveland Railway. These he declared to be a grave menace to low fare. Within the last four years the average demand has increased from \$1,800 to \$9,800. People have heard so much about compensation that they feel they are entitled to a huge sum when injured by a corporation, irrespective of the merits of the case.

Ohio Control Bill Modified.—The Gilmore bill, intended to bring all public and private utility plants, including those municipally owned, under the supervision of the Public Utilities Commission, has been amended in the Senate by eliminating the provision as far as municipally owned utilities and mutual telephone companies are concerned. This practically defeats the purpose of the bill. Senator Cunningham has introduced a bill increasing the number of members of the Public Utilities Commission from three to five and increasing the assessment on public utility companies from \$75,000 to \$100,000 to provide for the additional expense.

Company Opposes Further Compulsory Expenditures.—The Beaumont (Tex.) Traction Company lost \$6,636 in operating and maintaining its street railway in Beaumont during the fiscal year ended Nov. 30, 1916, according to a report filed with the City Council at the hearing on the proposal to compel the company to make certain improvements and extensions of service. The report showed receipts from all sources of \$201,914 and total disbursements of \$208,511. The expenditures include the cost of several miles of new track built during the year and a number of new cars purchased. The company paid a gross income tax of \$1,914.

Governor Signs Jersey Franchise Tax Bill.—Governor Edge of New Jersey has signed the bill increasing the franchise taxes of public utility corporations other than electric railways 1 per cent a year for the next three years. The franchise tax bill was passed in fulfillment of a pledge in the Republican State platform, which favored an increase in the taxes of public utility corporations to correspond with those assessed against the electric railways under the Voorhees franchise tax act of 1898. As a compromise it was decided to raise the tax on gross receipts at the rate of 1 per cent a year instead of levying the entire 5 per cent at the outset. The bill exempts from its provisions all companies whose gross income does not exceed \$50,000 a year.

Rental Question Considered in Toledo.—A resolution was introduced in the City Council of Toledo, Ohio, recently, authorizing the director of law to take the necessary legal steps to compel the Toledo Railways & Light Company to pay a rental of \$250 a day for the use of the streets, as required by an ordinance passed some months ago. Another ordinance pending before Council would require the payment of \$185 a day as rental. The two measures will be considered together. During a hearing on the latter ordinance F. R. Coates, president of the company, told the members of the street railway committee that it might be necessary to increase the rate of fare in order to take care of present burdens without adding any others.

Fund for Relief of British Professional Classes.—Seventy-six prominent engineers, representing all sections of the country as well as the principal engineering societies in this country, have just issued a circular urging all American engineers to contribute to the Professional Classes War Relief Council in Great Britain. This council was organized to assist the families of professional men who are in distress on account of the war. Major Leonard Darwin, a son of the great naturalist, is chairman of the council. The circular expresses the hope that every American engineer will contribute at least \$5 to this cause. These contributions may be forwarded to Lewis P. Stillwell, treasurer, care Farmers' Loan & Trust Company, 475 Fifth Avenue, New York.

Reduction in Railway Mail Pay.—The Post Office Department has applied to the Interstate Commerce Commission for a revision of the railway mail pay according to the plan adopted by Congress upon the department's recom-

mentation less than a year ago. The department was so well satisfied with its plan of paying the railways according to space used, instead of by weight carried, that it put the plan into effect on 90 per cent of the mail-carrying railways, although Congress had contemplated its application upon selected routes for the purposes of trial. The result is that the railways earn at the rate of \$3,222,405 more per year than on the weight basis. Now the department applies to the commission for a reduction of the rates, although still retaining the space system.

Minneapolis Street Railway Pays \$10,421 for Hauling Snow.—Following its plan of stating its cases to the public by newspaper advertising, the Minneapolis (Minn.) Street Railway has replied to criticisms of property holders that it is impossible to keep sidewalks clear after a snow because street railway plows fill them again. In a three-column 6-in. display advertisement it makes a concise reply that the first duty of the company is to clear its tracks, establish and maintain service. Individual inconvenience because snow is piled temporarily on sides of streets until the city can cart it off is more than offset by convenience to the general public. The advertisement continues: "This company pays to the city 19/40 of the cost to the city of removing snow and ice from the streets, 40 ft. in width from curb to curb, and in like manner for hauling away the snow on a strip of 19 ft. wide in all streets, regardless of their width. Our double tracks occupy a space of 15 ft. only, but we are paying the city for removing from a strip 19 ft. wide. We not only pay the city for removing snow and ice for the full portion of the streets which our cars occupy, but in addition we pay an equal portion of the cost of hauling away snow and ice which property owners shovel off their sidewalks and throw into the street. During the winter of 1915-1916 the company paid the city \$10,421 for hauling away snow and ice from the city streets."

Programs of Association Meetings

Railway Storekeepers' Association

The Railway Storekeepers' Association will hold its fourteenth annual convention at Chicago, Ill., on May 21, 22 and 23. Committee reports will be presented on the handling of rail, the handling of cross-ties, the reclamation of scrap and on other subjects of interest to storekeepers. The proper handling of materials distributed along the lines will also receive attention. The handling of stationery will be the subject of an exhaustive report. In addition, a number of interesting and novel features have been planned for this convention.

Illinois Electric Railway Association

The Illinois Electric Railway Association will meet at the Hotel La Salle, Chicago, Ill., on March 23. F. A. Lorenz, manager of sales of the American Steel Foundries, which manufacture the Davis steel wheel, will read a paper, "The One-Wear Manganese Rim Wheel." W. F. Carr, engineer of maintenance of way and overhead structures of the Chicago, Ottawa & Peoria Railway, will read a paper, "Track Construction and Maintenance." C. W. Register, of the Westinghouse Electric & Manufacturing Company, will show a series of moving pictures depicting steam railroad electrification work.

Wisconsin Electrical Association

The annual meeting of the Wisconsin Electrical Association was held at the Hotel Pfister, Milwaukee, Wis., on March 14 and 15. Among the papers of interest to electric railway operatives scheduled for presentation were the following:

"Effect of High Prices of Material and Decreased Rates Upon the Rate of Return," by Halford Erickson, former chairman of the Railroad Commission of Wisconsin.

"Review of the Proposed National Electric Safety Code," by J. N. Cadby, of the engineering staff of the Railroad Commission of Wisconsin.

"One-Man Car Operation," by Raymond D. Smith, general manager of the Sheboygan Electric Company.

Financial and Corporate

Annual Reports

New York State Railways

The comparative statement of income, profit and loss of the New York State Railways, Rochester, N. Y., for the years ended Dec. 31, 1915 and 1916, follows:

	—1916—		—1915—	
	Amount	Per Cent	Amount	Per Cent
Operating revenues	\$8,256,470	100.0	\$7,264,674	100.0
Operating expenses (including depreciation)	5,153,199	62.4	4,487,270	61.8
Net revenue from railway operation	\$3,103,271	37.6	\$2,777,404	38.2
Taxes	509,962	6.2	456,577	6.3
Operating income	\$2,593,309	31.4	\$2,320,827	31.9
Non-operating income	146,214	1.8	166,903	2.3
Gross income	\$2,739,523	33.2	\$2,487,730	34.2
Income deductions (interest, rentals, etc.)	1,377,775	16.7	1,389,119	19.1
Net income	\$1,361,748	16.5	\$1,098,611	15.1
New York State Railways' proportion of Schenectady Railway surplus (50 per cent)	17,035	0.2	*15,162	*0.2
New York State Railways' proportion of Ontario Light & Traction Company surplus (100 per cent)	8,089	0.1	7,090	0.1
	\$1,386,872	16.8	\$1,090,539	15.0
Dividends on preferred stock (5 per cent)	193,125	2.3	193,125	2.6
	\$1,193,747	14.5	\$897,414	12.4
Dividends on common stock (1916, 4¾ per cent; 1915, 4 per cent)	947,482	11.5	797,880	11.0
Balance	\$246,265	3.0	\$99,534	1.4

*Deficit.

The 1915 report of this company showed that the gross and net operating revenues had been materially affected by jitney competition and by the general business depression, the gross falling off \$330,327, or 4.3 per cent, and the net \$217,025, or 7.2 per cent, in 1915, as compared to 1914. The present report, however, indicates that the 1915 losses were more than recouped in the last year. The operating revenues, owing to the abolition of unregulated jitney competition and the improvement in business conditions, gained \$991,796, or 13.6 per cent, in 1916, as compared to 1915. The operating expenses, including depreciation, at the same time rose \$665,929, or 14.8 per cent, but the gain in net operating revenues was still \$325,867, or 11.7 per cent. Taxes increased \$53,385, or 11.6 per cent; non-operating income fell off \$20,689, or 12.3 per cent, and income deductions decreased \$11,344, or 0.9 per cent. The net effect of these items was to cut the gain in net income to \$263,137 in amount, although the percentage increase showed the high rate of 23.9 per cent.

The 50 per cent portion of the Schenectady Railway surplus accruing to the company was in the last year a credit of \$17,034, instead of a deficit of \$15,162 as in 1915, and the 100 per cent of the Ontario Light & Traction Company surplus similarly accruing represented an increase of 14 per cent. As a result, after paying the usual 5 per cent preferred dividend and increasing the common stock dividend from 4 per cent in 1915 to 4¾ per cent in 1916, the company had remaining a balance of \$246,264 for 1916. This constituted almost a 150 per cent advance over the balance of \$99,534 for the year before.

The asset side of the balance sheet of the company as of Dec. 31, 1916, showed materials and supplies of \$305,293, current assets of \$363,772, investments of \$2,456,307, unamortized replacement and depreciation expense of \$4,850,000, and unamortized debt discount and expense of \$1,612,705. The liability side included \$2,149,605 for unfunded debt, \$91,737 for casualties, \$1,112,633 for accrued amortization of capital, \$101,410 for reserves, \$5,000,000 for a re-

serve for accrued replacements and depreciation, and \$1,754,529 for the corporate surplus.

The origin of the previously mentioned surpluses of the subsidiary Schenectady Railway and the Ontario Light & Traction Company is shown in the following table:

	Schenectady Ry.		Ontario Lt. & Tr. Co.	
	1916	1915	1916	1915
Operating revenues	\$1,329,583	\$1,178,215	\$64,890	\$59,825
Operating expenses.....	867,153	762,211	40,457	37,429
Net revenue from railway operations	\$462,430	\$416,004	\$24,433	\$22,396
Taxes	88,811	91,313	*4,084	*3,833
Operating income	\$373,618	\$324,691	\$20,349	\$18,563
Non-operating income..	2,678	†52	6,619	6,624
Gross income	\$376,297	\$324,638	\$26,968	\$25,187
Income deductions	137,227	108,964	18,879	18,096
Net income	\$239,070	\$215,675	\$8,089	\$7,091
Dividends (1916, 5 per cent; 1915, 6 per cent)	205,000	246,000	.....	.....
Surplus	\$34,070	†\$30,325	\$8,089	\$7,091

*Includes \$155 in 1916 and \$264 in 1915 for uncollectible bills.
†Deficit.

Christchurch Tramway

The gross earnings of the Christchurch (New Zealand) Tramway for the year ended March 31, 1916, amounted to £144,847, while the operating expenses totaled £83,315, leaving a net from operation of £61,532. After a deduction of £58,788 for various reserves and other charges, and £1,445 for wages paid to men at the front and other patriotic expenses during the year, the surplus was £1,298.

According to the tramway board, when everything is taken into consideration, the result of the operation for the year must be regarded as highly satisfactory. In the first place, the cost of operating the cars rose considerably, to the extent of £5,242, owing to the increasing age of the system, higher prices of materials and increased wages. The main increase was £3,390 for repairs and maintenance. While the operating expenses increased 6.7 per cent during the year, the earnings did not keep pace, the increase being only £1,906, or 1.3 per cent.

The total number of passengers carried during the year was 17,831,644, an increase of more than 1,000,000 passengers. The average revenue per passenger was 1.949d., as compared to 2.038d. the year previous. The working expenses per passenger amounted to 1.121d., while the total average cost per passenger, including interest, sinking fund, depreciation, etc., was 1.932d. The average revenue per car-mile was 15.072d., and working expenses 8.669d.

West Jersey & Seashore Railroad

The West Jersey & Seashore Railroad in the calendar year 1916 carried more passengers and freight than in any previous year. During the year 11,983,739 passengers and 3,958,845 tons of freight were carried; 1,816,369 more people rode than in 1915, and 413,904 more tons of freight were hauled. The company earned, for the year, a net income of \$940,315, an increase of \$365,531.

