Electric Railway Journal

Published by the McGraw Publishing Company, Inc.

Consolidation of STREET RAILWAY JOURNAL AND ELECTRIC RAILWAY REVIEW

Vol. XLVII NEW YORK SATURDAY, JANUARY 1, 1916 No. 1

The statistical and outlook features of this special number of the Electric Railway Journal have three objects: They aim (1) to present a summary of 1915 electric railway facts; (2) to interpret these facts in the light of present knowledge, and (3) to suggest the probable lines of progress in the immediate future.

1915 A BUSY YEAR FOR THE "JOURNAL"

From the editorial point of view the past year presented many interesting problems emphasizing the newspaper character of the ELECTRIC RAILWAY JOURNAL. Take the rise of the jitney, for example. As soon as it appeared on the Pacific Coast like a cloud no bigger than a man's hand, the editors detected the coming storm and began to warn the industry. Jitney news and special articles received prominent positions from the start, and no trouble or expense was spared to render the service effective. Special emphasis was laid on the economic phases of the jitney. The San Francisco convention issues are worthy of mention also. A special pre-convention issue was prepared to portray the electric traction situation in the West. Reporting the convention required a division of the editorial staff and a close co-ordination of effort to permit the mailing on Saturday in New York of a full report of the proceedings up to and including those on Friday, with a difference in time of three hours in the wrong direction. The proceedings and abstracts of some papers were telegraphed, and with the hearty co-operation of the association officers the program went through on schedule. Other conventions, including the mid-winter meeting of the association in Washington and a number of State and sectional meetings, were handled on a newspaper basis also. Realizing the importance of getting reports of association activities to the industry while they have news value, the JOURNAL segregated American Association news and provided for the immediate publication, in complete but condensed style, of every significant event. Among the other many important events reported during the past year were the Chicago smoke abatement and terminal electrification commission report, the report of the Bureau of the Census on street and electric railways, those of many commission and arbitration board rulings, several important steam railroad electrifications and other notable developments in the field of electric railway operation.

THE UPKEEP OF THE ROLLING STOCK

The pages of the two volumes of the ELECTRIC RAILWAY JOURNAL published during 1915 afford an unusual opportunity for master mechanics each to learn what the others have been doing, for never before have so many contributed the results of their efforts to our columns. The routine of shop work is more or less monotonous, but there is plenty of interesting development to keep the wide-awake man out of the ruts. The most interesting of these developments eventually take form in the reports of the Engineering Association committee on equipment which has recently given special attention to axles, gears and pinions, steel wheels and air-brake hose. The past year was an economy year, shortage of funds for new equipment furnishing a stimulus for the rehabilitation of equipment on hand. A number of men have told how they repaired motors of old types for the purpose of reducing maintenance costs. It is an interesting problem to determine just when it pays to scrap old motors to secure the benefits of improvements in design and manufacture, but there is no question as to the importance of making the most of those in use. Hard service brings out inherent weaknesses in design and construction, and ingenuity points the way for their elimination. The series of articles on equipment defects, by C. W. Squier, printed in Vol. XLV, is an epitome of the kind of work in our line which is being done by alert master mechanics. The work of inspection and "rejuvenation" is facilitated by the design of the modern car shop. A number of mechanical departments have been fortunate in being newly housed recently. We have selected for description during the past year, as typical of good practice, the new shops in Cleveland, Ohio; Springfield, Ohio; Holyoke, Mass., and Monroe, Tex.; and those of the Mesaba Railway on the frontier of Minnesota. While these cover a wide range in size, equipment and location, they all show a purpose to provide comfortable working quarters and to arrange mechanical appliances to minimize labor costs.

The General Staff and the Electric Railways

THE interesting information comes from Gen. George H. Harries that the General Staff of the United States Army is considering the possibilities of using the electric railways of the country for the transportation of troops and supplies in case of war and that with this end in view it has now practically decided to have a complete survey of all the electric railway lines made. There is no doubt, as we pointed out in our issue of Nov. 20, that the electric railway lines of the country, especially those along the coast, possess great strategic advantages and that a tabulation of the routes, running times, power capacities, supply of rolling stock and data on clearances and other necessary information about interconnections would be very helpful for the movement of troops and supplies. The plan of utilizing the electric railways in this way has been indorsed in the columns of this journal by Major-Gen. William A. Bancroft, of the Boston Elevated Railway, and by Dr. Louis Bell, who took an active part in the engineering corps organized to look after the defenses in Boston during the Spanish war, so that the interest in the plan by the General Staff of the Army is not unexpected. In supplying the information required at Washington, the electric railway companies of the country have a patriotic duty which we know they will cheerfully perform.

Chief Features of 1915 Electric Railway Statistics

AN analysis of our annual rolling stock and track statistical tables, published elsewhere in this issue, shows the year 1915 to be unusual in three significant respects. In the first place, there was a marked depression in the electric railway business for the first three quarters of the year, a condition which is reflected by the 10 per cent falling off in total rolling stock orders and 11 per cent decrease in mileage of new track placed in operation, as compared with the previous year. The reduction is general in character, as may be shown from several angles of analysis, *i.e.*, as regards number of city, interurban, or miscellaneous cars ordered, mileage of new city or interurban track and number of companies ordering cars or building track. A reduction in mileage is likewise shown for all the regularly classified geographical groups of States except the Western group, where a large and increased amount of new interurban line is shown owing to the completion of a few individual projects in Utah, Kansas, Oregon and Oklahoma.

This slump in railway orders, however, is qualified by two compensating facts of significance. One is that the total rolling stock decrease is not characteristic of the last two months. During this latter period, purchasing activity revived to the extent that our rolling stock columns recorded orders for 739 cars as against only 172 during the same period in 1914. It is only fair to credit part of this revival to the current inclination among many railway companies to order their next summer's car equipment in advance of the usual buying season for the purpose of allowing for tardy deliveries, owing to the present overcrowding of manufacturing plants with war orders. Even neglecting this consideration, however, the rolling stock orders of the last two months are well in excess of any two heavy buying months of the preceding year, and there still remain a large number of railways which have not yet prepared their budgets for the ensuing year. In regard to the second compensating fact, although the track building business seemed threatened with starvation, there was a corresponding increase in mileage of electrified steam railroads placed in operation, so that the total mileage of track newly placed in electric operation is about the average for the last four years. This electrified mileage, it is interesting to note, is almost 100 per cent in excess of any other similar annual figure. Thus, while the city and interurban electric railways practically ceased new construction, initial electric service was inaugurated on three main-line sections of important trunk-line railroads, and operation was begun or extended on four other lines, as shown in detail on the statistical pages.

Refinements Mark 1915 Track Development

CONSTRUCTION, maintenance and renewals of track in paved streets have commanded unusual attention on the part of way engineers in the year just passed. Interest in track materials of all kinds also has not lagged. The way committee of the American Electric Railway Engineering Association, through its recommended standards for track construction and special work, has done much to crystallize opinion in these two departments. Standards and specifications for splice bars and rails were adopted by the association some time ago so that the track structure, so far as the way committee is concerned, is pretty well standardized. The difficulty now appears to be to interest engineers sufficiently to make them use these specifications and standards. Many continue to exercise their prerogatives and persist in incorporating their individual ideas in new track designs. Whether, as time goes on, there will be a gradual leaning toward the more general use of the approved standards is difficult to predict. Many arguments have been presented in favor of adhering to these standards which, we believe, represent the best engineering practice, but so far they have availed little. Dollars and cents arguments are the kind that convince the average railway engineer, and it appears that little progress will be made until it can be shown that a longer life at a lower unit cost can be

obtained by using a recommended standard, adopted after exhaustive study, than from a design that represents an individual's ideas.

Little or no new development in track foundation designs or construction methods has come to light recently. Ballasted construction predominates, and there is an increasing demand for the construction consisting of a concrete slab with a sand or crushed-stone ballasted cushion beneath the ties. In some instances this slab construction has conformed to the standard recommended by the way committee, and the track slab joins the concrete foundation supporting the pavement. In other designs, only a flat slab has been provided which leaves the edges of the ballast cushion exposed to drainage from the sub-soil beneath the adjoining pavement. Foundation construction of this kind is quite certain to develop defects which will not obtain in those types in which the cushion is completely confined.

Concrete-beam track construction, which to all intents and purposes has been a failure in America, still has some advocates and, in fact, has given good service in some localities. A modified type of beam construction has been designed and installed by the Southern Public Utilities Company at Anderson, S. C. The provision of additional bearing area beneath the rail base as a preventive against concrete failure, extra reinforcement at the joints and wooden washers to compress under load to make up for shrinkage in the concrete are features which should improve the results obtained from this type of construction. While the beam type of construction, or track laid on a concrete slab without cross-ties other than enough to serve as anchorages, has been unsatisfactory in this country, it has been used successfully in Europe for a great many years. In fact, a large part of the English track construction is laid in this manner, but special provision has been made against failure of the concrete beneath the rail base. Absolute rigidity in track construction seems to be the acme of perfection in the minds of the English tramway engineers, whereas American way engineers have concluded that some flexibility is necessary to prolong life and reduce track and rolling stock maintenance to a minimum.

Doubtless the most marked development in the track structure has been the return to the more general use of steel ties. While Brooklyn reports that 18.6 years' use made less than 40 per cent of the long-leaf yellow pine ties useless for further service, and treated and untreated hardwood ties have been reported as giving a service life even longer than this, the indestructibility of the steel tie in many soils has been a strong argument in its favor. At the beginning of the European war, there appeared to be some possibility that the scarcity of creosote would restrict the use of creosoted ties, but American producers have adjusted themselves to the situation and have practically supplied the demand. The price of hardwood ties has advanced materially, but this alone was not responsible for the increased demand for steel ties. When the steel tie was redesigned to embody the flexibility offered by wooden ties and to supply a sufficient bearing area to prevent destruction of the concrete through abrasion and at the same time could be sold at a reasonable price, it overcame the objections to former designs and its popularity in street railway track was a foregone conclusion. The principle of one form of the steel ties has also been adapted to the foundation supports of steam and electric railway crossings, where it is giving an excellent account of itself.

Taking up now the subject of pavement, it is undoubtedly the source of more friction with municipal authorities than any other part of the track construction, just as its cost of maintenance is increasing more rapidly than that of any other single item in the track. If the expense of the pavement, which is the heritage of horse car days, could be removed from the electric railway plant cost, it would, in a measure, make up for the diminishing returns due to longer average hauls. Granite block ranks first in the minds of way engineers as a material for paving the track allowance on heavy traffic streets, and treated wood block and brick come next in favor where the traffic is lighter. A comparatively new development in pavement construction that has attracted the attention of not only way engineers but the whole pavement industry is the substitution of a mortar or dry sand and cement mixture for the sand cushion now so generally used. An examination of pavements in service reveals the fact that the presence of the sand cushion has been the source of more pavement failures, perhaps, than the traffic that moves over the surface. The mortar cushion obviates most of these difficulties, as has been shown by the experience of more than ten years on some properties, and without doubt but few progressive way engineers will use anything but this type of cushion in their future pavement construction.

Labor-saving tools, including electrically-operated cranes and shovels, concrete mixers, rail grinders and drills have replaced hand tools, and it seems very probable that the pneumatic tamper, recently introduced on steam roads, will replace the tamping bars and picks on electric railways. While the difficulty of obtaining good labor has been a factor in forcing the introduction of labor-saving machines, reduction in construction costs as well as speeding up operations have been the real cause of their general adoption. Wherever street widths and construction conditions will permit, dump cars of various sizes have also replaced teams and wagons and effected considerable savings. Experience has also shown that the best quality of track construction is obtained on force account rather than by contract, hence most companies have fitted themselves with full construction and maintenance equipment. In other words, most way engineers realize their responsibilities and exercise extraordinary diligence in the selection and installation of track materials.

Rails and special work, of course, are an essential part of track construction, but the problems in connection with them are of such great importance that they will be considered in a separate article, appearing on the following page.

The Problems in Rails and Special Work

WE have referred briefly in the general editorial on track construction to the question of standards in rails and special work and to the action of the association thereon, but there are other questions in connection with both of these subjects which demand treatment in any general review. One of these is the matter of rail composition and method of manufacture, and in that connection reference should be made to titanium treatment, which as a means of insuring uniformity in the chemical analysis of the metal, is being quite generally specified. The announcement that vanadium steel for rails had sucessfully passed the laboratory and strength of materials tests also indicates that the use of this alloy, which has been so successful in other fields, may also become an important factor in the manufacture of track rails. Greater hardness as a preventive against rail corrugation seems to afford at least a partial remedy, and reports indicate that vanadium steel furnishes this desired quality and, at the same time, increases the elastic limit. Mayari steel rails also were laid for the first time in Worcester, Mass., in 1915. This is a nickel-chromium composition concerning which W. C. Cushing's report on special steels to the International Railway Congress Association, spoke so favorably. In design, there has been progress in the theory that the shape of the rail has a good deal to do with the problem which has been so elusive up to this time, that of corrugation. Further developments in this direction would be welcome.

If the demand for welded and riveted joints continues to grow, it appears to be but a question of time until use of the strictly mechanical joint for sub-surface track construction will become an obsolete practice. The various forms of welded and riveted joints now being used have proved beyond question the many advantages which can only be obtained with this form of construction. Joint life largely measures the rate of track depreciation, hence, security in this particular is certain to reduce maintenance costs. Fortunately for the industry the cost of the various types of special joints is somewhat lower than formerly, a condition perhaps largely due to the increased demand. On the other hand, the fact that the welded and riveted joints greatly diminish difficulties at this point in the track has made higher first cost less of an obstacle barring the way to their general adoption. Portable welding outfits which can be purchased at a reasonable cost, have put electric-welded joints within the reach of every electric railway property, and they have been largely responsible for the increased demand for joints of this type.