The point most of interest to electric railways in connection with this report is that the non-operating income decreased 12 per cent, principally on account of a further decrease in the rents from the Atlantic Avenue & Longport Line operated for the railroad by the Atlantic City & Shore Railroad. The decrease was caused by the continued operation of large number of jitneys in Atlantic City. In 1916 the city authorities made an attempt reasonably to regulate the jitney traffic, but legal proceedings have prevented so far the more equitable results expected from such action.

Indiana Interurban Statistics

Special Figures Compiled by Commission in Regard to Capitalization and Rate of Return

The second annual report of the Indiana Public Service Commission, for the fiscal year ended Sept. 30, 1915, which has just been received, contains a series of statistical tables for the various electric interurban railways operating in the State. Besides the usual revenue and expense figures for the fiscal year ended June 30, 1915, the report contains a table for each company showing the outstanding bonds, the current liabilities and the outstanding stock per mile of single track, the gross income for 1915 after the payment of operating expenses and taxes, the amount that this would yield on the bonds alone and on the total capitalization, and also the capitalization of the gross income per mile at 5 per cent. From the data for each company the accompanying table has been prepared.

According to the data in the table, the 1915 return of the various lines on capitalization varied from nothing in the case of one company which operated at a deficit to 5.77 per cent in the case of the Ohio Electric Railway. Other companies whose rate of return was 5 per cent or more were the Indiana Railways & Light Company, with 5.56 per cent, and the Public Utilities Company, with 5.06 per cent. According to the commission's report, the properties in the State were greatly affected during the year by the operation of jitney buses and general automobile competition. The properties, therefore, could not well be regarded as in a condition satisfactory to the investors.

STATISTICS ON CAPITALIZATION AND RATE OF RETURN OF INDIANA INTERURBAN RAILWAYS

Name	Mileage Single Track	Capitalization* Per Mile	Gross Income** Per Mile Capitalized at 5 Per Cent	Percentage of Gross Income to Bonds	Percentage of Gross Income to Capitalization
Bluffton, Geneva & Celina Traction Company.....	†18.5	\$36,863	\$7,581	(a)	1.03
Chicago, Lake Shore & South Bend Railway.....	†77.8	134,451	11,165	0.98	0.41
Chicago, South Bend & Northern Indiana Railway.....	120.4	99,317	47,535	6.76	2.39
Cincinnati, Lawrenceburg & Aurora Electric Street Railroad.....	.....	82,767	33,702	5.43	2.03
Evansville Railways.....	†68.3	46,568	25,602	6.34	2.75
Evansville, Suburban & Newburgh Railway.....	24.7	32,221	28,251	7.15	4.38
Fort Wayne & Northern Indiana Traction Company.....	192.5	103,463	70,408	5.16	3.40
Fort Wayne & Northwestern Railway.....	42.9	39,289	30,350	†17.38	†3.86
Fort Wayne & Springfield Railway.....	21.7	32,198	4,950	19.19	0.77
Gary & Interurban Railroad.....	74.8	97,186	(b)	(b)	(b)
Hammond, Whiting & East Chicago Railway.....	19.9	118,874	93,975	9.36	3.95
Indianapolis & Cincinnati Traction Company.....	104.4	59,083	29,068	6.32	2.46
Indianapolis & Louisville Traction Company.....	40.9	49,820	22,875	5.51	2.30
Interstate Public Service Company.....	58.5	163,236	147,629	12.24	4.52
Indiana Railways & Light Company.....	59.5	71,262	79,205	13.07	5.56
Lebanon & Thornton Traction Company.....	9.3	32,416	14,179	4.41	2.19
Louisville & Northern Railway & Lighting Company.....	19.4	\$276,131	32,071	3.64	0.58
Louisville & Southern Indiana Traction Company.....	22.7	179,728	77,555	7.04	2.16
Marion & Bluffton Traction Company.....	31.8	23,051	18,856	5.96	4.09
Muncie & Portland Traction Company.....	31.7	31,698	16,853	(c)	2.66
Ohio Electric Railway.....	600.7	42,256	48,752	17.68	5.77
Public Utilities Company.....	54.1	172,724	174,752	13.12	5.06
Southern Michigan Railway.....	32.9	98,168	51,684	7.61	2.63
Terre Haute, Indianapolis & Eastern Traction Company.....	428.9	84,080	61,449	8.48	3.65
Union Traction Company.....	403.2	65,594	44,270	5.78	3.37
Wimona Interurban Railway.....	72.4	19,813	14,898	5.39	3.76
Indiana Utilities Company.....	3.7	29,600	14,043	6.57	2.37
Gary & Southern Traction Company.....	14.5	38,950	6,959	2.02	0.89

*Includes outstanding bonds, current liabilities and outstanding stock.

**After operating expenses and taxes.

†Mileage first main track.

‡Taxes not reported.

§Investments in securities of affiliated non-carrier companies and collateral deposits, \$2,465,900.

(a) No bonds; per cent on stock, 1.039.

(b) Deficit.

(c) No bonds outstanding.

1916 Results of London Pool

The reports of the five operating railways working under the pooling scheme proposed by the holding company, the Underground Electric Railways, Ltd., London, England, have been issued for the calendar year 1916. The companies that are parties to the common fund agreement dated Dec. 21, 1915, are the City & South London Railway, the Central London Railway, the London Electric Railway, the Metropolitan District Railway and the London General Omnibus Company, Ltd. The aggregate traffic receipts of these companies for 1916 were £5,278,812, as compared to £4,924,245 for the preceding year. The aggregate gross receipts of the five companies from all sources were £6,038,529 in 1916, as compared to £5,481,144 in 1915.

The aggregate amount retained by the five companies in 1916 for "revenue liabilities" as defined in the agreement, which include working expenses, prior charges, reserves and other items specified, was £5,531,561. The balance of £506,967, which compares with £451,365 in 1915, was credited to the common fund authorized under the act, and this was divided among the companies as follows:

Metropolitan District Railway	£ 60,836	12 per cent
City & South London Railway.....	30,418	6 per cent
London Electric Railway	152,090	30 per cent
Central London Railway.....	101,393	20 per cent
London General Omnibus Company, Ltd...	162,230	32 per cent

The total number of passengers carried by the five companies and the average fare per passenger were not given in the reports, owing to the fact that the Metropolitan District Railway is still under government control and the figures of that company are consequently not available.

California Railway & Power Company, San Francisco, Cal.—A special meeting of stockholders is scheduled to be held in New York City on March 29 for the purpose of taking action in regard to the proposed reorganization plan of the United Railroads of San Francisco, which involves among other things the disposition by the California Railway & Power Company of the United Railroads securities held by it, including stock of the San Francisco Electric Railways, and the receipt of securities in such reorganization. The meeting will also consider any other matters having to do with the proposed reorganization.

Cleburne (Tex.) Traction Company.—The property of the Cleburne Traction Company was sold at public sale to the highest bidder on March 6. John W. Floore, Sr., Cleburne bought the property in for \$12,500. Mr. Floore announced that he would not operate the line, but would hold it for sale to any company that promised to operate it. There is a movement on foot for the organization of a local company to purchase and operate the line.

Clinton (Iowa) Street Railway.—Coffin & Burr, Boston, Mass., are offering at 98½ and interest \$350,000, part of \$400,000 of first mortgage 5 per cent gold bonds of the Clinton Street Railway. The bonds are dated 1906 and are due March 31, 1926, but are callable at 105. Interest is payable at the office of the Illinois Trust & Savings Bank, Chicago, Ill.

Electric Bond & Share Company, New York, N. Y.—The Electric Bond & Share Company reported for the calendar year 1916 gross income of \$2,170,915, an increase of \$350,578 over 1915. The net income at \$1,566,932 showed a gain of \$165,847 for the year. After the payment of \$375,558 in preferred dividends, an increase of \$30,911, and \$458,222 in common dividends, an increase of \$24,444, the surplus for the year totaled \$733,152, a gain of \$110,493. After adjustments and the payment of a special common dividend of \$1,000,000 in 1916, the surplus on Jan. 1, 1917, amounted to \$5,173,700.

Evansville (Ind.) Railways.—Plans are being developed for the reorganization of the Evansville (Ind.) Railways. This company was unable to pay the interest on the first mortgage bonds of the Evansville Terminal Railway due on Jan. 1, 1917, and has announced that it will be unable to pay the interest on either the first mortgage bonds of the Evansville & Eastern Railway or the Evansville & Mount Vernon Electric Railway on April 1. In consequence, a committee, of which James T. Walker, director of the People's Savings Bank, Evansville, is chairman, is asking for deposits of the

bonds. A number of circumstances contributed to the financial difficulties of the company. Crops have been short for several years, the prices of materials and supplies have been almost prohibitive and on Nov. 14, 1916, a collision occurred out of which large liabilities are likely to develop. The Evansville Railways and the controlled companies give through service from Mount Vernon, Ind., to Grandview, Ind., and it is the opinion of the committee that has been organized to represent the bondholders that their interests will be best served by continuing the properties as a unit.

Gary & Southern Traction Company, Gary, Ind.—The Indiana Public Service Commission has authorized the Gary & Southern Traction Company to issue \$200,000 of its first mortgage ten year gold bonds, dated Oct. 1, 1916, due and payable on Oct. 1, 1926, and to sell, at par, \$150,000 of the bonds for the purpose of retiring and canceling a former issue of \$300,000, of which issue \$250,000, bearing interest at the rate of 5 per cent, have been sold and are now outstanding. The remaining \$50,000 of the issue is now held in the treasury. Should the \$150,000 be insufficient to take up the former outstanding issue of \$250,000, the remainder will be paid in cash by the company, and the \$50,000 now held in the treasury will be cancelled and destroyed. Of the \$200,000 just authorized \$50,000 will be kept in the treasury to make additions, betterments, extensions and improvements.

Jacksonville (Fla.) Traction Company.—Stone & Webster, Boston, Mass., are offering at 98 and interest \$750,000 of two-year 6 per cent gold coupon notes of the Jacksonville Traction Company dated March 1, 1917. The authorized issue is \$1,000,000. The proceeds of the notes have been used to retire the present \$750,000 of 6 per cent coupon notes due March 1, 1917.

New Brunswick Power Company, St. John, N. B.—The New Brunswick Power Company has sold to Bodell & Company, Providence, R. I., \$1,000,000 of 7 per cent first preferred stock, out of an authorized issue of \$3,500,000. There is outstanding now \$350,000 of second preferred stock, \$2,000,000 of common stock, and \$1,750,000 of first mortgage 5 per cent bonds. The company was recently chartered by the Province of New Brunswick to take over the St. John's Railway, which operates the electric light and power, gas and electric railway service in St. John. The deal for the purchase of the stock of the St. John Railway was referred to in the ELECTRIC RAILWAY JOURNAL of March 3, page 410, and Feb. 10, page 268. Harris, Forbes & Company, New York, N. Y., are offering for subscription \$1,750,000 of first mortgage 5 per cent gold bonds of the New Brunswick Power Company dated March 1, 1917, and due March 1, 1937.

Seattle, Renton & Southern Railway, Seattle, Wash.—The petition of James W. Wall to have a receiver appointed for the Seattle, Renton & Southern Railway was dismissed by Federal Judge Edward E. Cushman on March 8. The petitioner sought to have set aside bonds of the railway used in the purchase of the Seattle & Rainier Valley Railway. The decision disposes of all pending litigation and clears the way for making of extensive repairs, extensions and changes of the company's property. Judge Cushman declared that there was no merit in the contention of the petitioner that the giving of an upset price of more than \$1,000,000 upon property estimated to be worth only \$846,000 and allowing the use of the bonds by the committee which bid in the plant, constituted a fraud upon the intending bidders.

Standard Gas & Electric Company, Chicago, Ill.—The Standard Gas & Electric Company is asking through the Philadelphia Trust Company for tenders until April 12 of sufficient of its convertible 6 per cent sinking fund gold bonds, dated Dec. 1, 1911, and maturing Dec. 1, 1926, to exhaust \$1,025,500 now available for sinking fund of this issue.

Texas Electric Railway, Dallas, Tex.—The Texas Traction Company, recently consolidated with the Southern Traction Company as the Texas Electric Railway, has called all of its outstanding three-year 7 per cent gold notes due in 1919 at par and interest, payable on April 1 at the office of the Guaranty Trust Company, New York, N. Y. The amount outstanding was \$700,000.

Dividends Declared

Arkansas Valley Railway, Light & Power Company, Pueblo, Col., quarterly, 1¼ per cent, preferred.

Connecticut Valley Street Railway, Greenfield, Mass., 3 per cent, preferred.

Galveston-Houston Electric Company, Galveston, Tex., quarterly, 3 per cent, preferred.

Manila Electric Railroad & Lighting Corporation, Manila, P. I., quarterly, 1½ per cent.

Philadelphia Company, Pittsburgh, Pa., \$1.50, on 6 per cent preferred.

Philadelphia (Pa.) Traction Company, \$2.

Toronto (Ont.) Railway, quarterly, 2 per cent.

Tri-City Railway & Light Company, Davenport, Iowa, quarterly, 1½ per cent, preferred; quarterly, 1 per cent, common.

Twin City Rapid Transit Company, Minneapolis, Minn., quarterly, 1¼ per cent, preferred; quarterly, 1½ per cent, common.

United Traction & Electric Company, Providence, R. I., quarterly, 1¼ per cent.

West End Street Railway, Boston, Mass., \$1.75, common.

West Penn Power Company, Pittsburgh, Pa., quarterly, 1¼ per cent, preferred.

Electric Railway Monthly Earnings

BANGOR RAILWAY & ELECTRIC COMPANY, BANGOR, ME.

Period	Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., Jan., '17	\$74,684	*\$42,912	\$31,772	\$18,725	\$13,047
1 " " '16	66,284	*34,648	31,636	17,717	13,919
12 " " '17	838,388	*469,141	369,247	215,924	153,323
12 " " '16	789,786	*404,316	385,470	212,697	172,773

COLUMBUS RAILWAY, POWER & LIGHT COMPANY, COLUMBUS, OHIO

1m., Jan., '17	\$337,571	*\$228,524	\$109,047	\$44,269	\$64,778
1 " " '16	297,417	*172,919	124,498	41,122	83,376
12 " " '17	3,577,554	*2,160,729	1,416,825	519,521	897,304
12 " " '16	3,135,840	*1,855,178	1,280,662	478,684	801,978

COMMONWEALTH POWER, RAILWAY & LIGHT COMPANY, GRAND RAPIDS, MICH.

1m., Jan., '17	\$1,617,719	*\$931,056	\$686,663	\$430,359	\$256,304
1 " " '16	1,407,552	*726,500	681,052	411,368	269,684
12 " " '17	17,172,773	*9,480,594	7,692,179	5,053,816	2,638,363
12 " " '16	14,755,303	*7,863,512	6,891,791	4,557,075	2,334,716

CUMBERLAND COUNTY POWER & LIGHT COMPANY, PORTLAND, ME.

1m., Jan., '17	\$238,719	*\$164,353	\$74,366	\$66,167	\$8,199
1 " " '16	213,184	*133,393	79,791	65,851	13,940
12 " " '17	2,892,531	*1,806,446	1,806,085	809,658	276,427
12 " " '16	2,655,336	*1,519,039	1,136,297	795,697	340,600

EAST ST. LOUIS & SUBURBAN RAILWAY, EAST ST. LOUIS, ILL.

1m., Jan., '17	\$292,607	*\$194,800	\$97,807	\$64,065	\$33,742
1 " " '16	229,368	*137,982	91,386	61,853	29,533
12 " " '17	3,090,938	*1,877,592	1,213,346	757,246	456,101
12 " " '16	2,490,176	*1,487,895	1,002,281	754,883	247,398

GRAND RAPIDS (MICH.) RAILWAY

1m., Jan., '17	\$113,108	*\$74,464	\$38,644	\$18,051	\$20,593
1 " " '16	105,817	*64,663	41,154	14,534	26,620
12 " " '17	1,304,878	*837,827	467,051	190,436	276,615
12 " " '16	1,177,539	*830,449	347,090	165,980	181,110

LEWISTON, AUGUSTA & WATERVILLE STREET RAILWAY, LEWISTON, ME.

1m., Jan., '17	\$61,703	*\$54,188	\$7,515	\$15,308	†\$7,793
1 " " '16	52,883	*40,350	12,533	15,963	†3,430
12 " " '17	812,480	*567,134	245,346	187,118	58,228
12 " " '16	741,207	*477,165	264,042	190,224	73,818

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

1m., Jan., '17	\$541,294	*\$234,332	\$306,962	\$216,231	\$90,731
1 " " '16	495,559	*211,286	284,273	213,397	70,876

NASHVILLE RAILWAY & LIGHT COMPANY, NASHVILLE, TENN.

1m., Jan., '17	\$209,869	*\$133,275	\$76,594	\$41,238	\$35,356
1 " " '16	196,585	*116,354	80,231	43,083	37,148
12 " " '17	2,396,326	*1,470,109	926,217	507,127	419,090
12 " " '16	2,155,941	*1,328,210	827,731	511,653	316,078

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

1m., Jan., '17	\$490,231	*\$260,189	\$230,042	\$182,338	\$47,704
1 " " '16	454,988	*257,732	197,256	181,762	15,494
12 " " '17	5,518,352	*3,040,711	2,477,641	2,178,833	298,808
12 " " '16	5,476,620	*3,069,956	2,406,664	2,207,756	198,908

*Includes taxes. †Deficit.

Traffic and Transportation

Dealing with Traffic Obstructors

Kansas City, Buffalo and Detroit All Confronted with the Problem—Buffalo Railway Employees Receive Police Power

Kansas City, Mo., has recently adopted a new set of traffic rules, and the ordinance is being strictly enforced. A condensed statement of the ordinance, in pamphlet form, is distributed on the cars of the Kansas City Railways for the information of the public. The feature of the measure that materially expedites street car traffic provides that motor cars must not be parked on east-and-west downtown streets, but may be ranked parallel with the curb and 4 ft. apart on north-and-south streets. On most streets there is now room for motor car traffic between the ranked cars and the street car tracks, and a very appreciable improvement has resulted in street car operation during rush hours. Previously, automobiles were parked at an angle, and, on most streets, other motor cars had to use the street car tracks.

PUBLIC SENTIMENT INFLUENCED

That the present safety campaign of the Kansas City Railways has influenced public sentiment materially was indicated in a recent trial of two men who obstructed traffic by driving on the street car tracks. Each of the men was fined \$10 on the ground that he had interfered with the public that was riding on the cars. The company is using the incident to arouse public sentiment against the "track hog," and published in all the newspapers a notice about the case. On the whole, however, the railway is receiving support from team and truck owners in its efforts to reduce collisions and traffic delays.

At the request of E. G. Connette, president of the International Railway, Buffalo, N. Y., thirty-five district superintendents and uniformed supervisors have been sworn in as special police officers by John Martin, chief of police. The special officers will have authority to make arrests of vehicle drivers who violate traffic ordinances by ignoring requests of motormen to turn off the tracks and allow cars to pass. Because of the refusal of some drivers to obey this ordinance, many street car delays have been caused. N. H. Brown, general superintendent of the International Railway, believes that the arrest of obstinate drivers will greatly aid in the enforcement of these traffic regulations.

Complaints about the "track hog" also come from Detroit. In a recent instance on the Detroit (Mich.) United Railway, noted by that company in its publication distributed to the public, a coal-wagon driver persisted in driving on the tracks for nine blocks during the rush-hour period.

Increase in Fare Denied

Despite the ruling of the United States Supreme Court in the Detroit fare case that the annexation of suburban districts by a municipality does not extend the city fare to those districts, the Court of Appeals of New York has handed down a decision denying an increase in fare to the New York State Railways between the Rochester city line and Charlotte territory. In view of the ruling of the United States Supreme Court a further appeal will be taken by the Rochester lines. Several years ago the New York State Railways began charging an extra 5-cent fare between the Rochester city line and Charlotte territory. Charlotte is the lake-port of Rochester and because of the number of amusement places, etc., at the port, there is heavy travel between the two points. An injunction was obtained by the company in the Supreme Court of Monroe County against a reduction in fare as ordered by the municipality and pending the appeal to the courts the general passenger agent of the company has been issuing claim coupons for 5 cents to passengers from whom the additional fare had been collected.

Hearing on F., J. & G. Fares

Rising Cost of Labor and Supplies Advanced as Reasons for Fare Increases

The only opposition to the proposed increases of fares on the Fonda, Johnstown & Gloversville Railroad between Schenectady, Gloversville, Fonda and intermediate points, when the company presented its case before the Public Service Commission for the Second District at Albany on March 8 came from Charles H. Collins, Colonie, and Frank H. Deal, representing the Schenectady council of the United Commercial Travelers. Mr. Deal qualified his appearance, however, by saying before the evidence was heard that he objected not to the new rates but to the manner in which the company had sought to put them into effect. The proposed changes in fare were referred to in the *ELECTRIC RAILWAY JOURNAL* for Feb. 10, page 271.

The case of the railroad was presented by William B. Baker and Frank Burton of Baker, Burton & Baker. They introduced William H. Collins, general manager of the road, as a witness to show that the increase in rates was justified by the rising cost of labor and supplies and the failure of the gross revenue to increase in proportion to the general improvement of business. Upon the objection of Mr. Deal Mr. Collins was not permitted to give his conclusions as to whether the revenue of the company under the present rates was sufficient and he declined to give testimony as to the details of the company's financial status, declaring that to be the province of the president of the company. Figures from the company's annual reports to the commission were submitted to sustain the contentions concerning increased expenses and inadequate increases of revenue.

The hearing was adjourned with the understanding that the company would file further statistics along these lines. The commission reserved the right to Mr. Deal to ask for a continuation of the hearing at some future date when he may, if he desires, cross-examine the company's representatives.

Segregation of Passengers Impracticable

In the decision issued on Feb. 20, in the case of the borough of Shenandoah against the Schuylkill Railway, Girardsville, Pa., the Public Service Commission of Pennsylvania requires the railway to make certain improvements in its cars and schedules, but does not require it to provide equipment for the segregation of mining passengers. The commission examined the company's cars on Oct. 16, 1916, and found that, of the thirty-eight in operation during the year, four were new double-truck cars put in service last spring, and four others were recently repaired and put in good condition. About half of the cars were considered by the commission to be inadequate to the service with respect to some feature of their equipment. The company had also placed orders for six new cars.

It was apparent that many of the cars were too small for interurban use to afford comfort and safety to passengers, especially during the hours of heavy traffic. The commission did not regard it necessary to require the purchase and installation of new cars in view of the fact that recent steps taken by the company to renew the equipment promise that every reasonable requirement for the service will be met within a comparatively short time. According to the order that was issued, the company is required to change its schedules, repaint several cars, renew all defective equipment, and improve its heating facilities.

Investigations showed that it would be impracticable to provide for the segregation of miners by operating special cars or reserving a compartment in cars as suggested by the complainant, for occasion might arise when miners would find it advantageous to ride on the regular cars. The commission held that the railway was obliged to carry upon any of its cars any miner who had complied with its transportation rules and regulations, and that, although many of the miners preferred a special arrangement for their transportation, the commission knew of no method whereby that could be attained.

Jitney Legislation in California

The Railroad Commission of California has prepared and submitted to the legislature a bill providing for the legislation of jitneys throughout the entire State. The proposed measure provides that no corporation or person "shall operate any automobile, jitney bus, auto truck, stage or auto stage for the transportation of persons or property for compensation on any public highway in this State, unless a permit has first been secured."

The bill requires every jitney bus, whether or not it operates wholly within a municipality, to first obtain a permit from the political subdivision in which it wishes to operate. In addition to the permits, those jitney buses which wish to operate outside of any municipality are required to obtain a certificate of public convenience and necessity from the Railroad Commission.

The bill also provides for the regulation by the Railroad Commission of the issue of stocks, bonds and notes, the latter only when they aggregate more than \$2,500, of jitney buses which do not operate solely within the limits of a municipality. It also vests in the Railroad Commission jurisdiction over rates and service of jitney buses when they do not operate wholly within the limits of a municipality. This is in accordance with the decision of the Supreme Court.