On larger properties, where the outfit necessary to install cast-welded joints can be afforded, it is being used very successfully. Many years of service have demonstrated beyond a doubt that objections to the cast-welded joints have been largely theoretical and that the percentage of joint failures is relatively small. Where a large number of joints are to be installed the Lorain electric welds continue to be used while the Thermit process continues to be popular, especially on account of its convenience. Other special riveted and welded joints are being installed locally but have not obtained wide popularity.

At the outbreak of the European war some fear was expressed that the manufacturers of special work would suffer thereby through a lack of ferromanganese, but this has not proved to be the case to any appreciable extent. Recent service records indicate that improvements in foundry practice and heat treatment have overcome many of the difficulties inherent in the earlier manganese steel crossings, and more uniform results are being obtained. Some changes in design were necessary to accomplish this end and, perhaps, the most advanced step taken has been the introduction of standard specifications for the manufacture of manganese steel special work. These specify not only the chemical analysis and finish but recommend design limitations which will insure increased serviceability in manganese steel special work. Some difficulties at present appear to be insurmountable, namely, the complete elimination of segregation, but a rearrangement of the supporting webs has removed this weakness from the crucial points of crossings, thus insuring a longer wear life.

Special-work experience on the Pacific Coast which was described in detail on page 576 of the March 20, 1915, issue of the Electric Railway Journal, bears out the results of our investigations of this subject and shows that the same difficulties have been experienced throughout the country. However, the hope is held out that the improvements pertaining to the more recent designs will overcome many of these objections. Insert special work, particularly that where the plate is set on a spelter bed, was found objectionable, because it was practically impossible to reset the loose inserts securely in the field. The general tendency appears to be that the demand for inserts set on partially or completely machined bearings is on the increase, and we confidently predict that in the course of the next few years only that type of construction will be sold to roads where dense, heavy traffic obtains.

Another phase of special work design which has attracted much attention during the past year has been the question of providing a flange bearing. Experience with this type of construction in Kansas City, Mo., indicates that the objections to a shallow flangeway are only theoretical, and that even the chilled-iron wheel does not develop chipped flanges in operating over flange-bearing crossings. On the other hand, the elimination of the heavy blows struck at track intersections not only prolongs the life of the crossing and the supporting structure, but removes the cause of numerous incipient defects that develop in the rolling stock. Provisions for flange bearings and the rate of incline in the approach to a flange bearing were included in the specifications for special work adopted at the San Francisco convention.

Changes in the Power Station

AS was to be expected in an "off" electric railway year the power plant was not the scene of any sensational development during 1915. Nevertheless the year was one of substantial progress. A most notable event was the adoption of a standard boiler code by the American Society of Mechanical Engineers after years of work on the part of a special committee appointed to prepare it. The effort necessary to bring this proposition to a satisfactory conclusion and to harmonize conflicting interests was comparable with that now being exerted on the proposed national electrical safety code mentioned elsewhere. This code includes boiler design, construction and materials. It is therefore analogous to only a part of the electrical safety code.

Some progress has also been made in the direction of a more rational unit for rating boilers, at least to the extent of an increasing recognition of the inadequacy of the old nominal horsepower rating. There are two inconsistencies in present practice. In the first place it is ridiculous to rate a boiler in horsepower, because this rating, if anything but nominal, must involve the water rate of the engine or engines furnished with steam by the boiler. Second, the output of a boiler depends very largely upon the furnace. Hence a unit should be used which will permit the separation of the furnace from the boiler proper.

The committee on power generation of the A. E. R. E. A. emphasized last year the importance of more systematic accounting in this field and outlined a general plan for keeping records which should make the interchange of data more practicable. Obviously the more readily comparable the data from different power plants can be made the more rapid will be the advance in power generation economy. One result of interchanging data will be a better realization of the fact that the nature of the load is related to the cost of energy.

This journal has more than once directed attention to the high cost of peak-load power. Where power is purchased there is no difficulty in realizing this cost as the terms of the contracts specifically include it. It is more difficult to comprehend when a company is generating its own power.

One of the most significant events in the history of electric railway power generation occurred recently when the splendid Ninety-sixth Street power plant of the New York Railways in New York City was shut down because it could not compete with the remodeled Seventy-fourth Street plant of the Interborough Rapid Transit Company, which supplies power to the New York Railways. The latter plant now contains three steam turbine generators of 30,000 kw. each, rendering obsolete the great Corliss engines which once made the Seventy-fourth Street plant famous. Large power-generating systems, large individual plants and small plants as well are being made over to enable them to profit by the advances in machinery design. An instance of the "rejuvenation" of a small plant, that at Springfield, Ohio, was described in a recent issue of this paper. In this plant a novel form of condenser was employed, one in which the surface and jet types were combined. This invention suggests that the condenser still furnishes a fertile field for the ingenious designer.

The electrical end of the power plant has kept pace with the steam end, although the problems met by electrical designers are not of general interest. The manufacturers of electrical machinery are endeavoring to obtain consent to permit it to be run hotter, under certain conditions, than was formerly considered desirable. As it is the permissible rise in temperature which largely determines the weight of electrical apparatus, it is to the advantage of all concerned to have it operate at as high a temperature as is possible without involving excessive maintenance costs. As the radiating surface in electrical apparatus increases less rapidly than the volume, the difficulty of radiating heat becomes greater as the capacity of a unit is larger. Users appreciate this, but they wish their generators and transformers to have long life, hence are reluctant to permit greater temperature rises. The standards committee of the A. I. E. E. is taking a conservative position in the matter.

Electrification for Freight Service

FROM the commercial standpoint, it may be said that not even a good start has been made in exploiting the opportunities for profitable installations of electric operation on steam railroads. This condition of affairs is chargeable to many causes, of which the majority are, perhaps, indirect and more or less obscure. Among them, the "battle of systems" has played an important part in the past, but at the present time, when actual results have displaced estimated figures, the industry has settled down to a general acceptance of the belief that in most cases the proper choice of "system" is not open to question and that with the cases that are on the border line there is not enough difference between them to be worth much argument. On the other hand, there is no doubt but that the success of electric operation of city and interurban lines, which originally drew attention only to the electrification of steam railroad suburban service, brought about the prevalence of an idea that electricity was primarily a means for handling passenger trains, and this has made its use in any other service seem somewhat like a dangerous experiment.

During the ten years' experience with electrification problems, the field of freight service, and especially long-distance freight service, where the greatest economies seem to be made available, has been completely neglected. On the New Haven system, it is true, freight trains have been hauled electrically for some three

years, but because of the limited length of route, only 70 miles, in combination with a not inconsiderable proportion of the traffic diverted to branch lines at intermediate points, the service cannot by any means be classed as long distance. In consequence, the Chicago, Milwaukee & St. Paul electrification, which was placed in operation only last month, constitutes actually the first step toward a demonstration of what may be attained by the thorough exploitation of this opportunity.

Naturally, the return that will be made upon the first cost of this installation cannot be definitely determined until after a year or more of actual operation, but that the investment will be directly profitable can hardly be doubted. The work was undertaken solely upon grounds of economy in operation, and no indirect benefits such as smoke elimination, or increase of terminal capacity entered into the calculations.

Only two other projects undertaken primarily with the idea of obtaining direct profit appear in the history of trunk-line electrification. These are the Butte, Anaconda & Pacific and the Norfolk & Western installations, and although the service in both of these cases is really switching and transfer work on a grand scale, it is significant that both involve a traffic almost exclusively of freight and that both have shown a handsome direct profit on the investment. This is more than any of the previous installations for passenger service have been able to do, and the conclusion is inevitable that the future of electrification will be in the field of freight traffic.

Of course, this does not mean that passenger traffic must henceforth be handled by steam, because the difference between hauling an 800-ton passenger train and a 2400-ton freight train is, in the end, largely a question of gear ratio, or its electrical equivalent. But where there is an ample amount of freight to be moved, the arbitrary conditions set up by passenger service may be eliminated, or at least offset, and the valleys in the daily load curve may be filled, while at the same time the necessity for protecting train movements with idle locomotives is relatively reduced.

That which has gone before, therefore, seems really to have been less of a period of commercial development than an elaborate series of technical experiments, these being made possible by highly artificial conditions which compelled electrification regardless of economic considerations. Freight traffic, up to the present, has been lacking, and without its aid there has been little chance of making really profitable installations. Electrification, in fact, has only just begun to be commercialized, and until it has reached the stage where general recognition is given to its ability to show a definite and direct profit, there is no use in expecting it to progress faster than any other interesting but highly academic experiment. This point, however, seems now within reach. Indeed, results from the St. Paul electrification are not needed to show that freight can be profitably moved by electricity but only to show what extra profits may be attained by long-distance hauls. In the immediate future, therefore, numerous electrifications of favorably situated sections of track are inevitable, because capital will always be eventually available where definite returns are assured.

Getting Together on Power Distribution

TO an unusual degree the past year was one of conferences and reports on power transmission and distribution subjects. This is a field in which utilities must get together. Overhead lines of different utilities, telephone and telegraph companies, lighting and power companies and electric railways must not interfere with each other either as to safety or reliability of service. The same is true of lines placed underground, although here there is less danger of interference. Where the utility uses a ground return there is the stray current to be considered. These facts account for the activity which is manifested in joint committees of one kind and another. The electrical safety conferences, which are closely related to power transmission and distribution, are discussed in a separate article. The joint committee on overhead and underground line construction, in the formation of which the Engineering Association took an active part, has been meeting monthly during the past year and has brought together a representative group of experts. G. W. Palmer, Jr., has been vice-chairman of this committee. While some difficulty has been experienced in bringing out constructive criticism of existing specifications progress is being made along several of the following lines of work laid out more than a year ago: Underground and undergrade crossings; crossings of electric wires over electric railway tracks; crossings of trolley contact wires; overhead crossings of wires or cables of telegraph, telephone, signal and other circuits of similar character over steam railroad rights-of-way or track, or over lines of wire of the same classes; overhead crossings of electric light and power lines, and parallel lines.

In May a comprehensive report on crossing specifications, prepared by a joint committee representing several utilities in Pennsylvania, was presented to the Public Service Commission of that State. This was the outcome of an exhaustive study by electric railway and other engineers and, while not yet formally adopted, stands as a monument to co-operative effort. It forms a booklet of 165 pages.

Another concrete and commendable piece of work accomplished in 1916 was the set of specifications for 600-volt overhead line material which was compiled by the power distribution committee of the A. E. R. E. A. This is a compendium of good practice in its field and should be extended, as soon as possible, to take in higher-voltage and catenary construction. This committee also did constructive work in systematizing the designs of concrete and steel poles. An important step was taken in the direction of rationalizing the formu-

las used in pole design and in harmonizing theory and practice. The committee also succeeded in solving the knotty problem of the lightning-arrestor ground, Shall the ground wire be connected to the rail and the ground or shall it not? The knot was cut by deciding that the track connection may be used when such use is unobjectionable, and these conditions were specified.

As is proper, the substation has received attention in several quarters during 1915. The A. E. R. E. A. committee on buildings and structures made a preliminary design for a standard substation, indicating a conviction that money could be saved if the common elements in the substation could be standardized. In view of the radical differences in substation sites and surroundings standardization is possible in this line to but a limited extent. There has been some discussion on the rating of substation machinery, this subject having been left open by the A. I. E. E. standards committee in view of the existing differences of opinion. On one hand is the desire to recognize the special requirements imposed upon substation apparatus by the intermittent load, while on the other is the general trend toward simplification in rating. The continuous and nominal ratings now find themselves in recognized competition and the more logical, whichever it is, will in the end survive. On general principles this journal has leaned toward the continuous rating as simpler, but recognizes that there are practical and weighty reasons for the nominal rating.

The automatic substation has been brought attractively to the attention of the railway industry this year and for certain classes of work promises well. The first commercial installation is giving a good account of itself and promises to meet objections with good performance. In this type of substation the rotary converter is started and stopped by control apparatus actuated through voltage fluctuation. In this connection the protection of substation machinery by means of long feeder taps is of interest. The automatic substation makes such protection unnecessary because it contains resistance grids which are automatically thrown into circuit when the substation is overloaded. The practical question is whether the resistance should be put into the feeder or into the substation. The subject is open for debate.

Electrolysis mitigation discussion has been quiet for the past twelve months pending the publication of the report of the national joint committee on this subject. The report has been in the hands of the editing committee for some time. Meanwhile the committees of the American and Engineering Associations have very properly deferred to the larger committee. Several return circuit investigations have been made, the National Bureau of Standards maintaining an active interest in the subject. On the recommendation of the bureau the Springfield (Mass.) Railway will try the "three-wire" system of distribution, with alternate positive and negative trolley sections.

Attention was directed to a kind of electrolysis, different from that usually associated with the word, in a San Francisco A. I. E. E. paper presented by S. L. Foster. This was the corrosion of overhead parts on sea-coast lines by leakage currents. The subject is special, but is worthy of more attention than the time which was available for discussion at the San Francisco convention permitted.

Conservation of Life and Property

ACTING on the principle that in the reduction of accidents better public relations can be fostered and money can be saved, the electric railways of the country went into the accident reduction movement with greater energy than ever during the past year. This fact was recognized by the National Safety Council in the formation of an electric railway section and the promise to inaugurate special bulletin service for this industry early in 1916. Moreover, at the recent meeting held in New York the executive committee of the American Electric Railway Association authorized the appointment of a committee on street traffic which will consider the most important phase of safety.

The first annual award of the Brady medal by the American Museum of Safety was an event of considerable interest in the electric railway field. The fortunate recipient of the medal, the Boston Elevated Railway, gained much desirable publicity, as did also the American Association and the safety association. The honorable mention accorded to the Public Service Railway and the Northern Ohio Traction & Light Company was good publicity. The Brady medal award recognizes the efforts made to insure the safety both of the public and of employees. This is fitting because the railway more than other utilities is both a very large employer of labor and is constantly in direct and hazardous contact with the public.

Among safety matters which attracted the attention of the railways last year none was more important than the effort of the National Bureau of Standards to secure the co-operation of the industries in the formulation of a code of safety rules to be applied in electrical construction and operation. At first this attempt was not taken seriously, as the utilities and other organizations recognized the almost insurmountable obstacles in the way of attainment. Dr. E. B. Rosa, in charge of this work for the bureau, persisted, however, and eventually succeeded in getting the attention of those concerned. It was expected that a formal conference would be held in Washington under the auspices of the bureau late in October, but when the time arrived the magnitude of the task of getting ready for such a conference was realized, and it was postponed. In its place an informal but effective two-week convention took place in New York, and excellent progress was made. The utilities are co-operating actively because they realize that there is a demand from public service commissions for something of this sort and that a rea-

sonable national code will in the end insure more uniform regulation than would be possible without it. In deference to the Bureau of Standards other efforts to promulgate safety codes, such as that begun by the utilities of Pennsylvania, are being held in abeyance, and the results of such efforts are being combined with those of the bureau.

The Electric Railway Journal has from the start emphasized the importance of this matter, directing attention to the conferences held and to be held from time to time. Contributed and editorial articles have been published, all bearing upon the necessity for study of the proposed code by those to be affected by its adoption. During the year it has been difficult to secure copies of the rules, but now the American Association has issued them in convenient form and at a nominal price. They should be diligently read, as constructive criticism at this time has double value.

Only secondary to the conservation of human life is that of property, and the accumulating evidence of harmony between the National Fire Protection Association and the electric railways is a cause for congratulation. By its action in convention last May, the N. F. P. A. recognized the position of the American Association as the natural authority on the subject of fire hazards in electric railway properties.

Growth of the Skip-Stop Idea

With the beginning of the new year the problem that seems most portentous of definite results to city railways is that of faster schedules, and the most obvious means to that end appears to be the skip stop. To this plan, which had lain almost dormant since its introduction in Cleveland some three years ago, there has been devoted an extraordinary amount of attention for the past year, and although the experiences of the electric railways along these lines have been by no means uniformly fortunate, a distinct gain for the industry has been registered.

During the year, it is true, the successful attempts to introduce the skip stop have been outnumbered by the unsuccessful ones, but this showing is not necessarily discouraging. The fact that the new method of operation can be introduced at all is good evidence as to its real acceptability to the public. There is no reason to believe that the people of St. Louis, for example (where the skip stop was popularly approved last November), differ materially in their ideas on schedule speed from the inhabitants of Detroit and Milwaukee, who rejected similar plans at the same time. Nor is there any reason to believe that the educational work that was carried on in the two latter cities during the period of experiments with the skip stop has been altogether futile and without value for the future. Indeed, reports from Richmond indicate a popular demand for the elimination of stops even without preliminary trials by the railway, and in the city of Schenectady there is being operated a non-stop rush-hour service for the large factories principally due to requests from patrons.

As a matter of fact, we believe that the skip stop is going to run a course much the same as that of the near-side stop. To-day, admission is made in practically every large city that the latter method of stopping cars is an improvement. Nevertheless, it was only a few years ago that the near-side stop was roundly condemned by the popular voice in almost every community where it was even suggested. In New York it was once inaugurated and abandoned within a few weeks. Yet when it was proposed again two years ago by a progressive few, none of the old objections that had been raised against it in the original trial were found to exist in reality, and it is now in New York to stay. That this was no isolated case is well demonstrated by the curve of growth of the near-side stop that was presented by the committee on schedules and time-tables at the San Francisco convention, and, in the light of the geometrically progressive change in public opinion therein displayed, it becomes difficult to take too seriously the early setbacks of the skip-stop idea which are in evidence at the present time.

These setbacks are, of course, generally chargeable to the failure of popular opinion to approve the innovation, although in St. Louis it seems to be the protest of a certain number of shopkeepers that has been the stumbling block, and as remedies for this condition there seem to exist only agitation by the railways and the lapse of time—the one thing that is really able to overcome the chronic inertia of the public mind. Agitation that is vigorous as well as continuous ought to help materially, and even though it may produce no immediate effect, it should be in the end well worth the slight effort that it involves. City railways, as they stand to-day, are between the devil of rising labor and material costs and the deep sea of a fixed fare, and there should be no likelihood of allowing any plan capable of providing relief to go by default.

With the skip stop in operation, the use of trailers becomes a commercial possibility instead of a pitfall wherein more money is likely to be lost in reduced speed than is saved in platform expense, and trailers will solve the otherwise hopeless problem of congestion in restricted business districts that is before so many cities at the present time. Even under normal operating conditions the time saved by eliminated stops may reach astonishing figures. In Milwaukee, as pointed out in an article on this subject which appears on another page, a reduction of 17 per cent in schedule time was found in one case, and this, on the basis of the results to be expected on the average electric railway, amounts to the equivalent of a 12 per cent reduction in the total of operating expenses. It seems inconceivable, therefore, that such an important economic measure as this, which saves time for the public at the same time that it effects economy for the railway, can fail to come into general use, and we look, as well as hope, for a great extension of the principle in the immediate future.

Car Design a Question of Capacities and Weights

THE outlook for the immediate future in car design gives every indication of the imminence of radical innovations. These, however, would appear to apply rather to car sizes and capacities than to the form of body and seating arrangements, as the small capacity car is persistently maintaining a position of importance in the minds of many operators regardless of the revolution in methods that its introduction is bound to establish in city railway practice. As yet, it is true, the extremely small car has not gained an actual foothold, but if it should once do so and should even approximate the results expected from it, there can be no doubt that it would come into almost universal use. The problem of the small capacity car, however, is really one of operation, centering about the largely unknown factor of the increased receipts that should follow decreased headway, and in the details of design of such small units as have been built thus far, there appears nothing that differs materially from the practice which has come to be accepted in the electric railway industry.

In general car construction, steel has displaced wood to such a degree that the all-wooden car is now as much of a *rara avis* as was all-steel design two years ago. This change has marked the practical disappearance of the old-style "underframe" design where the weight of the car body was supported upon heavy sills below the floor, and progressive designers have now eliminated center sills even from high-speed interurban cars, the buffing and pulling strains being transmitted at the bolsters to the side girders which support the load. The steel vs. wood problem, in fact, has now reached the point where it is involved only in such details as to whether wooden sheathing is to be preferred on car roofs and floors, and even in this case the use of steel seems to be looked upon with growing favor. The wide adaption of autogenous welding has no doubt had an influence in this regard, because through this means small or thin pieces of steel may be handled with a facility that once was considered only possible with wood. Insulation against heat or cold, which was at one time a serious problem in steel car design, has now been thoroughly worked out, sheet cork covered with canvas having proved to be thoroughly satisfactory either inside or outside of steel sheets, and this incidentally has had an indirect effect in demonstrating the possibility of getting along with a less ornamental but more practical interior finish.

In purely city service, where speeds are low, improvement in radial axle equipment has enormously broadened the field for single-truck designs, to say nothing of the growing numerical influence of the one-man car, which is generally built short enough so that, even without radial axles, a single truck can be used without bringing about excessive overhang beyond the wheels. However, the radial axle truck is to-day being made light enough so that its use in preference to the plain single truck does not impose a handicap in weight, and it has, in addition to its advantage of permitting a longer wheelbase than is possible with rigid axles, the faculty of relieving strains and wear when passing around curves, although it does not avoid the wheel slip that comes from the shorter distance traveled by the inside wheel. It seems likely, therefore, that the tendency toward a more general use of the single truck will continue, and this possibility is emphasized by the support now being given to the principle of smaller car capacities which, it may be said, was recently voiced by one car builder in a statement that 90 per cent of the electric railways were operating larger cars than were warranted by their service conditions.

Public Relations in Theory and Practice

THERE is no subject to which the attention of electric railways has been directed in association addresses and in this journal during the past decade to a greater extent than that of the necessity of establishing good public relations. Eminent committees have reported upon it, a code of principles has been adopted, and the methods by which this end can be secured should now be thoroughly understood. On commenting on this subject in our annual review of just one year ago, we suggested that each manager ask himself three questions, namely: "To what extent do I recognize the principle that the first obligation of public utility companies is service?" "To what extent am I following the practice of full and frank publicity?" and "What am I doing to improve the public relations in my own community?" A year has elapsed, but these questions are just as important as they were at the beginning of 1915.

The maintenance of satisfactory public relations depends primarily upon two things, to provide good service, by which we mean as good a service as the rate of fare warrants, and, secondly, to convince the public in the right way that this is the case. As regards the first requisite, we have sufficient faith in the ability of railway managers throughout the country to believe that they know what good service is. If they do not they have only themselves to blame. But we have not the same confidence that the average manager understands equally well the principles of publicity. Just why this should be so is difficult to understand because the methods of publicity are widely practised now by many of the large steam railroads and industrial corporations and even by several of the departments of the Government, yet while there are a few conspicuous examples of individual electric railway companies which conduct continuous and successful publicity campaigns, to a very large number the words carry no significance.

Many instances might be cited, but one must suffice. At the time of a serious strike several years ago, an

important metropolitan newspaper, known to be friendly to corporations, sent one of its representatives several hundred miles to the scene to get the facts. He was not a cub reporter but an editorial writer whose salary was not greatly different from that of the general manager whom he tried to see but in vain. Not only the manager but all of the executives were too busy to grant an audience, although the visiting newspaper man made several attempts to see them. But after he had given this undertaking up in despair he had no difficulty in meeting and interviewing the leader of the strikers as well as the Mayor of the city who was known to be unfriendly to the company. No barrier was put in his way at either of these places. Nor did he experience any trouble in seeing the editors of the local papers, who assured him that his experience did not surprise them in the least.

Not every company, fortunately, has strikes, and it is not in these periods of tension that a company's policy in regard to public relations is established. This question is settled during the daily intercourse which the utility has with its patrons as well as with the authorities and the newspapers which have an important influence in affecting public opinion. It is the reputation which the company establishes in these periods of quiet and peace which stands it in good stead in times of stress. This fact gives force to the third question which we suggested last year, and which we repeat this year, that each manager ask himself: "What am I doing to improve the public relations in my community?" If he is not doing all that he should and all that he can, it is time for him to change, and no time for making the change offers any greater opportunities than the present.

Business Is Improving

THE year 1915 will, we believe, stand out prominently in financial history as one that has swung in rapid course from the depths of acute depression to the heights of steadfast optimism. At the beginning of the year American business was felt to be in a critical state; some sections and industries were indeed prostrate, and everywhere there was a pessimistic point of view that saw with almost utter hopelessness only the points of weakness in American conditions. Since the middle of the year, however, evidences of an improving situation have been piling up with increasing rapidity, and favorable reports are now being sent in from all quarters.

In particular, the monthly reports of investment houses and commercial agencies have of late been showing better conditions in the country at large. For December, according to one authority, twenty-two subjects showed an improvement in business as compared to last year—these including new buildings, total bank clearings, bank clearings exclusive of New York, failures, commodity prices, imports, exports of merchandise, balance of trade, balance of gold movements, railroad earnings, money in circulation, comptroller's reports on national banks, bond and stock transactions, political factors (domestic), gold production, idle cars, social conditions, crops, metal situation, and new securities issued and listed. Only two subjects, immigration and new securities authorized, showed a decline in totals as compared to last year, while only one subject, foreign money rates, indicated that caution should be exercised. These returns are fairly indicative of the development that is reflected in every report bearing on the commercial and financial situation, and they cannot but inspire the most profound sentiments of relief and satisfaction. The most disquieting feature in the present situation is the large volume of war business being done, which is not a stable attribute of permanent prosperity, but we believe that this question can be handled without a serious and unsettling reaction if the industrial firms thus profited and the workers therein pursue a sane and conservative policy of now fortifying themselves against the inevitable reverses instead of being prodigal with their present large returns.

The experiences of the electric railway industry have been not unlike those of the country as a whole during the past year, for in this field we find the same combination of early depression and later improvement. It is undeniable that electric railways in the early months felt the depressing influence of the nation-wide curtailment of business and of special factors in the electric railway field, such as rates, wages, regulation, and especially jitney competition, but there are strong evidences that the depression thus enforced was at its maximum in the early summer, and that since then conditions have been becoming ameliorated. The stagnation in orders for new equipment and in new mileage placed in operation, so noticeable during the first nine months of the year, has in the last three months turned into an appreciable activity. This is a development that has naturally been based on a concomitant and to a certain degree antecedent improvement in earnings, so that we are not surprised to find evidences of a trend toward better earnings after the middle of the year. On the basis of more than fifty representative companies located in different sections of the country, it has been calculated that the ratio of gross revenues in one month in 1915 to those in the corresponding month in 1914 increased from an average minimum of between 85 and 90 per cent in the middle of the year to an average of about 96 per cent by the end of September. Returns for the last three months are not completely available, but it is known that many lines, especially those in the East, have shown marked progressive increases, and it is believed that the end of the year has brought an average return for December, 1915, on a par with that of December, 1914.