Comment on Fall River Fares

In commenting upon the recent decision of the Public Service Commission of Massachusetts, allowing the Bay State Street Railway, Boston, Mass., to discontinue the sale of six tickets for 25 cents to the passengers within the city limits of Fall River, the *Boston Herald* states editorially that satisfactory service could not be expected of any public service corporation that was denied the right to make reasonable profits, and likened the service of such a corporation to the work of an employee who was poorly fed and in ill health. The comment continues, in part, as follows:

"With operating expenses mounting day by day, with labor receiving more than ever before, with adverse legislation dampening the ardor of the investing public, the managers of the public service corporation of the present time carry a heavy load. But there is encouragement for them in the decisions that have of late been made in their favor, and in the awakening of the public at large to a recognition of the possibilities of driving away investors and thus making impossible the realization of public needs for better service. Fall River's apparent loss will benefit every public service corporation in the State in the minds of the investing public by creating new confidence in the fairness of the Public Service Commission."

Chicago Council Bars Parking

The City Council of Chicago, Ill., on March 12, passed two ordinances of great importance to surface lines transportation. One of these prohibits the parking of automobiles and other vehicles between the hours of 7 a. m. and 10 a. m. and 4 p. m. and 7 p. m. anywhere within the territory bounded by Lake Street, Wabash Avenue, Harrison Street and Market Street, comprising the Loop district. Vehicles will be permitted during these two rush periods to stop at the curb only long enough to discharge or take on passengers, or to load or unload baggage or merchandise.

The other ordinance passed created loading zones for the surface cars on eighteen of the corners in the Loop district where the parking of vehicles will be prohibited at all times. These loading zones will extend back from the corner a distance of 100 ft. and will be marked by signs.

Both ordinances are to become effective on May 1, and it is expected that these will greatly facilitate the movement of surface cars in the downtown district. This legislation is said to have come as the result of the inspection trip through the Eastern cities made by a number of Chicago Aldermen a few months ago, and also to recommendations of the Chicago Traction and Subway Commission and studies made by the *Chicago Herald* and the Chicago Surface Lines in pointing out the causes of street car delays.

Railway to Operate Buses.—The Southwestern Traction & Power Company operating along Bayou Teche between New Iberia and Jeanerette, La., has completed arrangements to operate auto buses between Edgar, a midway point on its line, and the new oil fields 3 miles east of New Iberia.

Plans for Norfolk Skip-Stop Nearly Completed.—The plans of the Virginia Railway & Power Company for the skip-stop system for Norfolk will soon be ready to be submitted to the City Council. If the system is approved, it will be put into effect without delay. The zones to which the system will apply are being worked out. The system will not be used in the business district.

Decrease in Fatal Accidents in Illinois.—The State Public Utilities Commission of Illinois reports that during the year 1916 there were five fatalities as compared with sixteen in 1915, in the number of passengers killed and injured on the electric railways of the state. The decrease is attributed to a more wholesome understanding on the part of the public of the value to them of the safety first campaigns conducted by the electric railways.

Unsatisfactory Service in Camden, N. J., Charged.—The Camden (N. J.) City Planning Commission, in its second annual report which will be presented to the City Council at its next meeting, alleges that the service of the Public Service Railway in Camden is unsatisfactory. It is also stated that the cars of different types run in Camden tend toward confusion and that there is need for more uniformity with respect to destination signs.

Auxiliary Bus Service in Fort Wayne.—The Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind., has contracted for four Studebaker buses of sixteen passenger capacity each to be delivered immediately. The buses will be painted the same color as the city cars of the railway and will be placed in service on Runnion Avenue and High Street to afford a belt line serving Bloomingdale. They will meet West Main Street cars at Main and Runnion Streets and Bloomingdale cars at Wells and High Streets.

Proficient Motorman Writes Essay on Coasting.—The San Francisco-Oakland Terminal Railways, Oakland, Cal., have published a folder containing an article entitled "Coasting and Its Principle." The article was written by O. W. Butler, a motorman of this company, who has an exceptionally good coasting record, and shows considerable interest in his work. It was decided to have the article printed in pamphlet form and place a copy of this pamphlet in the hands of each one of the conductors and motormen.

River Service to Supplement Electric Line.—The Crescent Navigation Company has purchased from Rounds Brothers, both river transportation companies of Owensboro, Ky., two fast motorboats, which will be put in service between Owensboro, Ky., and Rockport, Ind., making connections at Rockport with the limited trains of the Evansville & Eastern Electric Railway, running between Rockport and Evansville, Ind. Six trips will be made daily, and through rates are quoted from Owensboro to Evansville for passenger traffic. Rounds Brothers will withdraw from river service.

Railway Co-operates with Tobacco Growers.—Unusually good service on the Louisville & Interurban Railroad, Louisville, Ky., has been afforded the farmers in that district in transporting their tobacco crop. The farmers watch the Louisville market, and when it closes high one day they expect to get their tobacco on the "breaks" for the sales of the next day. It is not uncommon to have a shipment sold to Louisville buyers two hours after it is loaded on cars in Shelbyville. During the spring season, this road has handled nearly 300 carloads of tobacco in addition to other farm produce.

Annual Passes Granted to Employees.—The Union Traction Company of Indiana, Anderson, Ind., will, beginning April 1, grant annual card passes to its employees instead of a separate pass for each trip as at present. The annual passes will be divided into three classes. Employees in the service of the company for three years will receive a card pass good on the local division at all times, while those in service five years will receive a pass good over the entire system. A man employed seven years or longer will receive a card pass for himself and one for his wife, good over the entire system at all times.

Kansas City Railways Reward Presence of Mind.—The Kansas City (Mo.) Railways rewarded five platform men during January for particular alertness and watchfulness on duty. Twenty-five dollars went to a conductor who captured and held a negro who had tried to hold up the car, until the police came to take the bandit in charge; \$10 to a motorman who threw a switch and prevented a collision; \$5 to a motorman who backed his car and caught a following car that was sliding; \$10 to a motorman who backed his car and caught two runaways; \$5 to a conductor who took charge of a car of the company when the motorman lost control.

Hot Springs Line Encourages Church-Going.—In the health and pleasure resort of Hot Springs, Ark., with its 400 hotels and boarding houses, and where there are thousands of visitors from all parts of the world, the Hot Springs Railway has found a "Go to church" advertisement helpful in increasing street railway receipts, besides being highly appreciated by the churches of the city. A typical advertisement is worded as follows: "Go to church to-day—Visitors and Citizens Invited by all Pastors—see Columns of this Paper for Church Directory—All Churches are Located on or close to the Street Car Lines. Best Possible Car Service."

Forty-four Reported Killed by Vehicles in February.—A total of forty-four persons lost their lives in New York City during February, in accidents due to vehicles, according to statistics gathered by the National Highways Protective Society, and based upon reports from the coroner's office checked up from other sources. The society reported that automobiles caused the death of thirty, trolleys eleven, and wagons three, an increase of sixteen by automobiles and six by trolleys, as compared with February, 1916. In New York State, outside of this city, twenty-three persons were killed, as compared with fifteen for the corresponding month last year.

B. R. T. Efficiency Campaign Praised.—The joint efficiency campaign inaugurated by the men and management of the Brooklyn (N. Y.) Rapid Transit System, and the use of its standard courtesy code, are receiving commendation from various sources. Several other railways have requested copies of the efficiency bulletins, and two important systems, the Bay State Street Railway, Boston, Mass., and the Columbus Railway, Power & Light Company, Columbus, Ohio, have sent representatives to Brooklyn to investigate the efficiency program. This campaign by the Brooklyn company has been reviewed in previous issues of the ELECTRIC RAILWAY JOURNAL.

Posters Used in Anti-Spitting Campaign.—Posters, reminding passengers of the anti-spitting laws, are being displayed in the cars of the Beaver Valley Traction Company, New Brighton, Pa., in its present campaign for cleaner cars. The nature of the posters is that of a polite invitation to the public to help improve the condition of the cars, and at the same time they serve as a sufficient warning that health laws will be enforced. The wording is as follows: "We want you to feel at home on our cars. Therefore we trust that it will not be necessary to cause you any annoyance or embarrassment by the enforcement of the anti-spitting laws. We feel certain that you would not break them at home, and we want to make our cars as homelike as possible."

Improved Service for Salt Lake.—Plans for improving the service of the Utah Light & Traction Company, Salt Lake City, Utah, have been announced by H. F. Dicke, who was recently appointed general manager. All the cars owned by the company are being repainted and varnished, while the car equipment is being thoroughly overhauled. Orders have been placed for new car signs with numerals to designate the route over which the car travels. Vest-pocket booklets, to explain the numbering of the cars, and containing maps of the city, and time-tables, are being printed which will give the exact route and schedule time of each car. These will be placed in the cars for the use of patrons. The plans include also the purchase of additional snow-fighting equipment.

More "Journal" Cartoons Reproduced.—The editorial on "Complaints" which appeared in the February issue of the

magazine published monthly by the Southern Public Utilities Company, Charlotte, N. C., has provoked a considerable amount of favorable comment. It was inspired in part by one of the editorial cartoons which were published in recent issues of the *ELECTRIC RAILWAY JOURNAL*. In this connection it is of interest to note that this particular cartoon, entitled "How Are Complaints Handled on Your Road?" is reproduced on the front cover of the March issue of this company's magazine. Another one of the cartoons of this series with the title "Every Employee a Publicity Representative" appears in the March issue of *Safety*, the bulletin of the Union Traction Company of Indiana, Anderson, Ind.

Kansas City Railways Publish New Time-Tables.—The Kansas City (Mo.) Railways, which established a department of schedules several months ago with D. J. Fennell in charge, has found the department a means of gaining large favor with the public, through the assistance of advertising. The schedules have been worked out to the point where they are fairly settled, and now they are being advertised. Recently time-tables showing arrivals and departures at each terminal of each line were published in the local newspapers. The published schedules give exact information as to when cars leave the ends of the lines, and the patron can easily calculate the time any car will reach his corner. The company will publish special time-tables for each line, to be posted in the cars. These tables will go somewhat more into detail as to schedules, with reference to important transfer points.

Hearing on Railway Sanitary Code.—Street railways operating in Buffalo, N. Y., are opposing the enactment of a new sanitary code which has been recommended to the City Council by the Commissioner of Public Health. The proposed ordinances provide for the regulation of sanitary and other conditions on the street cars operated within the city. The companies affected will be the International Railway, the Buffalo & Lake Erie Traction Company and the Buffalo Southern Railway. A public hearing on the proposed law was held on March 1 before the City Council, and the companies were permitted to voice their objections. Those who appeared for the corporations branded the code as unfair and impractical. Previous test votes taken by the five members of the Council indicate that they do not approve of the measure. On a previous occasion a similar law was disapproved by a vote of four to one.

Motorman's Wife Keeps House for \$43 a Month.—The high cost of living has no terrors for Mrs. C. V. Barker, the wife of a motorman on the Kansas City (Mo.) Railways, who tells in the February issue of the *Kansas City Railwayman* how she and her husband live on \$43 a month, without unduly stinting themselves, as shown by the reasonably generous menus reproduced in the company publication. According to an itemized list of household expenses Mrs. Barker spent the following amounts from Nov. 11 to Dec. 11, 1916: House rent, \$16.50; lights (gas), 50 cents; fuel (coal), \$2.75; telephone, \$1.50; food, \$20.10; miscellaneous, \$1.65, making a total of \$43. The cost of clothes was not included, as this is difficult to analyze in one month. In introducing Mrs. Barker's story, *The Railwayman* expresses a desire to hear of other housewives' records, and states that the publication is as much for the wives, mothers and daughters of the employees as for the men themselves.

Complaint Alleging Improper Heating Dismissed.—The charge against Timothy S. Williams, president, and Slaughter W. Huff, vice-president, of the Brooklyn (N. Y.) Rapid Transit Company, and two minor officials, that they had violated an order of the Public Service Commission, directing them to maintain car temperatures of at least 40 deg. was dismissed on March 13 by the Justices of Special Sessions in Brooklyn, upon motion of Darius Marsh, counsel for the defendants. Mr. Marsh moved for dismissal on the ground that it had not been proved that the officials of the company had had knowledge of the condition of the car in question, which was operated on the Bay Ridge Avenue line on Dec. 30, last. Harry E. Lewis, District Attorney of Kings County, who brought the complaint, said that if such a course was sustained it would make a farce of the Public Service Commission laws. He added that eight other similar complaints would be pressed for trial.

Personal Mention

L. W. Jacques has been appointed master mechanic of the East St. Louis & Suburban Railway, East St. Louis, Ill.

Frank A. Henning has been appointed supervisor of the Niagara Falls (N. Y.) local lines of the International Railway.