When we consider the cumulative effect of the decreases and increases throughout 1915, however, it becomes evident that the sum total must be a loss. Some of the smaller railways have undoubtedly suffered

much more severely than the large companies, but it seems that for the country as a whole a fair estimate of the average decrease in gross revenues would be between 4 and 5 per cent and in net revenues 6 or 7 per cent. This showing on its face may not appeal strongly to the investment banker or private investor, but the point for such persons, and, in fact, everyone, to remember is that in periods of depression, even more than in prosperity, the relative stability of industries is of greater importance than their individual numerical or percentage returns. In this connection we desire to emphasize this fact—that electric railway earnings in 1913 and 1914, as compared to steam railroad earnings, building permits, bank clearings, steel and iron production, agricultural products and the cotton crop, showed the highest relative stability, and that under normal conditions they would respond most quickly to business rejuvenation. There are peculiar factors in the electric railway field that undoubtedly retard somewhat the full response of electric railway earnings to the influences making for improved conditions, but in view of the greater relative stability of such earnings we are confident that not even these factors will prohibit electric railways from making a comparatively favorable showing when the full returns of 1915 in all lines of industry can be compiled.

A word may well be said regarding some of these special problems of electric carriers, however, for they influence particularly the relative profitableness of the industry, in which the casual investor is more interested than in the relative stability. Probably the question most discussed to-day is that of jitney and automobile competition is waning and we believe that electric railjects that we shall not discuss them here in connection with the business situation except to say that jitney competition seems to be waning and that electric railways will ultimately adjust themselves to the private automobile situation without serious loss. As to other special factors it may be remarked that in spite of the stable character of electric railway earnings, the problem of furnishing continually more and better service under constantly increasing costs at a depreciated rate of fare is one of serious moment. We are of the opinion, however, that the public is daily becoming better educated, through the disastrous results of excessive repression of the transportation agencies of the country, to a wider appreciation of the service performed by electric railways and their needs for successful operation and development. It is gradually becoming patent that fares must be adequate to allow the companies to pay a fair return and so to obtain capital for needed improvements, and courts, commissions and the public at large are acquiring a more rational point of view regarding the urgency of relief through increased rates of fare.

It must be remembered, however, that the harmful results of too high wage-fixing by arbitration, excessive tax requirements, restricted legislation and improvident rate-making are, of course, too far-reaching to be remedied at once, and the mitigation of these special problems thus far must be continued with even more assiduity if the transportation industry is to develop to the fullness of its powers. The industry is endeavoring to do its part through the furnishing of good, quick and safe service, and through the establishing of more economical methods of operation, such as by the skip-stop plan—all of which will have an important influence on the financial status of electric railroading. The full restoration of confidence in electric railway investments, however, is largely dependent on the public itself, but we are confident that the public now is realizing better its responsibilities as well as its opportunities in this matter. Thus there are positive reasons for the future success of electric railways which, in view of the present propitiousness of general conditions, seem clearly to warrant now a banishing of pessimism.

Classification of Rent Items

RECENTLY we published a letter stating that in the matter of accounting for rents the electric railway classification is guilty of an inconsistency not found in the steam railroad classification. It is admitted by our correspondent that in accounting for rentals (aside from operating expenses assumed) on leased property as a deduction from income, the electric railway classification pursues the theoretically correct course of looking upon these rentals as a return to the lessor on such leased property. It seems to be contended, however, that in the case of rentals on jointly operated property the failure to provide joint facility accounts for the operating expenses assumed on such property, and to charge against income the additional payments made to the owning or controlling company as a return applicable to the investment in the used property, constitutes an omission which steam railroad practice proves should be remedied. This is an argument which we cannot support, for to our mind the very failure so to account for the payments on jointly used property brings out the exact point wherein the theory of the electric railway classification is more sound than that of the steam railroad classification.

Let us reiterate, for a moment, the basis of the editorial along this same line in the issue of Nov. 13. We believe that all rent items should be treated as operating expenses with the exception of the permanent pure rental charges on property held under long leases, such leases being, as before stated, usually the concrete evidence of the right to that "exclusive use and control for operating purposes" of which our correspondent speaks. Charges of this latter character represent the portion of the accounting company's return that goes to the lessor for his part of the company's used and useful property. Charges on property, however, whose use is merely temporary or accidental, or which is primarily owned or controlled by another corporation for its own use even if it allows joint operation thereof, do not

constitute a return on property exclusively used and controlled, and they should be handled as operating expense, as the electric railway classification provides.

To these premises the fact that rental payments may consist of two portions—the first representing actual or apportioned costs of operation that are assumed, and the second a return on the investment involved in the rented property—does not present any insuperable objections. In the case of rentals under leases on property exclusively used and controlled, the maintenance and similar expenses that are assumed are obviously proper charges to the operating expense group, just as if they were paid by the lessor himself, while what might be called the "pure" rental above these expenses, or the return on the leased property, is properly charged as a deduction from income. The operating costs assumed in such a case were an obvious factor not discussed in the preceding editorial, and their presence is deemed not at all inconsistent with the supported theory of accounting for the pure rental payment. Property exclusively used and controlled under lease is property that would be included in the company's valuation, and the different accounting for the operating costs and the pure rental or return thereon is just as natural as the different accounting for the operating expenses and the return on the property actually held in legal ownership. All property that is held temporarily, incidentally or only in joint operation with the primary owner, however, is not property that would be included in the accounting company's valuation. Consequently there should be no concern as to what portion of the payments for the use of such property represents operating costs or return on the investment, for the entire payments are legitimate operating expenses incurred in the operation of the company's used and useful property, and the determination of and accounting for the return on such nonvalued property may be left to the one really interested —the primary owner and user.

Moreover, the fact that all temporary, incidental and joint charges on electric railways are carried to the one "general and miscellaneous" division of the operating expense group, instead of the joint facility charges being subdivided among certain divisions of the group, as in steam railroad accounting, is a separate issue that does not at all affect our thesis—that all temporary, incidental and joint facility charges belong in the operating expense group. Whether subdivisions for the maintenance, operation and administration of joint facilities should be used, against which a great deal might be said on account of impracticability, is not the question. The point is that there should not be included as deductions from income what the steam railroad classification calls "joint facility rents" (amounts above any actual or apportioned expenses of maintenance, operation and administration), or any payments for interchanged or floating equipment. Such payments do not represent used and useful property to which can be assigned a portion of the fair return of the company.

This brings us to the question as to what figure on the income statement best represents the return on the investment. Our choice of the term "gross income," which has met with an objection, was based on two reasons. In the first place, the varied terminology in regard to "earnings," "revenues" and "income," both gross and net, made it seem necessary to use an official term definitely fixed. In the second place, the investment that is used in measuring the fair value of a property is not alone that of the bondholders or of the stockholders but the total amount contributed by both. Hence fixed charges on the funded debt and dividends on the capital stock must both be considered as essential elements of the return on the investment. "Gross income" is the official term used before fixed charges on the funded debt are deducted, while "net income" is the term used after such deduction. For obvious reasons, therefore, the gross income is the official figure to be used in calculating approximately the return. We say "approximately," for of course it must be used with qualifications in mind. Interest on unfunded debt, amortization charges, appropriations to sinking and other necessary reserve funds and similar items naturally in various cases may serve to reduce the gross income figure until the real balance for funded debt and capital stock is obtained. Exceptions only prove the rule, however, and with such possible deductions in mind the gross income may justly be used in measuring the reasonableness of the return. To use the net income figure, after the fixed charges on the funded debt have been deducted, would be to ascribe no importance at all to the interest rate and other features surrounding the acquisition of the bondholders' investment—a theory of valuation work to which we can in no way agree.

In the general revival of prosperity in this country the electric railway companies are not enjoying their share. The chief reason is that they are not receiving adequate payment for the service which they perform. This condition can be remedied, but it requires united effort. With "a long pull and a strong pull and a pull all together" we should make substantial progress during 1916.

James H. McGraw

Eliminated Stops in City Service

Various Considerations in Connection with the Faster Schedules Accompanying a Reduction in the Number of Stops Are Discussed by Electric Railway Operators, Whose Experiences Indicate the Economy as Well as the Practicability of This New Method of Operation

DURING the past year a great deal of attention has been devoted to the possibilities in increasing the schedule speed of cars in city service by the elimination of part of the stops that are made under ordinary conditions. All of the experience that has been acquired with this new method of operation points to the fact that it is of utmost importance to the electric railway industry, and in order to present the inherent opportunities of the movement, the following articles by electric railway operators who have investigated it are published. These include discussions on the economics of schedule speed and on the situation in Cleveland which is undoubtedly the most conspicuous example of skip-stop operation; an account of the simple and successful plan of introduction in Rochester; and an outline of the preliminary work that has been done in Chicago. It is to be hoped that they will aid in focussing attention on this really vital subject.

The Economy of Higher Speeds

BY B. F. WOOD
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Since the competition of the automobile became an acute problem of the electric railway industry, one significant fact in connection with it has stood out above all others, and that is the necessity for faster schedules. Speed is desired by the public at large, which has frequently supported the irresponsible jitney bus because of its rapidity of movement. At the same time, increased speed makes possible an increase in service at the same expense. An analysis of costs on any property will show this to be the case, and as an elaboration of this statement there is presented in the following paragraphs a study of the figures for the average electric railway appearing in the last electric railway census, which indicates that each decrease of 10 per cent in the running time will permit an increase in service of some 7 per cent without an increase in the cost of operation. It should be said here, however, that faster schedules may be obtained in two ways:

1. Increasing the maximum speed; and,
2. Reducing the number of stops.

Manifestly, the former method brings with it the possibility of increased accidents as well as of interference with legal restrictions. For this reason, it is not considered in this analysis, which deals only with decreases in schedule time that may be obtained either by reducing delays or by cutting out stops, and all of the deductions herein submitted are predicated upon the existence of an absolute maximum running speed.

Such a situation as this, for example, might exist in connection with the introduction of a skip-stop scheme, whereby enough stops might be cut out to shorten the running time, say, 10 per cent. For a given schedule, the number of cars required would vary in proportion to the change in schedule time. Of course, conditions might be conceived where the rush hour was of such a short duration that an appreciable number of the trippers would make but one trip per day, and under such circumstances the number of cars would not vary exactly in proportion to the schedule time. However, a close approximation of direct proportion would obtain in any event so that the relation may be generally applied.

Since the average electric railway of the country has its operating expenses distributed as shown by the figures of the electric railway census for 1912 (see ELECTRIC RAILWAY JOURNAL, Jan. 16, 1915, page 131), it may be said that a number of the items which go to make up the total expense would be directly affected by a reduction in running time, and these are shown in Table I. This table shows, in the first column, the amounts chargeable to the various accounts included under operating expenses, these amounts being expressed in percentages of the total operating expenses. In the adjoining column are transferred the percentages representing those accounts which are affected by an increase in speed, which total 54.4 per cent. Expressed otherwise, each $100 of operating expenses includes $54.40 that will be affected by faster schedules, and if schedules are reduced 10 per cent there will be a reduction of 10 per cent in the affected accounts, this reduction amounting to $5.44, and this would pay for practically 6 per cent more service. There are, as a matter of fact, other incidental savings which do not appear in the table, but these will be taken up in a later paragraph.

An explanation of the reasons for the selection of the affected accounts that are shown in the second column of Table I is, perhaps, necessary. First in the list is the general heading covering way and structures. It is obvious that none of the expenses involved here would be influenced by changes in the speed or in the number of cars, provided the changes were within reason. A possible exception may be made in connection with the items applying to buildings, but this will be discussed later. Therefore no entry from this account appears in the list of items affected by schedule speed.

With regard to the charges under the general head of equipment, however, it may be said that material changes should take place if the schedule time of the cars is decreased. The charge for superintendence of equipment, perhaps, would not be affected except upon a property of the largest size, but the charge for maintenance of cars should vary exactly in proportion to the running time. The reason is that, as the speed increases, a greater daily or yearly mileage is obtained from each car, and proportionately fewer cars are needed to do a given amount of work. Maintenance of cars will, in the end, vary as the car-years rather than as the car-miles. Indeed, there is ample experience to show that within a reasonable variation in mileage the cost of maintaining a car will average very close to a fixed sum per car per year, so that a car making a large annual mileage will cost less per mile for repairs than one making a small mileage per year. Based upon the census figures, then, the entire charge for maintenance of cars, amounting to 5.1 per cent of the total operating expense, will be affected by a change in speed, and this percentage has been entered in the column of affected accounts shown at the right in Table I.