Edward Scranton has succeeded Worth A. Baldwin as passenger agent for the Union Traction Company at Muncie, Ind.

T. P. Mason, comptroller of the Havana Central Railroad, Havana, Cuba, has been appointed acting general manager, succeeding R. M. Orr, deceased.

S. D. Jackson, maintenance and construction foreman on the Anderson (S. C.) Branch of the Southern Public Utilities Company, Charlotte, N. C., has resigned from railway service.

John T. Benson has been appointed manager of Norumbega Park to succeed Carl Alberte. Mr. Benson has had extensive experience in securing and handling wild animals for menageries.

H. M. Schumpert has been promoted to the position of foreman of construction and maintenance of lines located at Anderson, S. C., for the Southern Public Utilities Company, Charlotte, N. C., succeeding S. D. Jackson.

Lawrence I. Grinnell has resigned from the editorial staff of the *ELECTRIC RAILWAY JOURNAL* to become connected with the Goldschmidt Thermit Company, New York, N. Y. Mr. Grinnell was graduated from Harvard and was connected with the *Railway Age Gazette* before he became a member of the staff of this paper.

Frank Hedley, vice-president and general manager of the New York Railways and the Interborough Rapid Transit Company, New York, N. Y., is a patient in the Post-Graduate Hospital, that city, recovering from an operation performed on March 12 for mastoid trouble. Mr. Hedley's condition is reported as satisfactory.

Albert R. Bailey, assistant professor of civil engineering of the University of Michigan, who has made a specialty of valuation work in connection with electric railways and other properties, has been granted a leave of absence for the remainder of the year to allow him to take a position with F. W. Stevens, general valuation counsel for the New York Central Lines. After March 19, Professor Bailey's headquarters will be at Grand Central Terminal, New York City.

A. P. Ramstedt, former president of the Idaho Public Utilities Commission, has resigned as a member of that commission to become general auditor and comptroller of the Day Mining interests. These include the Hercules Mining Company, Tamarack & Custer Consolidated Mining Company, and other mining companies in Idaho and British Columbia, the Northport Smelting & Refining Company, Northport, Wash., the Pennsylvania Smelting Company at Pittsburgh, Pa., and various banking interests in Idaho and Washington.

Harry Branson, recently superintendent of equipment for the Lehigh Valley Transit Company, Allentown, Pa., has been appointed master mechanic of the Wheeling (W. Va.) Traction Company. Before assuming charge in the position he has just relinquished, Mr. Branson had been connected for seventeen years with Philadelphia (Pa.) Rapid Transit Company. He was a carhouse foreman for six years and in charge of one of the company's shops for four years, after which he was appointed assistant general manager in 1909 with the title of superintendent of rolling stock and equipment. He held this position until 1913 when he entered the service of the Lehigh Valley Transit Company in a similar capacity.

James B. Woodyatt, who has been appointed general manager of the Southern Canada Power Company, Montreal, which owns the Sherbrooke Railway & Power Company, operating the street railway, and other utilities in Sher-

brooke, Que., was born at Brantford, Ont., July 2, 1886. He was, from April to July, 1905, chairman for the Niagara & Welland Power Company; from July to September, 1905, topographer for the Toronto & Hamilton Railway, and from April, 1906, to December, 1908, an apprentice of the Canadian Westinghouse Company, Hamilton, Ont. From December, 1908, to June, 1909, Mr. Woodruff was investigating ice conditions in the Gulf of St. Lawrence for the Dominion Government. From June, 1909, to June, 1910, he was sales engineer of Allis-Chalmers-Bullock, Ltd., Montreal. In June, 1910, he was appointed superintendent of power for the Sherbrooke Railway & Power Company and from July, 1913, to October, 1916, was general superintendent of this company.

Lily J. Spangler, who has been connected with the Virginia Railway & Power Company and its predecessors at Norfolk, Va., for more than seventeen years, has resigned to enter other work. Mrs. Spangler served first as stenographer and cashier in the office of the gas company in Norfolk. This was before the consolidation of the local gas company there with the other utilities. When E. C. Hathaway went to Norfolk in 1902 to take charge of the consolidated properties under the name of the Norfolk, Portsmouth & Newport News Company, Mrs. Spangler was appointed secretary to him. During the time that John Blair MacAfee was president of the Norfolk & Portsmouth Traction Company, from 1908 to 1911, Mrs. Spangler acted as his chief clerk. When the publication of *Public Service Chat*, intended for general distribution to the public, was started in February, 1914, Mrs. Spangler became the editor of the paper. Part of the material used in that publication was written by Mr. Hathaway, but a goodly portion of it was written by Mrs. Spangler herself, subject to approval by Mr. Hathaway.

James P. Barnes, general manager of the Buffalo, Lockport & Rochester Railway, Rochester, N. Y., has been appointed general manager of the Schenectady (N. Y.) Railway, to succeed James F. Hamilton. Mr. Barnes is a native of Syracuse, N. Y., and was graduated in 1905 from the Massachusetts Institute of Technology. For about six years he served in various capacities with the Oneida (N. Y.) Railway and the Syracuse Rapid Transit Company. While associated with the latter company he was responsible for the layout and construction of the Wolf Street shops in Syracuse, and he also assisted in the electrification of the West Shore Railway. In 1912 he resigned the position of chief engineer of the Syracuse Rapid Transit Railway to become general manager of the Syracuse & Suburban Railway, and later was appointed to the position which he has just relinquished. Mr. Barnes has demonstrated a rare ability in the several executive positions he has held. In June, 1916, he was elected president of the New York Electric Railway Association, and has shown an unusual interest in the problems confronting the industry at the present time.

J. P. Pulliam, general manager of the Eastern Wisconsin Railway & Light Company, Fond du Lac, Wis., and the Wisconsin Electric Railway, Oshkosh, Wis., has tendered his resignation. Mr. Pulliam entered railroad work when he was fourteen years of age. His first position was as a telegraph operator on the Louisville Southern Railroad. He was subsequently employed in various capacities by the Kentucky & Indiana Bridge Company, after which he became chief clerk to the superintendent of the Louisville-St. Louis line of the Southern Railway, and the year following was employed by the Choctaw-Oklahoma-Gulf Railroad of Shawnee, Okla. Later he engaged in commercial pursuits for one year, and then served as trainmaster for the Grand Rapids, Grand Haven & Muskegon Railway for three

years, when he became superintendent of the Winnebago Traction Company, Oshkosh, Wis. When the Wisconsin Electric Railway purchased the Winnebago Traction Company in 1908, Mr. Pulliam served the former company and the Eastern Wisconsin Railway & Light Company as general superintendent. In June, 1910, he was appointed general manager of the two companies, the position he has just relinquished.

A. L. Neereamer

A. L. Neereamer, secretary-treasurer of the Central Electric Railway Association since March 26, 1908, was again continued in his important office at the recent annual convention. Mr.



A. L. NEEREAMER

Neereamer holds a unique position in the affairs of the association and its subsidiaries, for by constitutional provision of the individual bodies he is made permanent chairman of the Traffic Association and permanent treasurer of the Accountants' Association, and in this manner binds the three organizations into a single unit following

three separate studies, yet all working for the advancement of the whole. When he became secretary of the Central Association, the traffic organization had been conceived but had not been born. Some of the most important work of the association was later to be done through this body with Mr. Neereamer as its sponsor. The joint baggage tariff, joint passenger tariff now under revision, the interchangeable mileage ticket, the Central Electric Railway Association map now being brought up to date, etc., are examples of the real work of this body. In this connection Mr. Neereamer's former broad experience in steam railroad accounting and traffic work, and electric railway traffic and transportation work has served him and the association well. The Accountants' Association, in which he has also carried a share of the burden, was organized and continued as a separate association until the beginning of 1915, when it was joined with the main body and has since acted in conjunction with it through Mr. Neereamer.

In this compilation and revision of tariffs, in the labor of making the map and the joint time table folder, and now the monthly publication of the latter, Mr. Neereamer has been a tireless worker and has almost single-handedly taken care of all the mass of routine work, correspondence and study which is represented but not seen in the finished product. Past-President George Whysall tells of how during the early days of the association, when the membership was small and the funds very limited it looked at one time as though the association must fail. Three or four of the railway men, however, decided to put up enough money to carry the work on another year, and to make this possible the secretary offered to draw only enough salary to cover only his own personal and direct family expenses. It is generally recognized now that it was this spirit of interest and faith in the development of the electric railways that made possible the continuation and success of the Central Electric Railway Association, which may indeed count itself fortunate in having retained so long the services of Mr. Neereamer.

Obituary

R. M. Orr, general manager of the Havana Central Railroad, Havana, Cuba, is dead.

Otto Armbruster, who for the past ten years has been claim adjuster for the New Orleans Railway & Light Company, New Orleans, La., died recently at the age of fifty-two.

Construction News

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

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

RECENT INCORPORATIONS

*Northern Alabama Traction Company, Florence, Ala.—Incorporated in Alabama to construct an electric railway from Florence to Huntsville, via Athens. Capital stock, \$2,000. Incorporators: Solan L. Whitten, Tracy W. Pratt and Thurston H. Allen.

FRANCHISES

Oakland, Cal.—The San Francisco-Oakland Terminal Railways has filed with the City Council application for a resettlement franchise to take the place of the many franchises granted under Oakland's former charter and which expire at different times.

Atlanta, Ga.—The Federal Construction Company will ask the City Council of Atlanta to renew a contract between the company and the city, extending the time until April 25, 1918, by which the company may begin actual construction work on its proposed line in Atlanta. The company proposes to construct a line from Atlanta to Creighton. [May 6, '16.]

*Silver City, N. M.—The Empire Zinc Company has received a franchise from the City Council to construct an electric railway in Silver City.

Chillicothe, Ohio.—The Hillsboro, Cynthia, Bainbridge & Chillicothe Traction Company, which proposes to construct a line from Hillsboro to Chillicothe, has asked the City Council for a new franchise under which it may operate its cars through Chillicothe. The old franchise granted this line has expired. J. C. Anderson, Chillicothe, secretary. [Jan. 27, '17.]

Youngstown, Ohio.—The Mahoning & Shenango Railway & Light Company has asked the City Council of Youngstown for a franchise to construct an extension of its line in Mahoning Avenue from the present terminus at Calvary Cemetery to Perkins Corners.

Irwin, Pa.—The McKeesport & Irwin Street Railway has received a franchise from the Borough Council to operate in Irwin. The company is owned by the West Penn Railways. In Irwin it will have connection with the Pittsburgh, McKeesport & Greensburg Railway to Greensburg and the coke region and the Trafford extension, owned by the West Penn Railways.

Port Arthur, Tex.—The City Council of Port Arthur has passed an ordinance granting the Jefferson County Traction Company the right to make certain changes in its tracks on Waco Avenue and Austin Avenue, to enable cars to have access to the new terminals that are to be built by the company. The ordinance also grants the company the right to operate by contract or otherwise its cars on the tracks of the Port Arthur Traction Company and the Pier Railway Company, and such other extensions of tracks as may be constructed in the operation of a trolley system in Port Arthur. The franchise is granted for a period of fifty years.

San Antonio, Tex.—The San Antonio Traction Company has received permission from the Commissioners of Bexar County to construct an extension along Somerset Road.

TRACK AND ROADWAY

British Columbia Electric Railway, Ltd., Vancouver, B. C.—This company will shortly begin the construction of new tracks, a mile along the North Burquitlam Road, in compliance with the conditions of its Burnaby franchise.

Pacific Electric Railway, Los Angeles, Cal.—Grading work has been begun by the Pacific Electric Railway on its new LaHabra-Fullerton line, and it is expected that the extension will be ready for service by May 15.

Municipal Railway of San Francisco, San Francisco, Cal.—The Board of Works has advertised for bids, to be opened March 21, for approximately \$14,000 worth of rail appliances to be used in the double-tracking of Market Street for the Municipal Railway.

Tidewater Southern Railway, Stockton, Cal.—Through sale of stock to the Western Pacific Railroad the Tidewater Southern Railway will have money available about April 1 to commence the construction of terminal facilities at Modesto and the electrification of the line between Modesto and Turlock, according to an announcement by Byron A. Bearce, president. The cost of electrifying the Modesto-Turlock line will be about \$700,000, it is said.

Chicago, Milwaukee & St. Paul Railroad, Chicago, Ill.—This company contemplates the construction of a new double-track bridge at Sabula, Iowa, at a cost of about \$3,000,000.

Des Moines (Iowa) City Railway.—Plans for extensive street railway construction work for the coming season have been announced by the Des Moines City Railway. Eleven miles of new track will be laid along old routes, and several new lines and extensions are on the improvement program for next summer. The construction of the Twenty-fourth Street viaduct, over High Street, will start the work on the new lines. Work on the viaduct, which will be of concrete construction, is to begin immediately. This will be the first step in the building of the new Crocker Street line, which will run north and west from Twenty-fourth Street and Ingersoll Avenue. Polk Boulevard and Chamberlain Avenue will be the terminal of the new line.

Arkansas Valley Interurban Railway, Wichita, Kan.—Preparations are being made by the Arkansas Valley Interurban Railway for the construction of 5 miles of track from Twenty-fourth Street to the Midland Valley Railroad depot. It is reported that the company's proposed line to Salina will be in operation by October.

Ocean City & Fenwick Island Railway, Ocean City, Md.—According to plans recently announced, this company's proposed trolley line connecting Ocean City and Fenwick Island will be in operation by the beginning of the summer. The road will be 11 miles long, and will be built for both passenger and freight service. Application will be made to the Public Service Commission of Maryland for permission to issue stock to the par value of \$100,000. C. Edward Shute, Ocean City, secretary. [Feb. 10, '17.]

Bay State Street Railway, Boston, Mass.—This company has asked the Legislature for a two years' extension of time in which to place its feed wires underground in the thickly-settled section of Salem.

Detroit (Mich.) United Railway.—To the end that the rerouting plan may be placed in operation as speedily as possible for the relief of the congested condition of street railway traffic in the heart of Detroit, work on the track construction necessary for the plan is now under way. There are about thirty pieces of straight track or special work necessary to make the entire plan effective, and as the rerouting of one line largely depends upon the rerouting of some other line not much of the plan can be developed until all the physical connections are made.

Minneapolis (Minn.) Street Railway.—Mayor Thomas Van Lear has vetoed the two resolutions recently passed by the City Council ordering the Minneapolis Street Railway to construct the Seventh Street car line and a line across the Third Avenue bridge.

Helena Light & Railway Company, Helena, Mont.—This company plans the immediate improvement of its local lines, to include new ties and heavier rails. Work will cost between \$60,000 and \$80,000.

Public Service Railway, Newark, N. J.—This company plans to double-track its line from Magnolia to Clementon, 6 miles, at a cost of about \$65,000.

Brooklyn (N. Y.) Rapid Transit Company.—The Public Service Commission for the First District of New York has saved the City of New York approximately \$58,000 by re-advertising for bids for the relocation of the surface railroad tracks on New Utrecht Avenue, Brooklyn. On Feb. 7 the Commission received only one bid upon a proposed contract for the relocation of the tracks. By changing the terms of the contract slightly when bids were re-

opened on March 5 several bidders made proffers, the lowest being that of the Thomas Crimmins Contracting Company, New York, whose figure was \$165,409, or approximately \$58,000 less than the single offer received on Feb. 7. The tracks in question which are to be moved are those formerly used by the cars of elevated trains operated by the Brooklyn Rapid Transit Company on the West End line.

Interborough Rapid Transit, New York, N. Y.—A series of contracts has been awarded the Union Switch & Signal Company, Swissvale, Pa., by the Interborough Rapid Transit Company to provide interlocking and automatic block signal apparatus on several of its lines. All the interlocking plants will be of the electro-pneumatic type. The interlocking signals on the suburban and elevated lines will be of the electro-pneumatic semaphore type, with electro-pneumatic stops used throughout; the automatic block signals in the subway will be of the Interborough light type, and those on the suburban and elevated lines of the daylight type with color indication.

New York & Queens County Railway, New York, N. Y.—This company has agreed to begin construction in April, 1918, of the trolley line through Flushing Avenue, from Ehret to Jackson Avenue, which it abandoned some time ago. The agreement was contained in a stipulation filed with Justice Aspinall in the Supreme Court in the mandamus action brought by the Public Service Commission, after the company had declined to resume operation of the road. The line was discontinued in 1915, when the work of filling in the Flushing meadows was begun. The line had been operated on a trestle and the creation of solid land would have vested the company with a franchise to operate cars over it, along the line of the old trestle. The railroad company declined to resume the line, however, saying it did not pay. It also declined to construct a temporary detour.

Union Railway, New York, N. Y.—This company has applied to the Board of Estimate and Apportionment for permission to construct, maintain and operate a double-track extension from a connection with the existing route of the company in West 207th Street, along Amsterdam and Nagle Avenues and Dyckman Street to the right-of-way of the New York Central Railroad, at the foot of Dyckman Street. A preliminary hearing upon the petition will be held March 23.

Willamette Valley Southern Railway, Oregon City, Ore.—Plans are being considered by the Willamette Valley Southern Railway, which is controlled by the Portland Railway, Light & Power Company, for the construction of an extension from Mount Angel to Silverton. It is estimated that the cost will be approximately \$120,000.

Philadelphia, Pa.—Sealed proposals will be received by the Department of City Transit, Philadelphia, Pa., William S. Twining, Director, until April 3, for the construction of the following sections of the Broad Street subway: Contract No. 103—575 lin. ft. of two-track and 2500 lin. ft. of four-track subway in Broad Street, from south of Filbert Street to Buttonwood Street, including one station; contract No. 104—4086 lin. ft. of four-track subway in Broad Street, from Buttonwood Street to north of Stiles Street, including three stations; contract No. 204—2960 lin. ft. of four-track subway, merging into two-track subway, in Broad Street, from South Penn Square to south of South Street, including two stations. Copies of plans and specifications may be obtained upon deposit of \$50, to be refunded upon return of plans.

Charleston Consolidated Railway, Gas & Electric Company, Charleston, S. C.—Work has been begun by this company on the construction of a double-track line on Clements Ferry Road.

***Austin, Tex.**—It is reported that the Stone & Webster interests plan to construct an interurban line from Austin to San Antonio.

Dallas (Tex.) Southwestern Traction Company.—At a recent meeting of the stockholders of the Dallas Southwestern Traction Company, E. P. Turner was re-elected president; E. L. Sargent, Samuel P. Cochran and B. M. Sansom were elected vice-presidents; John T. Witt, chief engineer, and J. E. Bassett, secretary and treasurer. The executive committee consists of J. J. Carter, Samuel P. Cochran and John L. Cleveland. [Nov. 18, '16.]

Tacoma (Wash.) Municipal Railway.—With a tacit understanding that a bill permitting the city of Tacoma to extend its municipal car line to the proposed army post at American Lake, will be passed by both houses of the Legislature, now in session at Olympia, Mayor Fawcett and the City Council are considering plans for extending the tideflats car line from its present terminus at the city limits to the locality proposed for the shipyards center. The proposed bill prohibits cities from extending municipal street car lines more than 3 miles from the city limits, but a proviso was attached permitting the extension of the city line to the army post.

SHOPS AND BUILDINGS

New York State Railways, Syracuse, N. Y.—A car storage yard, accommodating sixty cars, including repair shop and building for trainmen, will be built by the New York State Railways at Burnet and Fairview Avenues, Syracuse, at a cost of about \$125,000.

Wilkes-Barre & Hazleton Railway, Hazleton, Pa.—Bids have been asked by the Wilkes-Barre & Hazleton Railway on the erection of a large freight station on its newly acquired land west of Hazleton.

POWER HOUSES AND SUBSTATIONS

Georgia Railway & Power Company, Atlanta, Ga.—This company contemplates the installation of a power station and the erection of electric transmission lines in the Emerson district.

Iowa Railway & Light Company, Cedar Rapids, Iowa.—This company will erect a high-tension electric line from its plant at Nevada to the Dayton Lake Amusement Park, 11 miles, to furnish electricity for light and power to the park, as well as the farmers along the line. Plans are also being made to extend the line through Gilbert to Story City.

Twin City Rapid Transit Company, Minneapolis, Minn.—Plans have been completed by the Twin City Rapid Transit Company for the erection of a new substation 200 ft. by 240 ft., in St. Paul, to cost about \$25,000.

Federal Light & Traction Company, New York, N. Y.—This company has purchased a site for the erection of a \$250,000 substation at Springfield, to be used to relay the hydroelectric power now being supplied to the Springfield Gas & Electric Company from the White River dam. The proposed equipment includes a new 5000-kw. turbine.

Interborough Rapid Transit Company, New York, N. Y.—Plans have been made by the Interborough Rapid Transit Company for the construction of a two-story, 49 ft. x 108 ft. brick transformer station and telephone exchange at 122-126 Park Row, to cost about \$45,000.

Richmond Light & Railroad Company, New York, N. Y.—Application has been made by the Richmond Light & Railroad Company for permission to install two new cable lines across Fresh Kill Creek to Lake Island, to be used for the operation of a proposed garbage disposal plant.

Pittsburg County Railway, McAlester, Okla.—This company, which operates McAlester street car lines and line between South McAlester and North McAlester, will install a new 3500-kw. turbo-generator in the power house of the company at Ninth Street and Johnson Avenue in McAlester.

Conestoga Traction Company, Lancaster, Pa.—Plans have been prepared by this company for improvements to its plant and system, which will include the installation of new rotary converter equipment in the Orange Street station and a 15,000-kw. transformer bank installation at the Engleside power plant, to cost about \$125,000.

Texas Electric Railway, Dallas, Tex.—A new \$750,000 power plant will be built by the Texas Electric Railway and the Texas Power & Light Company on the north bank of the Red River in Oklahoma, 5 miles north of Denison, as soon as the United States Bureau of Indian Affairs approves the proposition. The Legislature of Oklahoma has already given authority for the construction of the plant.

Rutland Railway, Light & Power Company, Rutland, Vt.—A new 13,000-volt line is being built by this company to connect with the line of the Western Vermont Power & Light Company, a subsidiary.

Manufactures and Markets

Discussions of Industrial Conditions

A Department for the Manufacturer, Salesman and Purchasing Agent

Rolling Stock Purchases

Business Announcements

Trade Literature

Importance of Purchasing Manufacturers' Standard Electrical Apparatus

Low Cost and Best Delivery on Standard Equipment—Railways Foreseeing Requirements—Large Orders Expected During Present Year

BY J. G. BARRY

Manager Railway Department General Electric Company

Various elements in present market conditions are taxing the capacity of manufacturers of electrical apparatus to the utmost and as a result are substantially increasing the cost of the finished product and making early deliveries most difficult. Owing to the unprecedented demand for raw materials, the electrical manufacturer must place orders many months in advance of requirements and in addition face the uncertainty of transportation due to congestion of terminals, embargoes, etc.

The general prosperous business conditions have resulted in the placing of unusually large orders by railway companies during 1916 and at present. Inquiries indicate that railway equipment orders likely to be placed during 1917 will exceed orders booked for 1916. On account of these conditions railway companies which have not anticipated their requirements well in advance will be unable to obtain deliveries of apparatus sufficiently early to meet their requirements if apparatus not standard with the manufacturer is desired.

The advantages accruing to both the manufacturer and to electric railways by the purchase of standard apparatus are very great. Frequently a piece of electrical equipment requires a dozen or more different raw materials including steel bars, shapes and plates, rolled or drawn sections of copper, malleable or cast iron in various forms, composition castings and various kinds of insulating materials. Preliminary work must be done on most of this material before final fabrication, involving the use of molds, dies, punches, jigs, tools and machining. Deviations from the standard line must necessarily delay production and appreciably increase costs.

MANY MATERIALS IN DEMAND

The greatest difficulties have been experienced in securing material: for example, the delivery on some grades of sheet steel is now about twenty-six weeks as compared with four to six weeks under normal conditions. Deep stamping steel cannot be obtained. Even greater difficulty has been encountered in securing linen tape for the insulation of armature and field coils. In regard to electrical asbestos cloth and tape, formerly woven in England, the price is more than six times that paid in 1915, and, furthermore, it is impossible to purchase tape in large amounts. White mica for commutators formerly imported from India is no longer in the market and it is therefore necessary to use amber mica from Canada. While this substitute is equally serviceable and, on account of its greater density, tends to give a tighter commutator, considerable difficulty has been encountered owing to the lack of skilled hands capable of splitting the mica into the desired sheets. One of the important raw materials which has caused delay is copper wire or cable used for car equipments. Orders for this material cannot be filled in less than about six months and special sizes are likely to require a longer time.