With regard to the charge for maintenance of the electric equipment on the cars, it should be said that an increase of schedule speed obtained by a reduction in the number of stops involves no increase in the work done by the car motors. Paradoxical as it may seem, a faster schedule will result in a lower power consumption per car-mile, always considering, of course, that the

TABLE I—DISTRIBUTION OF OPERATING EXPENSES FOR AVERAGE RAILWAY SHOWING ACCOUNTS AFFECTED BY INCREASED SPEED

Account	Percentage of Total Operating Expenses	Percentage Affected by Higher Speed
Way and structures	13.9	...
Equipment:		
Superintendence of equipment	0.5	...
Maintenance of cars	5.1	5.1
Maintenance of electrical equipment	3.0	3.0
Miscellaneous	0.9	0.6
Depreciation of equipment	1.1	1.1
Other operations	0.3	0.2
Maintenance of power equipment	1.1	...
Traffic expenses	0.8	...
Power:		
Power plant employees	1.9	...
Substation employees	0.6	...
Fuel for power	6.1	6.1
Other power supplies	0.6	0.4
Power purchased	7.4	7.4
Other operations	1.6	...
Conducting transportation:		
Superintendence of transportation	2.1	...
Conductors, motormen and trainmen	29.5	29.5
Miscellaneous transportation expenses	7.2	...
General and miscellaneous:		
General	5.7	...
Injuries and damages	6.2	...
Insurance	0.9	0.6
Rent of equipment	0.4	0.4
Miscellaneous	3.1	...
Total	100.0	54.4

higher speed comes only by the cutting out of stops. Briefly to cite an example; a car on an 8-m.p.h. schedule with twelve stops per mile, requires about 150 watt-hours per ton-mile. If the same car is operated without any stops, the schedule time will be reduced approximately 40 per cent, and the power consumption will be decreased somewhat more than in direct proportion, or to less than 90 watt-hours per ton-mile.

If, when the schedule time is reduced by a given percentage, the power consumption per car-mile is reduced by a still greater percentage, it follows that the work done by each motor in a given time is actually reduced. The maintenance of the electrical equipment should therefore be somewhat reduced because of the less work done. But in practice maintenance costs vary rather with the number of motors in service than with minor changes in the amount of work. Therefore the total charge under this account will be reduced at least in proportion to the number of motors at work, the cost per motor remaining about the same. This whole account, therefore, may be said to vary in proportion to the running time and is so entered in Table I.

According to the classification adopted by the electric railway census, four items other than those above mentioned appear under the general heading of equipment. These include "Miscellaneous equipment expense;" "Depreciation of equipment," and "Other operations." With regard to the first it may be safely said that two-thirds has to do with the cars that are in service, so that two-thirds of this charge has been transferred to the list of affected accounts. The item covering depreciation of equipment is obviously directly proportional to the number of cars required to do the work, and all of this item has been transferred. With regard to other operations, probably two-thirds are directly affected by the number of cars, and two-thirds of the percentage appearing under this account has been transferred.

The fourth item above referred to covers the maintenance of power-house equipment, and in connection with this it should be said that the census figures apply both to roads which purchase power and to those which produce their own energy, so that a strict adherence to the classification as shown in the census summaries makes the average road assume the rather unusual situation of generating two-thirds of its power and purchasing one-third. There is, however, no insuperable objection to this procedure, provided the method that is followed is understood. Upon this basis the item covering maintenance of power equipment would remain practically unchanged regardless of the reduced amount of power required under the conditions of higher speed. The reason for this is that the repairs for any power station of a given capacity and equipment are substantially constant regardless of the output, and in this case, except upon the largest properties, the change in capacity of the power station would be too slight to make any appreciable difference in the maintenance charges of the machinery.

The next item which appears in the summary of the census figures is that of traffic expenses. Obviously, this would not be affected by any change in operating methods because it depends upon the condition and character of the business done by the railway rather than upon the methods by which that business is handled.

Under the general heading of power, the first subdivision covers charges due to power-plant and substation employees. These charges could hardly be affected, even on roads of a very large size, by the slight reductions in energy consumption that are here considered. Therefore, the percentages expressing these items are not transferred to the list of affected accounts. The item covering fuel for power should vary in direct proportion to the energy consumption and, therefore, this item is transferred. The item covering other power supplies and expenses includes only some charges that would be affected by a change in power station output. These should amount to approximately two-thirds of the whole item and, therefore, two-thirds of the figure representing the item is transferred. The item of power purchased should be directly affected by a change in power station output as previously outlined, and the entire percentage, as shown, is transferred to the affected accounts. Other operations in connection with power can hardly be affected one way or the other, and this item is not transferred.

The item covering superintendence of transportation, under the general heading of conducting transportation, is also not subject to change with an increase in scheduled speed. It is true, of course, that a greater daily mileage from each car would result in correspondingly reduced platform expense, but on the other hand, the number of car operations would remain unchanged, because as many cars would pass a given point during a given time under the higher speed as under the lower one.

In connection with the expense for conductors, motormen and trainmen, amounting to 29.5 per cent of the total operating expense, it is obvious that the increased daily car mileage that comes from an increase in speed will influence this charge in inverse proportion, and the item is transferred complete. The item of miscellaneous transportation expenses, however, should not change with the increased speed.

In general, the items under the heading of general and miscellaneous expenses should change but little under the assumed conditions. General expenses, which include the salaries of the various officials, manifestly would not be affected, because of different methods of operation. Injuries and damages would perhaps be affected to the extent of a slight decrease in interior accidents and boarding and alighting accidents, on account of the reduced number of stops and starts, and exterior accidents might increase because the cars would run past more corners without stopping. However, the two conditions might well balance one another. The item of insurance would change only in proportion to the extent of insurance that was carried upon cars and upon shops and carhouses. Two-thirds of this item has, therefore, been transferred. The items covered by stationery and printing, store and stable expenses, rent of track and terminals and other operations are small and can hardly be affected in any event. Rent of equipment would be directly influenced with the decreased

need for cars, and this appears in the list of affected accounts.

With regard to results other than the reduced operating expenses that are to be expected from an increase in speed, it may be said that interest and depreciation upon the cars released is an important item. Because of the normal growth which may properly be expected upon any railway system, the release of a number of cars through more efficient operation would not result in keeping the cars in idleness, but would soon have an effect equivalent to a reduction in the number of cars owned. Each car is worth, roughly speaking, $4,000, and interest and depreciation on it would amount, at 12 per cent, to $480 per year.

In round numbers the gross income of all operating companies for the last census was $586,000,000, and this, divided among the 84,000 revenue cars in service, amounted to $7,000 per car, of which 56.8 per cent, or about $3,960, is operating expense. The above-mentioned interest and depreciation, amounting to $480 per car, is 12.1 per cent of $3,960 and may therefore be represented by a figure of 12.1 per cent of the operating expense. However, an allowance of 1.1 per cent of the total operating expenses has already been considered in connection with the census figures, so that the figure

TABLE II—INCREASE IN SERVICE TO BE EXPECTED ON THE AVERAGE RAILWAY FROM A 10-PER CENT REDUCTION IN RUNNING TIME

	Affected Items Expressed in Per Cent of Total Operating Expense	Increase in Service Made Possible by Each 10 Per Cent Decrease in Schedule Time, Per Cent
Direct effect on operating expenses, (Table I)	54.4	5.84
Interest and depreciation on released cars	11.0	1.18
Interest and depreciation on released shop and carhouse space	2.7	0.29
Total	68.1	7.31

here derived should be reduced to 11 per cent to avoid duplication on this score. In other words, for each $100 of operating expense, there will be an invisible charge for interest and depreciation on the cars owned which amounts to $11. This, as explained above, is affected by the number of cars required to do a given amount of work and should be included with the items affected by faster schedules. In Table I is shown a list of these items totaling 54.4 per cent of the operating expense, and when the 11 per cent for interest and depreciation on cars is added a new total appears equal to 65.4 per cent.

In addition, for each car owned there will have to be provided about 800 sq. ft. of carhouse at a cost of $1.25 per square foot, making a total of $1,000, and there must also be provided about 200 sq. ft. of repair shops for each car at a cost which will approximate, including equipment, about $4 per square foot. This will make the total shop and carhouse facilities amount to about $1,800 per car. On large properties the interest and depreciation on these facilities would be affected by a small increase in mileage per car, and assuming interest and depreciation on the buildings and equipment at 6 per cent, the charge involved would approximate $108 per car. As before mentioned, the operating expense on the average road amounts to about $3,960 per car, and on this basis the annual charge for shops and carhouses is equivalent to 2.7 per cent of the operating expenses. However, this possibility would apply only in the case of the very largest systems, and as a means for differentiating the influence of the three general items, operating expenses, released equipment and shop and carhouse space, Table II has been prepared.

This is based upon an assumed decrease of 10 per cent in running time, and the result of the faster schedule is expressed as the increase in service that could be made without increasing the operating expenses existing before the speed was changed. It indicates that, under the most favorable circumstances, an increase in service of more than 7 per cent will accompany a 10 per cent decrease in running time or, in the same proportion, an increase of 11 per cent with a 15 per cent reduction in the schedules.

The Skip Stop in Cleveland

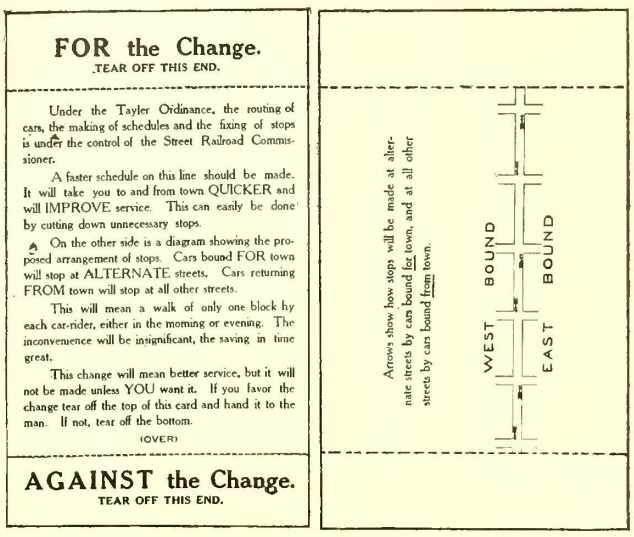
BY PAUL E. WILSON
Secretary to the President, The Cleveland Railway

When the skip stop was established in Cleveland in 1912, the problem of introduction was, fortunately for the city, materially simplified. The ordinance under which the Cleveland Railway operates, generally known as the "Tayler Plan," gives the City Council the right to fix stops, and by exercising this right, under the advice of the city street railroad commissioner, the plan of eliminating every other stop on both in-bound and out-bound tracks was adopted.

A poll was taken on every line ("plebiscite" was the term used to describe the poll in which women as well as men were allowed to vote), and a good-sized majority in each case approved the change. The majorities ranged from a proportion of three to one up to eleven to one, the larger majorities coming from the longer lines where the saving of time was greatest. Of course, these plebiscites were not required by law, but they were inaugurated by the city street railroad commissioner to show the City Council the sentiment of the car riders and thus persuade the Council to exercise its power to fix stops at the alternate streets.

In the plebiscites, cards were distributed to all car riders of a given line as they boarded the cars. The cards set forth the fact that the council, through the city street railroad commissioner, had the power to make schedules and to fix stops, and that a faster schedule and better service could be maintained if cars stopped at alternate streets. The ends of the card were perforated for tearing and at one end bore the words, "For the change," and at the other, "Against the change." Car riders were invited to tear off one end or the other and thus vote.

As soon as each line had voted the city street railroad commissioner eliminated substantially every other stop in-bound and out-bound, making stops as far as possible at alternate streets with spaces between them of 700 ft. or 800 ft. However this was exclusive of the downtown district, or that territory within a radius of



CLEVELAND SKIP STOPS—FRONT AND REVERSE SIDE OF BALLOT

about 1 mile from the Public Square, which is the heart of the city. The reason for non-elimination of stops in this district is, briefly, that this is the district of the short rider. Unless cars stop at every street intersection the intending passenger, in walking to the stop, makes up his mind to continue walking, and he is lost as a rider. This business should not be lost. Again, the destination of substantially all of the riders on any trunk line is within the downtown district, and it would be unfair to ask them to walk too far, assuming that at least half of them have had to walk some considerable distance to board the car. Third, within the downtown district, street car traffic is necessarily slow because of vehicular and pedestrian traffic, and as safety stops must be made at many intersections, the item of time saving is negligible in any event.

After the commissioner had ascertained the wishes of the car riders with respect to stops he submitted the results to the City Council with the recommendation that his arrangement of stops be officially fixed by the Council. This statement carried with it the result of the referendum which had been taken and the effect of the change on the number of stops. As the City Council approved the commissioner's action, the railway changed the usual stop signs to conform with the new plan and issued the necessary bulletin to its trainmen.

The plan has worked well from its inception. The distance between stops which was formerly short, is now in many cases more than 1000 ft. and averages for the system more than 700 ft. Nowhere is it under 500 ft. There have been eliminated 47 per cent of the stops, and the running time per half trip has been reduced on every line. The actual total saving in running time for the entire system attributable to the change cannot be definitely determined, because improvements in power and elimination of grade crossings were made on many lines coincident with the adoption of alternate stops. The city street railroad commissioner has estimated the saving at approximately 10 per cent. Comparisons of schedules before and after elimination of stops show a cut in running time that averages close to this figure, but it is impossible to say what part of the saving was made possible by the alternate stops and what part was due to changes in other operating conditions.

That the alternate stops have effected a saving, however, cannot be denied. Just how great this is depends entirely upon the individual line. To the company there is, besides the saving in platform expenses and in the use of power, the further economy in maintenance of equipment. To the car rider the saving in running time gives a faster service and a more reliable headway. In addition to this, the fact that the number of possible stops has been cut substantially in half makes the service seem even faster than it really is because cars are not continually stopping and starting. That this eliminates the extreme vexations and irritations of ordinary street car travel is indicated by the fact that ordinary routine complaints against trainmen have decreased during the last four years, and if that does not tend to prove that the public is well pleased, the entire absence of complaint against the plan itself on the part of the car riders should make it a certainty. In more than three and one-half years of operation under the new plan our records show less than a dozen complaints from car riders regarding the alternate stop plan.

From an operating standpoint there can be no question as to its benefits. It permits the giving of better, quicker and more reliable transportation without materially increasing the danger of accidents and with a substantial saving in the cost of that transportation. It is impossible to conceive of good service being given anywhere when stops are very close. Not that stops a long distance apart will, in themselves, give good service, but the spacing will give the street railway operator a chance to give better service than he possibly can give where his equipment and his men are at the mercy of too frequent stops. A comparison of service in the congested district and the outlying district of any city establishes that truth. The location of stops at even every third or fourth block instead of at every other block where the distance between streets, as in many cities, is short can work no hardship on the car riding public nor, indeed, real hardship on any one. This is proved conclusively by the Cleveland experience.

The only trouble we met with in eliminating stops was that given by property owners who believed their interests to be affected. As already stated, the car riders themselves registered no kicks and so marked is this absence of complaint that Peter Witt, the city street railroad commissioner, says, "I am positive that were we permitted to restore the old stops on any one line and return to the old running time, uncertainty of headway and general inefficiency, the car riders of that line would descend on the City Council or the street railway officials in a body." It is, therefore, the property owner and not the car rider who objects to the skip-stop plan, and the problem of introducing this plan is how to handle the property owner. Skip stops present no operating problem. On the contrary, they lighten the usual routine troubles of the transportation department. The skip-stop plan introduces no new problem in the treatment of the public served, for the public to which the railway owes a duty and for which it must formulate a policy favors the plan. How to give the riding public what it wants when the giving inures to the advantage of the railway as well as to the public advantage should present no problem. Theoretically, that should be the easiest thing to do. With our own experience in mind it is an easy thing to do, but the failure of the plan in Milwaukee and Detroit shows that it may be very difficult.

Comparisons are odious, and when applied to street railway systems they are quite apt to be valueless as well because of the local conditions which go to explain the whys of the many differences that are found. It has been said that "in Cleveland things are different." Perhaps they are. Many things are different in any city from any other, but the car rider is the same wherever he is found, so is the property owner. Business houses at or near stops which are eliminated are sure to think that the change will hurt their business. The owner of renting property is sure that his tenants will move if the stop nearby is moved, although, parenthetically, neither believes that the street railway company makes business good. This applies throughout the United States. No one should think that the Cleveland business man or property owner differs from his brother in Milwaukee or Detroit. The tobacconist or confectioner where daily papers are sold wishes the town-bound cars to stop at or near his store, and the grocer or butcher wishes the home-bound cars to discharge passengers in front of his place of business just as earnestly in Cleveland as elsewhere. Of course, the effect on any one man's business for any one year is absolutely nil. The passenger who desires a paper will go to the first corner beyond the store or must walk to the second corner. The same thing is true of the out-bound passenger. If he has it in mind to shop after he leaves the car his intention is not changed by the fact that he has to walk one block instead of getting off directly at the store. Show that passenger better service and actual saving in the time he must spend on the car, and any inconvenience to which he is put by

a longer walk is forgotten in the advantage which he realizes has been purchased by that inconvenience.

Whenever an injustice is done by the change in stops it is not difficult to ascertain the fact and right it. The schedule of stops on no line in Cleveland is the same now as when originally fixed by the City Council. Some stops have been restored, some changed, some cut out. If it has been found in actual operation that the placing of a stop at a certain street discommodes no larger number of people than placing it at another street, a change is made. Throughout all the fixing of stops and in subsequent changes one thing has been kept in mind—the majority be served. But when protest against the change has been narrowed down to the protest of some one who is not a car rider, the complainants have been told that the stops on this system were not fixed for the convenience of the druggist or the grocer or for any merchant but for the convenience of the majority of the car riders.

Finally, if the Cleveland experience with skip stops tends in any way to solve the problem of skip-stop introduction, it is because the following facts have been demonstrated:

The promise of rapid transportation, contingent upon the adoption of the plan, is fulfilled in better service when the stops are eliminated. The fixing of stops is conditioned solely upon the public served. No individual can capitalize his friendship with the management or his political pull with the public authorities against a majority of the car riding public. In short, the stop elimination can be shown to be actually "for the good of the service."

Skip Stops for Rush-Hour Service

BY ELMER E. STRONG
Superintendent of Transportation, New York State Railways, Rochester Lines

The city of Rochester, N. Y., has but a single main thoroughfare, through which a large proportion of the cars in service on the various lines in the city must pass. Within the last few years the growth of the city, and the consequent increase in the number of cars needed to provide a satisfactory rush-hour service, has resulted in an excessive number of car movements through this street and conditions of extreme congestion have become the rule during the morning and evening rush hours. As a consequence, the New York State Railways, Rochester Lines, which operate the local service, placed in operation twenty-five center-entrance prepayment trail cars, the idea being that the use of trailers was the only practical means for providing increased service without increasing the number of car movements on the main street beyond the physical capacity of the tracks.

Each trail car had a seating capacity of sixty-two, while the average motor car in the regular city service seated forty-four people. Obviously, the two cars with a total of 106 seats running together as a single unit would tend to reduce congestion within the area of heaviest traffic as compared with two separate units each having forty-four seats. This was the primary reason for introducing trailer operation, but it was recognized at the same time that the larger units would move more slowly in the outlying districts of the city and that the trail cars would have to be introduced only with the idea of making such changes in stops and running time as might be found to be necessary in actual practice.

It was more or less manifest that a train which provided seats for more than 100 passengers would have to stop at practically every corner upon the line, while the single cars with their smaller loads would be able at least to pass an occasional street without stopping. In consequence, it seemed likely that the two-car trains would be unable to maintain the schedules that were laid out for the single cars, unless these schedules included a lot of slack—an improper condition which certainly should not be permitted to exert its detrimental influence upon operation. In actual practice it was found on lines where two-car trains and single cars were operated together that the trains consistently lost time with the result that single cars invariably followed the trains at close distances. The resultant irregularity of headway made it necessary that one of two things should be done. Either the running time for trains would have to be increased from 6 per cent to 10 per cent over that allowed for single cars, or else part of the stops made by the trailer trains would have to be eliminated.

Between the two alternatives it seemed that the elimination of stops was infinitely preferable from the standpoint of the company's patrons. The use of the two-car trains was absolutely necessary in order to permit operation of a sufficient number of cars through the main street during the rush hours. But an increase of the running time on the lines to which the trains were assigned would be the equivalent of moving the residences on those lines farther away from the business district of the city, and it seemed logical that a number of the residents would be willing to walk a distance of from 100 ft. to 200 ft. from the stopping point of the cars in order to reach their homes if, by so doing, the rapid service that had been given with the single cars could be retained, and at the same time an increased number of seats were being provided. Consequently, about the middle of November, 1913, the company announced to the public, through the press and through notices placed in the cars, that the skip-stop scheme of operation would be introduced during the rush hours on the several lines that were equipped with trailers. These notices outlined in detail the method that would be followed in the selection of the eliminated stops and stated at what streets cars would stop during the rush hours.

In the selection of the streets at which rush-hour stops were to be made every effort was devoted to placing them as nearly as possible at intervals of 500 ft. At the same time, an attempt was made to serve those streets that had the greatest number of residences contiguous to the street car lines. All of these details were fully explained to the public through the local newspapers, and about ten days after the notices had first been brought out the scheme was put in operation without any confusion and with very considerable popular approval.

At the present time two-car trains are operated regularly only during the morning and evening rush hours. In consequence, there have been practically no changes in stops during other hours. On the lines where the scheme is in operation the stopping points are marked by plain white bands painted upon nearby poles, and at those streets where cars do not stop during the rush hours the following notice is stenciled upon the white bands: "Cars do not stop here between 6 a. m. and 8.30 a. m.; and between 4.30 p. m. and 7 p. m. except on Sundays and holidays."

Very little popular opposition to the plan developed at any time, although when the skip stops were inaugurated a few protests against it were heard from some residents because their particular streets were omitted from the list of stopping points. However, after making a few adjustments subsequent to personal interviews with the complainants, these complaints generally disappeared, and now that the system is permanently established it has been found that the company was obliged only to replace about 10 per cent of the stops that were

scheduled for elimination under the original plan. At the present time, it may be said, the skip-stop scheme is giving thorough satisfaction in every respect, both to the company and to its patrons. The elimination of the stops during the rush hours has made possible the operation of single cars and two-car trains on the same line without increasing the running time over that required when only single cars were operated, practically all of the cars making stops at the designated points during the rush hours whether operated as single cars or as trains. It appears, therefore, that the saving in time for the trains approximates 10 per cent.

Skip-Stops and Schedule Speed

BY J. V. SULLIVAN
Statistician Chicago Surface Lines

Dragging schedules benefit no one. On long routes, especially, they result in costly waste of time both to passengers and to the operating company. Steam and elevated railroads, having private right-of-way, usually can maintain headways with great regularity, but the street railway, especially in large cities, is held in check at all times by the frequency of stops and the interference of vehicles on the tracks. The modern remedy offered by students of the problem is the skip stop, supplemented by exclusion of other vehicles from the right-of-way.

That there is a definite relation between number of stops and schedule speed has been proved wherever stop elimination has been tried. Express trains on steam and elevated roads are a daily illustration of this fact, and even the modern skyscraper serves its "long-distance" riders best by providing express elevator service to the upper floors. However, the people in some communities still have to be convinced that this new phase of operation is in their interest. They recently voted it down in Milwaukee, while in the same week the street car patrons of St. Louis voted strongly in favor of its continuance. It is said to be in successful operation in Cleveland, Kansas City, Pittsburgh, Portland, Ore., Seattle and a few other places. Popular votes have frequently favored it, and competent engineers have recommended it in Detroit, Boston, Chicago and elsewhere.

Skip-stop practice is a comparatively recent feature of operation. About fifteen years ago Williston Fish, then connected with the Chicago Union Traction Company, made some preliminary studies to determine the relative importance of car stops and the saving that could be made by elimination of those which were least used. In January, 1910, his views on this method of increasing the efficiency of surface lines in large cities were first made public through an article in the Electric Railway Journal. This was followed next year by a practical try-out of alternate stops on certain lines of the Metropolitan Street Railway of Kansas City, Mo. The new departure in urban transportation was slow to take hold elsewhere, but through a gradual realization of its possibilities other companies began to experiment with it, and later, several of them put it into effect.

It has been proposed to adopt this plan on two long routes in Chicago, and to determine whether it would be worth while an investigation was made on the Broadway line. Stops were counted and timed, and the number of passengers boarding and alighting was ascertained. Each stop was timed in the interval between the slowing down and starting up of a car during which passengers safely boarded and alighted from it. The average time, counted in this way, was 11.4 seconds per stop. To this should be added several seconds consumed when the speed fell below the normal during the approach to and the departure from the stopping place. In other words, the signal for a stop meant that a car began to slow down, and before it reached its normal speed again, some fourteen or fifteen seconds had been lost.

It was found that duration of stops was affected by condition of street pavement, condition of rails, number of persons boarding or leaving car, number of passengers on car, street lighting, and by the sex and age of the passengers. The early morning traffic could be handled more quickly than the evening crowd, and stops were longest in the period of the day when women and children formed the principal part of the load. For instance, the morning rush-hour checks, when most of the passengers were men who were quick in boarding and alighting, showed an average time per stop of 9.51 seconds. The more leisurely crowd of women and children during the middle of the day required an average of 11.92 seconds per stop. Tabulation for the evening rush hour, when more persons were getting on and off, and when all stepped more carefully because of darkness, showed an average time of 11.77 seconds.

Stops were made at only 50 per cent of the regular stopping places, and yet the fact that a stop signal might be expected at any of the other 50 per cent of crossings held the motorman in check and did not give him the full benefit of time saving.

On the route in question, a distance of 10.7 miles, there were 127 places at which stops are required for safety or on signal. The number of actual stops per trip ranged from thirty-one to eighty. Outside of a congested district in which it was thought desirable to make all stops, it was found that 35 per cent of the stopping places were unimportant if judged by the number of passengers boarding and alighting from cars. It was realized, however, that all of these places could not be cut out because some of them come in groups, and the result of their elimination would be walks of too great a distance for the people wishing to get on or off cars in those districts.

On another route—Clark Street—there are 120 stopping places between Illinois and Howard Streets. In a count of 23,274 passengers boarding and alighting from cars, almost one-half of them, in a five-day check, got on or off at the eighteen transfer points. Of the 102 non-transfer stops, fifty-eight showed a count below the average, this being 57 per cent of the total.

In Chicago maps have been prepared to show the character of the stores or other property at the various corners, and these have been used to fix a tentative list of stopping places. One difficulty in selecting stops has been the fact that some important stopping places came close together while others are spaced as far as ten blocks apart—a good example of the fact that the present arrangement of stopping places in most cities is largely a matter of custom and is a survival of horse car days when running time was slow and distances were not great.

While the Chicago plan is, as yet, only one paper, sufficient results have been observed during the recent tests in Milwaukee and St. Louis to demonstrate the value of stop elimination. In Milwaukee the experiment was made on three routes where the original running times were twenty-nine, thirty and twenty-seven minutes respectively, the savings by cutting out certain unimportant stops were 14 per cent, 17 per cent and 11 per cent. There were formerly 12.7 possible stops to the mile, but the actual average was only 6.4. The company asked for designated stops averaging 9.4 to the mile, making an average additional walk for the small percentage of persons affected of 257 ft.