With the present volume of business the manufacturer is able to purchase standard materials in large quantities and a long time in advance, thus producing at minimum cost and securing reasonable delivery. The manufacturer of small

lots of any type of apparatus and special parts will incur greatly increased costs, notably in the expense for setting up tools, jigs and machine fixtures. It may readily be appreciated that the manufacture of any special apparatus will delay the production of standard articles, reduce the output of the factory and consequently disrupt the entire process of production. It is evident, therefore, that the purchaser will gain both in delivery and price by ordering from the manufacturer apparatus which is standard.

An important consideration in the use of standard apparatus is the purchase of supply parts which are more likely to be carried in stock and can therefore be secured without waiting for manufacture. Greater refinement is also obtained in the complement of tools, jigs, dies, etc., used in the production of standard articles insuring perfect interchangeability of parts.

Purchasers of steam turbo-generating equipment have apparently foreseen their requirements for some time in advance, orders being booked for as long as two years from the present date. This equipment in the main is standard with the manufacturer and material can be ordered sufficiently in advance to meet schedules. Many purchasers of railway substation equipment are inclined to depart from standard products, thus encountering the same delays on motor-generators and synchronous converters as on railway motor equipments. In the case of switchboards, panels of special dimensions are sometimes required preventing the manufacturer from selecting material from stock.

Railways Face Hardships

Manufacturers Raise Prices, but Railways Cannot Follow—High Prices Prevent Big Increases in Business

BY B. A. HEGEMAN, JR.

President National Railway Appliance Company

That the railways of the country are facing hardships and will continue to struggle along until relief is obtained either through the lowering of prices or through the increase in rates, cannot be emphasized too strongly. Unless the Federal and State Government recognize this fact and permit the railways to charge more for their service, the railways cannot keep from being affected seriously in the near future. The manufacturer has increased the cost of his products with each increase in the cost of raw material, but the railway is not permitted to increase its fare. Another item of importance that must be taken into account is the increasing number of automobiles used for pleasure purposes. This does not include jitneys. There is not a day passes but that the railways lose many nickels on account of automobile owners inviting their neighbors or friends to jump in and ride down to work with them.

NEW BASIS FOR QUOTATIONS AND DELIVERY

At the present time, no quotations are made by the manufacturer except for immediate acceptance. This is the only course open to the manufacturer as he in turn must obtain all his raw material on the same basis. This company, whose principal products are tool steel gears and pinions, Johnson fare boxes, Perry side bearings, Hartmann centering plates, Wasson trolley bases, Garland ventilators, C. & C. electric arc welders, and railway varnishes and enamels, formerly had a considerable supply of its products on hand and was able to make prompt deliveries. Many of these accessories were made up in lots of one thousand each, but owing to the extensively high prices of raw materials, they are now made up to meet actual requirements. On most of the products, deliveries can be made within six weeks or two months. On the varnishes and enamels, however, or

ders can usually be supplied from present stocks. Prices have been increased steadily, and owing to the prevailing high prices, the railways are buying only absolute necessities.

MONEY-SAVING DEVICES BEST SELLERS

One of the largest economies being effected by railways at the present time is possible through the use of arc welding machines. They usually pay for themselves within a short time. Their most valuable use is to reclaim those broken parts which usually are thrown on the junk pile. Sales have been made to many railways of anti-friction, center or side bearings, and the prospects for the sale of this product are very good for the next year.

The railways are now showing more interest in buying as they have come to realize the conditions of traffic and the tendency of the market. At the present time the need for equipment on many roads is imperative, and much old equipment which is now in use will be promptly discarded as soon as prices are such that new equipment can be purchased. If war is declared, this need for rolling stock will be emphasized all the more, and as a consequence the roads will have to buy more equipment. In the general line of defense the electric railways will be utilized for transporting troops and supplies wherever it is found that they can be used advantageously.

Market for Used Machinery Never Better

Country Being Scoured for Equipment in Good Operating Condition—Demands Cannot Be Supplied—All Business Done on Cash Basis

BY FRANK MACGOVERN
President MacGovern & Company

During the last two years a marked expansion in different lines of the industrial world has been universally observed. Extraordinary demands have made for a condition which strikes the keynote of preparedness. Everywhere large additions have been made not only to establish enterprises but new fields of activity have sprung into life through necessity. New markets have been opened up to us, others have been largely confined to us, and at home we have been called upon to supply products which heretofore have been obtained through importation. These conditions have multiplied the need for power machinery far beyond the manufacturers' capacities to supply these needs within a reasonable time of delivery. Central service stations have been pushed to the utmost to meet the increased requirements for power. During 1916 additional generating capacity to the extent of 2,500,000 kw. was added to plants throughout the country. During the same year there was an increase of 23 per cent in kilowatt-hours generated and sold. Indications are that the central stations had combined gross revenues of over \$500,000,000, an increase of 15 per cent over the previous year.

DEMAND FOR POWER EQUIPMENT

It was not to be expected that large enterprises could have foreseen before the advent of changed business conditions the extraordinary demands which were to be made upon them for power equipment, and therefore their ability readily and quickly to increase their capacities to meet the requirements were limited. Unquestionably there has been a tremendous speeding up in production, but in some cases the attractiveness of a few war contracts has diverted from the possibilities of concentrating more thoroughly on the production of power machinery. All this has augmented the demand for used power machinery of every description, ranging from machines of small capacity to single generating units of 10,000 to 15,000 hp. capacity, chief among which are turbo units, reciprocating units, rotary converters, motor generator sets, frequency changers, transformers, induction and direct-current motors, boilers, pumps and condensing equipment.

The used equipment business is peculiar. It must keep in touch with a diversified class of equipment including electrical, hydraulic, steam and gas power equipment. Were it not for the fact that this business had been built up, not

necessarily from the standpoint of purchasing apparatus for re-sale, but more particularly in the nature of handling the necessary engineering details attending both the purchase and subsequent sale of the same, the uninterrupted production could not have been enjoyed by many who have turned to the used market for power equipment. Therefore this business has served its purpose in having contributed largely to the end that production can go on without delay. Moreover the practicability of installing high grade used electrical and steam power machinery has been proved to many whose needs for power equipment have had to be cared for with the utmost dispatch. Time was when used equipment was looked upon as something cast aside as no longer useful. There are many to-day, however, who have learned that this is not the case, but it needed just such a condition which has prevailed during the past two years to convince them to the contrary. Not only has a saving in price to purchasers been effected, but their requirements have been cared for promptly which otherwise would have been most difficult.

PROBLEMS INVOLVED IN PURCHASE OF USED EQUIPMENT

A large quantity of useless apparatus has been broken up for scrap because of a good metal market and this condition has made possible a better selection of saleable equipment for the reason that obsolete and no longer useful apparatus could be disposed of as metal. The saleable equipment has therefore been retained for immediate use. Everything purchased must necessarily be closely inspected by competent men who by reason of special training and experience are able to note hidden defects and provide for possible repairs in the purchase price. Freight rates, conditions for removal, possibilities for quick disposal and a hundred other trade conditions are necessary before a purchase is consummated. The business itself should be conducted on a cash basis in so far as possible. This refers to both purchases and sales. Any other terms of payment would not be attractive to a company who realizes the uncertainty of the present demand. Conditions of the times are intensifying the need of a used market. Therefore, this company buys only for cash and in this respect is unique in so far as its obligations are concerned. This is a remarkable business especially when one appreciates that in 1916 used power equipment was traded in to the extent of \$50,000,000, which otherwise through the lack of a well built up market would have gone into the scrap heap or have laid idle for a considerable length of time to become possibly obsolete and necessarily to deteriorate in value.

MARKET FOR USED EQUIPMENT EXCELLENT

Owing to the fact that a good sound market has been created for the disposal of apparatus it has been possible for a vast amount of apparatus to be gathered together on more scientific lines than heretofore. It is thus made use of at a time when more than ordinary profits have been taken by the buyers. This has not only benefited the manufacturers themselves, but thousands upon thousands of skilled labor employees. The market conditions at present are possibly as good and sound as they ever will be. There must, however, come a time when business in general will settle down to normal transactions and when that time comes the values of to-day will depreciate materially. We are constantly called upon to supply apparatus which we do not have in stock at the moment. The wise owners of unused or obsolete apparatus would do well to list it for its ultimate disposal and that without delay. It necessarily follows that opportunities for quick disposal are everywhere apparent and we know of no better market conditions for the future than those which we are experiencing to-day in reviewing our daily correspondence.

Conservation, preparedness and business thrift are three salient factors upon which the bulwark of the used power equipment business has been established. The secret of successful operations in this line of business endeavor is solely dependent upon the power of distribution. It is a very simple matter to buy up tremendous quantities of apparatus, but to survive and thrive this apparatus must be disposed of. Each and every business transaction negotiated for must ultimately be consummated with satisfaction existing on both sides and any other kind of business policy cannot hope to succeed.

Large Subway Car Order Taken by Pullman

Details of Recent Bids for Interborough Car Bodies, Motors and Trucks

As noted in the *ELECTRIC RAILWAY JOURNAL* of March 10, the bids for the car bodies have been opened and the Pullman company was awarded the order, subject to the approval of the Public Service Commission. Bids were received on motor-car bodies, trail-car bodies, motor trucks and trailer trucks. The lowest bid on the motor-car bodies with all accessories included as specified by the railway, as submitted by the Pullman company, was \$4,670, the next lowest, as submitted by another carbuilder, \$4,965 and the highest bid \$5,795. On the trail-car bodies, these bids were \$4,555, \$4,765 and \$5,594 respectively, the lowest bid being the Pullman bid.

Bids on the trucks varied according to the deliveries promised. The lowest two bids for motor trucks were \$1,126 and \$1,130 and for trailer trucks \$904 and \$934. Although one bidder's estimate was \$137 less on trucks than the Pullman bid which provided for the use of the Commonwealth Company's cast-steel frame, the delivery was not quick enough to satisfy the railway company.

Delivery on cars has been promised by the Pullman Company at the rate of five cars and ten trucks per day beginning eight months from date of the placing of the order. Three of the bids for cars provided for delivery in six months of the rate of six, five, and three cars per week respectively, one bid provided for delivery in seven months of six cars per week, one bid provided for delivery in eight months of from ten to twelve cars per week and one bid promised eight cars per week in thirteen months.

The order for motors was divided equally between the General Electric Company and the Westinghouse Electric & Manufacturing Company. The first named company will furnish 337 GE-260 motors of 200 hp. each and 168 Sprague-General Electric d.c. control equipments, while the Westinghouse Company will supply 337 type 577R motors and 168 sets of ABFD automatic battery field drum control equipments. Each of the above orders for motors amounts to more than \$1,000,000.

PREVIOUS INTERBOROUGH ORDERS TO PULLMAN

The following statements in regard to the order are based on an interview with an official of the Pullman Company.

The car-manufacturing plants of the Pullman Company are located in the southern part of the Chicago industrial district. These plants are engaged in building and repairing cars for Pullman sleeping and parlor-car service, also in building steel freight cars and steam-railroad passenger coaches. In recent years the Pullman Company is said to have built about 70 per cent of the steam-railway passenger cars ordered from car builders for service in this country. These great plants have grown with the transportation industry and include the most modern equipment for economical and fast work.

So far as the electric railway field is concerned the Pullman Company has shown interest only in the larger car orders. That is, orders of equipment that have been fairly well standardized for large lots. During the rehabilitation period of the Chicago Surface Lines, it ordered from the Pullman Company 950 large double-truck pay-as-you-enter street cars of a standard design, with steel underframes and wood superstructures. The Interborough Rapid Transit Company has placed other large orders with the Pullman Company. In March, 1915, when steam-railroad car-building work was slack, the manufacturing department of the Pullman Company received an order from the "Interborough" for 478 car bodies and 974 trucks, and in November of the same year another order from the same company was received for 311 bodies, 246 motor trucks and 405 trailer trucks. The entire lot of 789 bodies was of one design. The production capacity of the company is better realized when it is stated that these all-steel subway cars were manufactured complete at the rate of ten per day.

The order for which bids were recently received includes 377 motor car bodies, 140 trail car bodies, 337 motor trucks and 617 trailer trucks. Delivery is contingent upon the availa-

bility of steel and other construction materials. No work will be done on the construction of the bodies until October, 1917, when shop capacity will be available at the Pullman works for building at least five cars a day.

Inasmuch as the Pullman Company's manufacturing plant is just completing the construction of nearly 800 of this design of steel subway car it was in the best position to quote on the new lot. Shop procedure and production costs for this design were well understood and the Pullman Company has a complete equipment of dies and templates for the proportionately large number of special pressings and forgings incorporated in the subway car design. The trucks included in the recent order for subway cars are to be built by the Pullman Company. The design differs from that heretofore used by the subway. The new trucks will include the Commonwealth Steel Company's cast-steel frames.

President Names New Tariff Board

President Wilson has selected the following men to serve as members on the new tariff board: W. S. Culbertson, Kansas; William Kent, California; David J. Lewis, Maryland; E. P. Costigan, Colorado; Daniel Roper and Prof. Frank Taussig. Professor Taussig, who will act as chairman, has held the chair of political economy at Harvard. Mr. Culbertson was formerly in the legal department of the Federal Trade Commission and is considered an expert in tariff matters.

CURRENT PRICES FOR MATERIALS

Quoted Wednesday, March 15

Copper (electrolytic)	New York, 36 cents per pound
Rubber-covered wire (base).....	New York, 40 cents per pound
No. 0000 feeder cable (bare).....	New York, 37½ cents per pound
No. 0000 feeder cable (stranded)...	New York, 35 cents per pound
No. 6 copper wire (insulated).....	New York, 37½ cents per pound
No. 6 copper wire (bare).....	New York, 37 cents per pound
Tin (straits)	New York, 54 cents per pound
Lead	New York, 9½ cents per pound
Spelter	New York, 10¾ cents per pound
Rails, A. S. C. E., O. H.	Mill, \$40 per gross ton
Rails, A. S. C. E., Bess.	Mill, \$38 per gross ton
Wire nails	Pittsburgh, \$3.20 per 100 pounds
Steel (bars)	Pittsburgh, 3¾ cents per pound
Sheet iron (black, 24 gage).....	Pittsburgh, 4.85 cents per pound
Sheet iron (galv., 24 gage).....	Pittsburgh, 6.55 cents per pound
I-beams over 15 in.	Pittsburgh, 10 cents per pound
½-in. galv. extra high strength steel wire.	New York, \$7.04 per 100 ft.
¾-in. galv. high strength steel wire....	New York, \$3.52 per 100 ft.
¾-in. galv. Siemens-Martin wire.....	New York, \$2.60 per 100 ft.
5/16-in. galv. Siemens-Martin wire....	New York, \$2.00 per 100 ft.
Galvanized barb wire and staples.....	Pittsburgh, 4.05 cents per pound
Galvanized wire (ordinary).....	Pittsburgh, 3.85 cents per pound
Cement (carload lots) with rebate for sacks.	New York, \$2.02 per barrel
Cement (carload lots)	Chicago, \$2.06 per barrel
Cement (carload lots).....	Seattle, \$2.60 per barrel
Sand in large lots.....	New York, 50 cents per ton
Linseed oil (raw, 5-bbl. lots).....	New York, \$1.01 per gallon
Linseed oil (boiled, 5-bbl. lots).....	New York, \$1.02 per gallon
White lead (100-lb. keg).....	New York, 10¼ cents per pound
Turpentine (dbl. tots).....	New York, 50 cents per gallon

OLD METAL PRICES

Copper (heavy).....	New York, 30 cents per pound
Copper (light).....	New York, 24¾ cents per pound
Red brass	New York, 20 cents per pound
Yellow brass	New York, 19 cents per pound
Lead	New York, 8 cents per pound
Zinc	8 cents per pound
Steel car axles.....	Chicago, \$34 per net ton
Iron car wheels.....	Chicago, \$18 per gross ton
Steel rail (scrap).....	Chicago, \$26.50 per gross ton
Steel rail (relaying).....	Chicago, \$34 per gross ton
Machine shop turnings.....	Chicago, \$9.25 per net ton

ROLLING STOCK

Jamestown (N. Y.) Street Railway had a double-truck car, valued at \$7,000, destroyed in a fire which damaged the building and other cars to the extent of about \$13,000.

Trenton & Mercer County Traction Company, Trenton, N. J., noted in the *ELECTRIC RAILWAY JOURNAL* of March 3 as being in the market for ten double-truck city cars, has placed the order with the J. G. Brill Company. These cars will seat forty-eight passengers, will be equipped with 26-in. wheels and 4 GE 258 motor equipments. The air brakes will be furnished by the Westinghouse Air Brake Company.

New York State Railways, Syracuse Lines, noted in the *ELECTRIC RAILWAY JOURNAL* of Feb. 24 as being in the market for twenty-five double-truck cars for city service, has placed the order for this equipment with the J. G. Brill Company. These cars are of the front-entrance, pay-as-you-

leave type, and will cost in the neighborhood of \$200,000. They will be equipped for two-car operation.

North Carolina Public Service Company, Greensboro, N. C., noted in the ELECTRIC RAILWAY JOURNAL of Feb. 3 as having ordered fifteen light-weight, single-truck, double-end cars from the American Car Company, has specified the following details for this equipment:

Seating capacity	28	Gears and pinions.....	Westinghouse
Length over bumpers,	27 ft. 9½ in.	Hand brakes.....	American Car
		Heaters.....	Peter Smith (electric)
Length over vestibule,	26 ft. 9½ in.	Headlights.....	Golden Glow
		Journal boxes	Brill
Width over all.....	7 ft. 10 in.	Lightning arresters,	Westinghouse
Height, rail to trolley base,	11 ft. 7 in.	Motors, type and number,	Two, West. 506-A
Body, wood, semi-steel or all		Motors, outside or inside hung,	Inside
steel	Semi-steel	Sash fixtures,	Dayton Manufacturing Co.
Interior trim	Polished bronze	Seats, style,	American Car reversible
Headlining.....	Rafter finish	Seating material.....	Rattan
Roof, arch or monitor.....	Arch	Springs	Brill
Air brakes	Westinghouse	Tread treads	Feralun
Axles	Brill	Trolley base	Westinghouse
Bumpers	American Car	Trucks, type,	Brill single, 78-M-1
Car trimmings	Brill	Ventilators.....	Railway Utility Co.
Control, type	G. E., K-10-Q	Wheels (type and size),	24 in., cast chilled
Couplers.....	American Car pull bar		
Curtain fixtures,	Curtain Supply Co.		
Curtain material.....	Pantasote		
Designation signs.....	Hunter		
Door operating mechanism,	National Pneumatic		

TRADE NOTES

Chandler & Company, Inc., New York, N. Y., announces the removal of their offices to the sixth and seventh floors of the Franklin Bank Building, Philadelphia, Pa.

William A. Hayes has been appointed receiver of the Street Railway Signal Company, a \$100,000 Delaware corporation doing business at Philadelphia, Pa. The appointment was made as a result of a creditors' bill of complaint which was filed recently asking for a receiver.

National Lumber Manufacturers' Association, Chicago, Ill., has established a retail service and has engaged men to make a study of retail conditions. Walter H. Bell and H. R. Isherwood are now constantly on the road working in conjunction with the manufacturers to develop their sales.

F. C. Stieler, who has been connected with the New York office of the Westinghouse Electric and Manufacturing Company for the past eight years, has resigned, effective March 15. He is now handling canvas conveying belting for the Imperial Belting Company, 42 Broadway, New York City.

Frank L. Gordon, Western sales manager, American Brake Shoe & Foundry Company, has been appointed assistant to the vice-president, with headquarters in Chicago, and L. R. Dewey, formerly a member of the sales department, has been appointed to succeed Mr. Gordon as Western sales manager, with headquarters in Chicago.

American Electric Tool Company, Petersburg, Va., at a recent meeting elected a new board of directors. The officers of the company are as follows: I. C. Shore, president; B. Mason Hill, vice-president; David A. Lyon, secretary and treasurer, and Louis Paulero, general manager. This company is engaged in the manufacture and sale of the Paulero electric hammer.

Joseph T. Ryerson & Son, Chicago, Ill., announce in connection with the readjustment of the departments heretofore under the direction of the late Edward T. Hendee the following appointments: C. E. Pynchon, manager of sales in the machinery department, including domestic and export, and Howard Gray, manager of sales in the railroad department.

Holden & White, Inc., Chicago, Ill., general sales agents for the Garland Ventilator Company, announce that an order has been received from the Cincinnati Car Company for 400 Garland ventilators for installation on new cars of the Public Service Railway, Newark, N. J. This company, also general sales agents for the Wasson Engineering & Supply Company, has received an order from Bion J. Arnold for twelve Wasson air-retrieving trolley bases for use on the Elgin & Belvidere Electric Company, which is owned by Mr. Arnold.

Peabody, Rice & Wilson, electrical engineers, Johannesburg, South Africa, announce that Philip Herd, Johannesburg, having entered into partnership with them, they shall henceforth cease to trade under the name of Peabody, Rice & Wilson. The title of the new firm will be: Rice, Wilson &

Herd. Mr. Herd has been associated with the South African interests of the British Thomson-Houston Company, Ltd., of Rugby, and the General Electric Company of Schenectady, N. Y.

Frank B. Kennedy has joined the Dayton Fare Recorder Company, Dayton, Ohio, as sales manager. Mr. Kennedy has been located at New Haven, Conn., for the past twenty-two years with various manufacturers of fare collecting and registering devices. He began in this field as assistant secretary of the New Haven Car Register Company, was later made secretary and manager of the Recording Register and Fare Box Company, and for the last three years has been vice-president and manager of the New Haven Trolley Supply Company.

Railway Improvement Company, New York, N. Y., has received an order for Rico sanitary straps to be used on the new cars being built for the Northern Ohio Traction & Light Company by the St. Louis Car Company; also for Rico sanitary straps for the cars being built by the Cincinnati Car Company for the South Covington & Cincinnati Railway; for ten cars being built for the Wilmington & Philadelphia Traction Company by The J. G. Brill Company, and for 1540 new Rico No. 7 sanitary straps to be used on the cars of the United Railways & Electric Company, Baltimore, Md. The Rico No. 7 Railway Improvement Company's new strap is of bakelite composition. The company has also received an order from The J. G. Brill Company for anti-climbers to be used on the fifty cars being built for the Montreal Tramways.

ADVERTISING LITERATURE

Van Dorn Electric Tool Company, Cleveland, Ohio, is distributing circular No. 56 which describes external, aerial and bench types of electric grinding machines.

Peter A. Frasse & Company, Inc., Hartford, Conn., is distributing a folder on its oxy-acetylene process for repairing parts made of different metals.

Sangamo Electric Company, Springfield, Ill., has issued bulletin No. 45 which describes a mercury motor type of ampere hour meter.

Abrasive Company, Philadelphia, Pa., has issued catalog No. 6 describing a line of grinding wheels including those made from two special abrasives, Boro-Carbene and Electro-lon.

Ingersoll-Rand Company, New York, N. Y., has issued catalogs No. 3037 and 3038 containing illustrations and descriptions of straight line and duplex types of dry vacuum pumps.

Automatic Ventilator Company, New York, N. Y., has issued a folder describing a new development in the form of the Flower brush holder for the slip ring side of rotary converters.

General Electric Company, Schenectady, N. Y., is distributing bulletin No. 44,001-K, which is a price-list on renewal parts and supplies for car equipment, mine locomotives and railway and mine line material.

Vanadian-Alloys Steel Company, Pittsburgh, Pa., has issued a folder describing three brands of carbon tool steel with data on the uses to which they may be put and the shapes in which they are supplied. A standard list of extras is included in the folder.

Boss Nut Company, Chicago, Ill., has issued a pamphlet on the "Boss Lock Nut and Its Home." In this pamphlet various stages of the manufacture of these nuts are shown, as well as its application to locomotive trailer trucks, passenger car draft rigging, railway frogs and to arch bar trucks.

Van Emburgh & Atterbury, New York, N. Y., have compiled a sixty-six-page book dealing with the finances of the Interborough-Consolidated Corporation, with especial reference to conditions when the new rapid transit lines shall have been completed. The book is divided into three sections, the first explaining the financial structure of the corporation, the second presenting pertinent financial statements of parent and subsidiary companies, and the third outlining the future. It is said that by 1921 there will probably be a balance sufficient to meet 6 per cent on Interborough-Consolidated preferred stock and provide a substantial sum for returns on the common stock of that company.