The test in St. Louis was made on two routes where the running time was forty-three and eighty minutes, respectively, and on these the skip-stop trial resulted in savings of 7 per cent and 7.5 per cent. That this economy was an item not to be overlooked by the public was indicated in the company's estimate that the general use of stop elimination on the system would, at 10 cents an hour, mean about $625,000 a year to the riders.

Local conditions, of course, should determine the advisability or inadvisability of adopting skip-stop operation. It should also fix the method, whether by the "odd-and-even" car number plan of Kansas City, the alternate-stop system of Cleveland, or the express and local car arrangement of Denver. Each of these deviations has its advocates, and the railway manager must consider the effect of the new plan on the stranger as well as on the local patron.

Inauguration of service of this kind should be conducted with care to hold the good-will of patrons. Any change which brings even slight inconvenience to the few will arouse opposition, and these few will not fail to agitate against the proposition while the many who are benefited will more likely be passive. Publicity is the necessary ally in this case. The public should be educated as to the benefits of the new plan, and a proper system of signs should be adopted so as to make clear the stop and non-stop points. It will be found that interested property owners or tenants whose places of business are not at the new stopping places will raise the strongest opposition. Patrons of the lines will be the beneficiaries, and it should be the strongest indorsement of the proposition that working people, who must through necessity live farthest from the city's center, will have a chance to save from five minutes to twelve minutes in getting to or from their work.

1916 Deliveries of Electric Cars and Parts

Manufacturers of Car Equipment Give Information Regarding Deliveries Which Should Impel Railway Managements to Place Orders Promptly

AS was outlined in an editorial last week, 1916 deliveries of some parts of car equipment must necessarily be slow. To ascertain the facts as definitely as possible the ELECTRIC RAILWAY JOURNAL asked several manufacturers to state their views. The substance of some of the replies which were received from manufacturers are given below.

Chilled wheel manufacturers have not yet experienced any difficulty in securing the charcoal iron and scrap wheels necessary for the production of these wheels. It is suggested by one manufacturer that the fuel supply will be the first thing to affect the situation. Difficulty is already being experienced in securing prompt deliveries of coke, and prices for this article are advancing rapidly. Undoubtedly the wheel makers will have to take this fact into consideration in making deliveries of chilled wheels later on, even if they are not already handicapped by the condition of affairs as exists at the present time. George W. Lyndon, president Association of Manufacturers of Chilled Car Wheels, states that this industry is a flexible one. In case of renewed activity in car building, however, where new wheels are sold without exchange, an extraordinary demand for new material follows. In ordinary times the exchange wheels provide a certain percentage of the new ones, but when there is no exchange, increased quantities of pig iron are required. Mr. Lyndon believes that many manufacturers have anticipated this condition and feels that there need be no apprehension regarding deliveries of chilled wheels during 1916.

The secretary of an important company which makes steel wheels states that the demand for steel is so great that the company's capacity is taken up for a good portion of the coming year. He believes that deliveries in less than from three to four months will be difficult to arrange, although there may be exceptions where material is in stock. The limit of delivery, this maker thinks, is not set by the shortage in steel, but by the lack of capacity to get the wheels out rapidly enough to supply the demand.

H. P. Bope, first vice-president Carnegie Steel Company, states that in view of the very heavy demand that has occurred in the line of general steel products, deliveries of materials not yet ordered will be slow. So far as solid wheels are concerned it is doubtful if any new business could be taken for execution during the first half of the year. Mr. Bope states, however, that the regular electric railway trade will be cared for, and he assumes that other manufacturers have made similar provision.

W. H. Heulings, Jr., vice-president J. G. Brill Company, calls attention to the fact that the general limiting feature of car delivery will be the maximum date of delivery of any important element. His investigations indicate that there is an extraordinary situation regarding axles. Three weeks ago one of the larger makers of axles withdrew all quotations to his company, another promises delivery in from three to six months, and a fifth one, depending entirely upon billets, as he does not make his own, in from four to six months. One axle maker stated that he could turn out a few axles in from six to eight weeks.

The rolled steel wheel situation, according to Mr. Heulings, is a worse proposition than that of axles, as the steam railroads are having difficulty in getting the wheels which they require. One wheel maker states that his output is sold for the entire coming year. Prevailing promises for delivery of structural shapes are for from five to six months, with difficulty in fulfilling these promises. Bars are especially difficult to get, and spring steel is in the same class. Tubing delivery promises are also quite discouraging.

New Power House in Australia

A recent issue of the *Commonwealth Engineer* describes the progress made in connection with the Victorian Railway's Newport power house, which will supply energy for the Melbourne (Australia) Electric Railways. The 36-acre site of this station is situated near the Yarra River, the ground being covered with a basaltic rock, which has been used for concrete work in the foundations. The main building, measuring 310 ft. long and 415 ft. wide, is built with steel pillars and reinforced plaster walls, while the transformer and switch houses are of brick. Concrete has been applied to the walls by a compressed air apparatus, which projects the mortar into the required position. The first section of the power plant, consisting of six 10,000-kw. Parsons turbo-alternators and exciters, is being erected. Current will be generated at 3300 volts and stepped up to 20,000 volts for distribution to the substations. A wet air-cooling plant is being installed in the power plant and also two 350-kw. auxiliary turbines. Special arrangements to facilitate the testing of any steam electrical set are being provided in addition. Nine miles of cables for auxiliary plants are led through cement conduits in the foundations. An electrically driven 50-ton crane with a 5-ton auxiliary hoist is provided in the engine room. The assembling of the first twelve Babcock boilers and Green economizers has been practically completed.

One-Man Cars Becoming Popular

New Designs Introduced for Use in Tucson—Reports from Eight Other Companies Which Have Been Using One-Man Cars for a Longer or Shorter Length of Time—All Are Favorable Toward This System of Operation

ALTHOUGH the advantages of one-man car operation for lines of light traffic have been the subject of very active discussion during the past year, the idea is not new. The old "bobtail" car of horse car days was a one-man car, and it was not until the general introduction of electric traction that many city lines in this country, where the traffic was light, put a conductor on the car to collect fares. With the one-man horse cars, however, the entrance for the passenger was in the rear, although there may have been exceptions, the rear entrance probably being an inheritance from the omnibus. The passenger was expected to drop his fare in the box on entering the car, and if he did not do so the driver would rap on a window to attract his attention.

The early electric one-man near-side cars were simply standard cars with the rear door closed, but lately inventive genius has been devoted to the design of cars especially for one-man service. Several of these cars have been described in previous issues of this paper. A number of articles on one-man car operation have also been published, the longest probably being that on page 578 of the issue for March 29, 1913. Some interesting statistics of the roads using one-man cars were published in the 1915 report of the committee on passenger traffic of the American Electric Railway Transportation & Traffic Association. Below will be found a symposium of articles from managers who have had experience with one-man car operation.

Louisville, Ky.

By J. T. FUNK, General Superintendent Louisville Railway

Cars were operated by one man in Louisville and in no other way for more than twenty-five years and until the city reached a population of about 200,000. The system was then changed and larger cars were substituted for smaller cars, and then it was that two men were placed upon them. During the time of the operation of the cars by one man the average seating capacity per car was about thirty-two passengers. The entrance was in the center of the rear end and through a door which was opened by passengers and closed by the man who occupied the front platform of the car by a strap, there being no rear platform at that time. The system was very successful and was satisfactory to the traveling public. The passenger, after entering, deposited his fare in a conveyer, which could be reached from any seat in the car, and the fare was carried to a fare box which was placed in the front of the car convenient to the front platform. The motorman or driver, because in the early days horse cars were used, could see the fare plainly with very little inconvenience before he dropped it from the tilting plate into the lower part of the box. Transfers of passengers were made either through a station at certain points or from car to car, so that no transfer slips whatever had to be issued by the motorman. Our records show that during the entire time of the use of these one-man cars a smaller percentage was paid out for accidents and damages than at any other time during the history of the corporation.

The motorman in approaching railroad crossings would stop within a reasonable distance and look both ways for trains, and if there were none close by would cross over. He never left the platform to flag a car across, and during the time I have stated accidents at railroad crossings were almost unknown. The reason of this is there was no divided responsibility, and the man in charge was held strictly responsible. During recent years, since large cars have been substituted for the small ones and two men, a motorman and a conductor, have been on each car, the expense for accidents, claims and damages of various kinds has constantly increased, and one of the reasons, in my judgment, is the dividing of the responsibility between the two men. Since the introduction of the large cars and a change in the transfer system also, passengers are now transferred by slip and at almost every crossing in the city. The issue of these transfers would entail too much work for one man to run a car without assistance, but in any city having cars with a seating capacity no larger than thirty-six and with only a very limited number of transfers to issue, one-man cars can certainly be run successfully.

The type of car which I would recommend would be with a platform and controller on each end. The man in charge of the car, when changing ends, could carry the controller handle and the fare box with him. With only one employee on the car, he should not be required to assist passengers on and off the cars, in fact, even with two men the advisability of assisting people is doubtful, as a great many people seem to be offended when the conductor takes hold of them for that purpose, and the practice is a source of much litigation and many claims.

At present in this city we only have about eleven cars that are run by one man. They are run only between the hours of 1 and 5 A. M. Fare boxes are used on these cars, and during these hours no transfers are issued. This system seems to work satisfactorily both to the company and the traveling public. The schedule speed of the one-man cars is about 9 m.p.h.

Cape Girardeau, Mo.

By A. M. TINSLEY, General Manager Cape Girardeau-Jackson Interurban Railway

All of the cars on this line, four in number, are one-man cars. Two of them are equipped with the door-closing and step operating device of the American Car Company; the other two are simply fitted with fare boxes. They have been in operation for four years. The original franchise of the company called for two men on each car, but the City Council passed an ordinance permitting the company to run with one man, and there was no objection on the part of the public. The scheduled speed is 6 m.p.h. and 102 car-miles are run per day per car. The seating capacity is forty. Two of the cars are equipped with Brill fare boxes and two with Cleveland fare boxes. No fare registers are used. Transfers are issued by the motormen at transfer points only. An interesting feature of this system is that at times of heavy traffic, when the traffic originates at one point, as a ball park, fair grounds, etc., the company stations one man at the place where passengers board the car to help motormen in handling the crowds. At railroad crossings the motorman is required to get off the car and look up and down the tracks before the car passes over the crossing. This is a State law.

Tucson, Ariz.

By W. A. HALLER, Chief Engineer Federal Light & Traction Company, New York

The accompanying halftone engravings show a novel type of one-man car designed by the writer for operation on the Tucson property of the Federal Light & Traction Company and just completed at the Wason Works of The J. G. Brill Company. Although it is not the final word in one-man cars, it represents a sincere attempt to secure a light car of the double-end type suitable for one-man operation. Such a car, the writer believes, has an important future on railways in cities of small size, where the traffic is light.

The following are the main dimensions of the car:

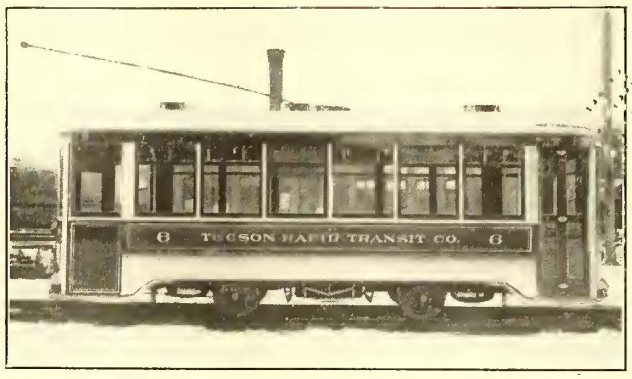
Length over buffers	27 ft. 6 in.
Length over vestibules	26 ft. 6 in.
Length over corner posts	18 ft. 6 in.
Length of each platform	4 ft.
Width over sills, including sheathings	6 ft. 3⅞ in.
Width of aisle	3 ft.
Height from top of rail to underside of side sills	23 3/16 in.
Height from top of rail to center of headlining	7 ft. 8 in.
Height from top of rail to platform	15½ in.
Height from platform to floor of car	9 in.
Rise of ramp from entrance of car to center of car	2 in.

The underframe is of steel, and the outside sheathing below the belt rail is of No. 18 gage aluminum. The floor is 13/16 in. Southern pine in single thickness, and there are no bulkheads. The window sash, which is in two parts, has the upper half stationary, while the lower half drops into concealed pockets in the side of the car. The ceiling and the wainscoting or paneling under the seats are of Agasote, enameled white. The seats are of mahogany slats with Wilton carpet upholstery, the seats being used bare in summer and covered with carpet in the winter.

The equipment on the cars consists of the following: Pantasote curtains, Electric Service Supply Company's 9-in. motorman's gong and push buttons, Golden Glow headlight with 46-watt mazda lamp, Hunter signs, Pyrene extinguishers, Dumpit sand boxes, Knutson trolley retriever, Rico hand straps, Garland ventilators and Commercial Truck Company's America type of truck with 8-ft. wheelbase and 26-in. wheels.

Perhaps the most novel features in the car are the motors and running gear, the control and the brakes.

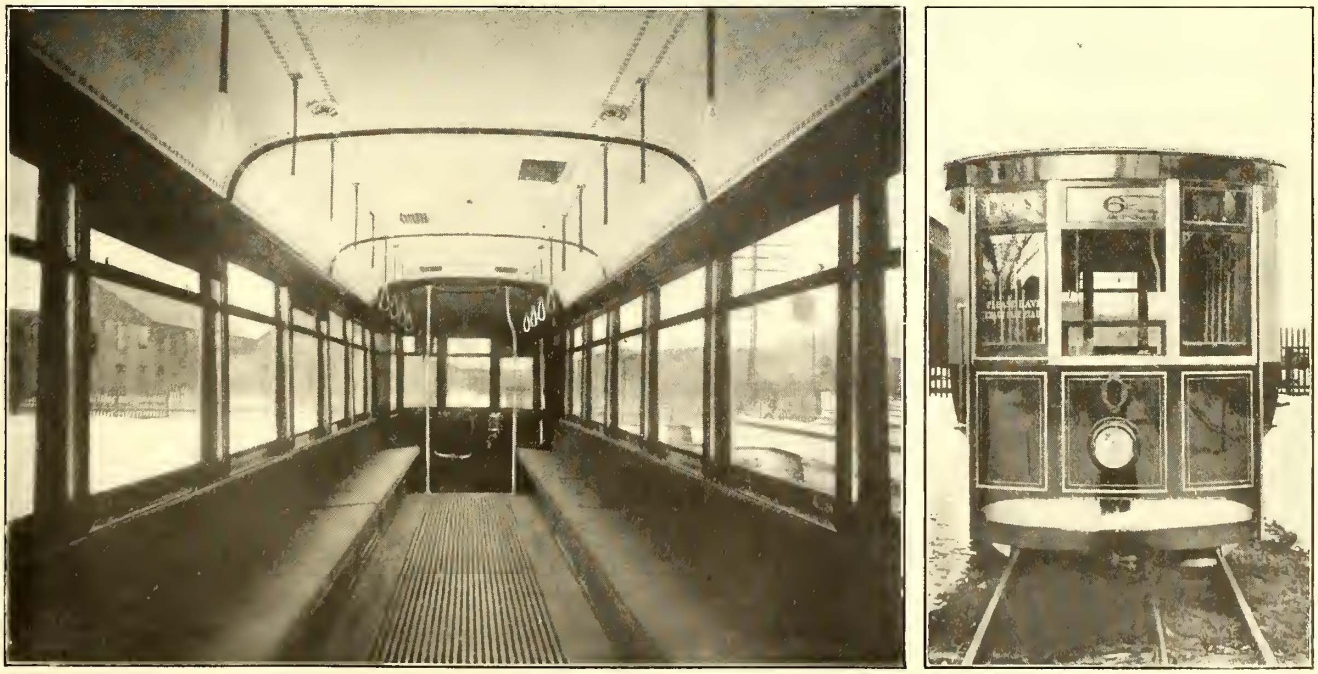
The motors are the GE-1063 automobile type, wound for 250 volts and designed for individual wheel drive,



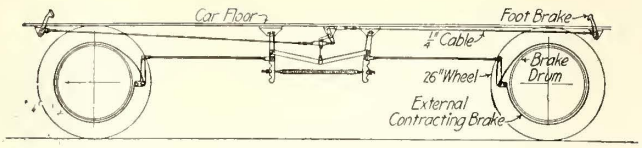
ONE-MAN CARS—SIDE VIEW, TUCSON CAR

so that there are four motors to the car. As each motor is of about 7 hp., the power capacity of the car is 28 hp. Each motor drives its wheel through a concentric gear which reduces the speed of the armature in the ratio of 10:1. The gear connection between armature and wheel is the same as that used in the electric drive of the vehicles of the Commercial Truck Company of America. In this design the motor armature pinion engages three spur gears which are carried by studs mounted on a spider integral with the driving shaft. These gears also have pinions which engage a single internal gear which is keyed to the gear case. This system of drive insures an equal distribution of load between the different driving gears as well as a continuous alignment of the gears. The motor itself is bolted to the inner side of the gear case, which, in turn, is bolted to the crossbars of the truck. The motors on opposite wheels are permanently connected two in series for a 550-volt circuit. The wheels are equipped with Timken roller bearings, and the armature journals with ball bearings.

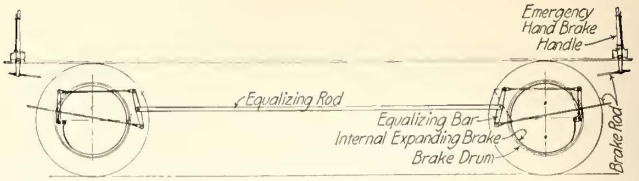
The brake is also of novel type, the design of the writer, and by mechanical means, the braking effected is as graduated and as easy of application for this type of car as with an air brake. There are really two separate and distinct braking systems, one for service stops and one for emergency stops, and each can be applied from either end of the car. A diagram of the system of levers used in each brake accompanies this article.



ONE-MAN CARS—INTERIOR AND END VIEWS, TUCSON CAR



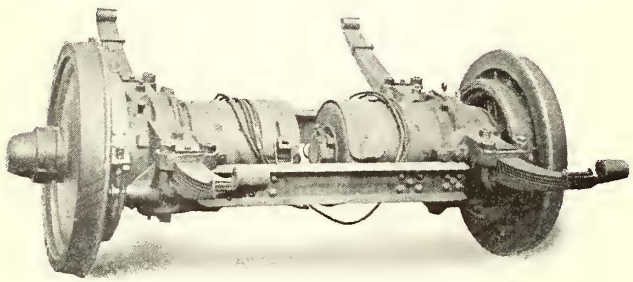
ONE-MAN CARS—DIAGRAM OF SERVICE BRAKING SYSTEM, TUCSON CAR



ONE-MAN CARS—DIAGRAM OF EMERGENCY BRAKING SYSTEM, TUCSON CAR

Both apply the pressure on an inside flange of the wheel, the service brake system operating a band on the outside of this braking flange and the emergency brake applying an expanding band or friction clutch against the inside of the braking flange.

The service brake is applied by means of a spring, which, when the car is in operation, is held extended by means of the brake cable, which is connected to a pedal on the platform. The brakes are set, therefore,



ONE-MAN CARS—PAIR OF WHEELS WITH MOTORS, TUCSON CAR

by releasing the pedal, and the brake pressure is regulated by means of the pedal. The arrangement of levers is such that the brake can be applied from either end of the car. The emergency brake system is independent of the service brake system and is applied by a ratchet hand lever on the platform.

The controller was supplied by the Cutler Hammer Manufacturing Company and is of the drum form with series parallel connections. It is bolted to the underside of the middle of the car and is operated by a lever from either end of the car, and automatically goes to the off position if the operator's hand is removed from the controlling lever. The wheels are 26 in. in diameter with cast steel spider and rolled steel tire. Even the motorman's seat is novel. It is of pressed steel, similar in design to those used on harvesting machines, and weighs only about 1½ lb. It is mounted on an adjustable support and is arranged to fold back when not in use.

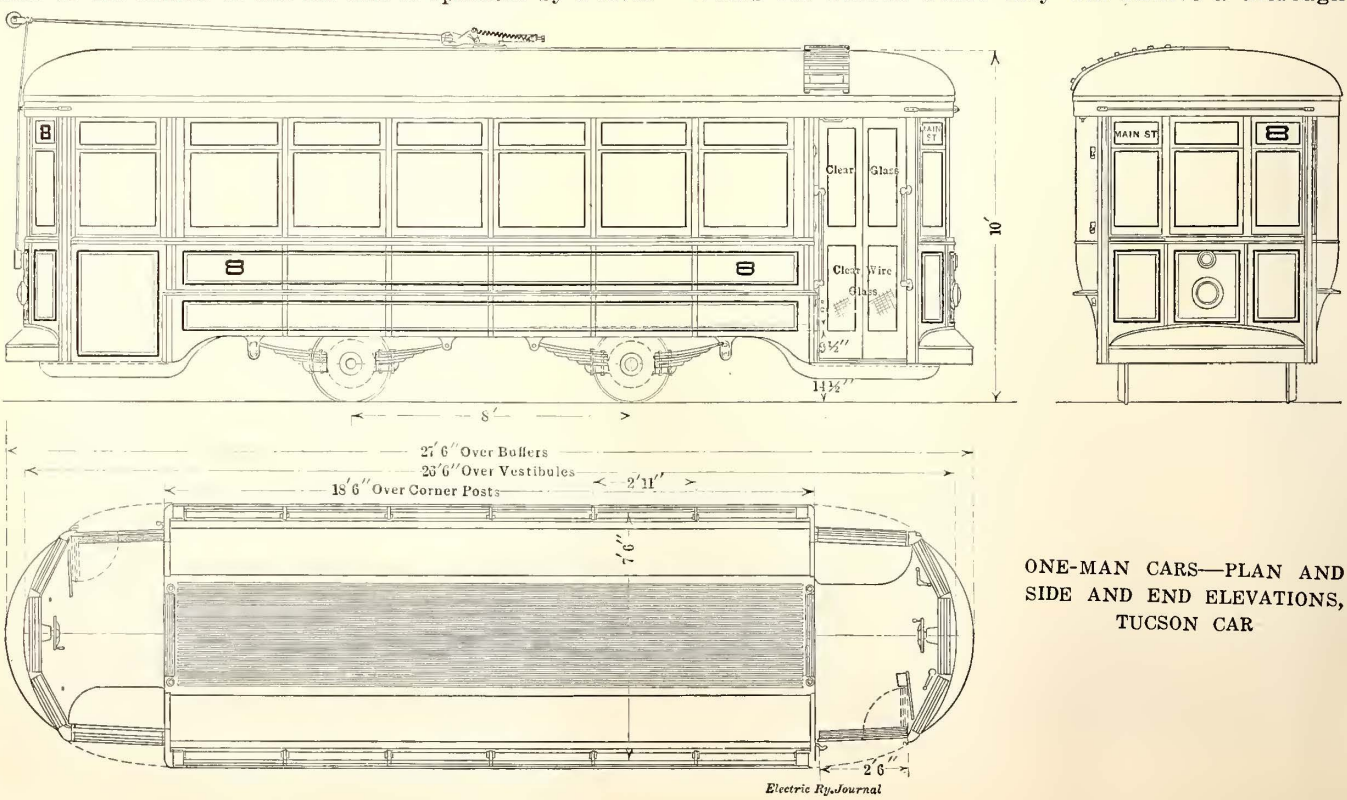
The approximate weight of the car is:

Car body	6000 lb.
Motor equipment and brake	4000 lb.
Rest of equipment, including wiring, circuit breaker, fare box, etc., approximately	1000 lb.

This makes a total of about 11,000 lb., but in a later car, even of this general type, the writer believes that this latter item could be cut approximately in half, or reduced to 500 lb. from 1000 lb.

Tests made with this car last week in Springfield, Mass., showed that it was very easy riding, due, in part, probably to the fact that the springs have lubricated pins. Moreover, in spite of the 8-ft. wheelbase, the car easily ran around a 28-ft. radius curve. This was probably owing to the independent drive of the wheels. The speed made with a normal load on level track was 20 m.p.h., and on an 8 per cent grade, 9 m.p.h. A higher speed, if desired, could be secured, of course, by the use of larger motors, such as would be obtained by the substitution of 10-hp. motors in place of the present 7-hp. motors.

Four of these cars are being built at the Wason Works for Tucson where they will receive a thorough



ONE-MAN CARS—PLAN AND SIDE AND END ELEVATIONS, TUCSON CAR

test so that the practical merits of their new features will be determined.

CENTER ENTRANCE TWO-MAN ONE-MAN CAR

The Federal Light & Traction Company has designed for future use on its other railway properties an improved type of car to be constructed principally of steel and aluminum with wood trim which will be suitable for either one or two man operation, and which it is believed will meet the traffic conditions and prove very economical in relatively large and also in small cities. This car is shown in plan and elevation on this page. This car has doors at the diagonal right hand corners, one of which is intended as both entrance and exit when one man operated, except at terminals or at points where inspectors are stationed, where the side door may be opened by the motorman to permit rapid unloading. Or the car may be operated with two men within congested areas, using the side door for both entrance and exit, or using the front door for entrance and the side door for exit. Under this plan of operation a conductor could be assigned to each car to accompany it through the congested districts and possibly across railroad crossings, if any, and then double back on a car going toward the city and thus effect a saving in platform labor.

In any plan of operation the arrangement of doors will permit rapid loading and unloading at congested points.

Perhaps the most striking feature of this car is that there are no drop platforms and the floor is on a continuous level. This greatly simplifies the system of levers for operating the brakes and controller. The steps are within the car, and of course those not in use are covered by a platform.

The car is double-ended, with controller and brake levers, sand box, etc., at either end, but at the end not in use this apparatus is arranged to be covered by a folding seat. Everything being inside the car, there are no exposed handles or steps on the outside of the car.

The frame of the car is of steel with aluminum panels and wooden doors and trim. By this construction it is hoped that a weight of not more than 7000 lb. can be secured for a car with a 30-ft. body and seating capacity of thirty-five. The same running gear, automatic brake and control are to be used on this car as on the Tucson cars already described.

From the standpoint of economy it is believed that this type of car and its method of operation offers a great opportunity to reduce operating expenses, and its attractiveness should tend to increase patronage also the gross and net earnings.

The following schedule of comparative operating costs is submitted:

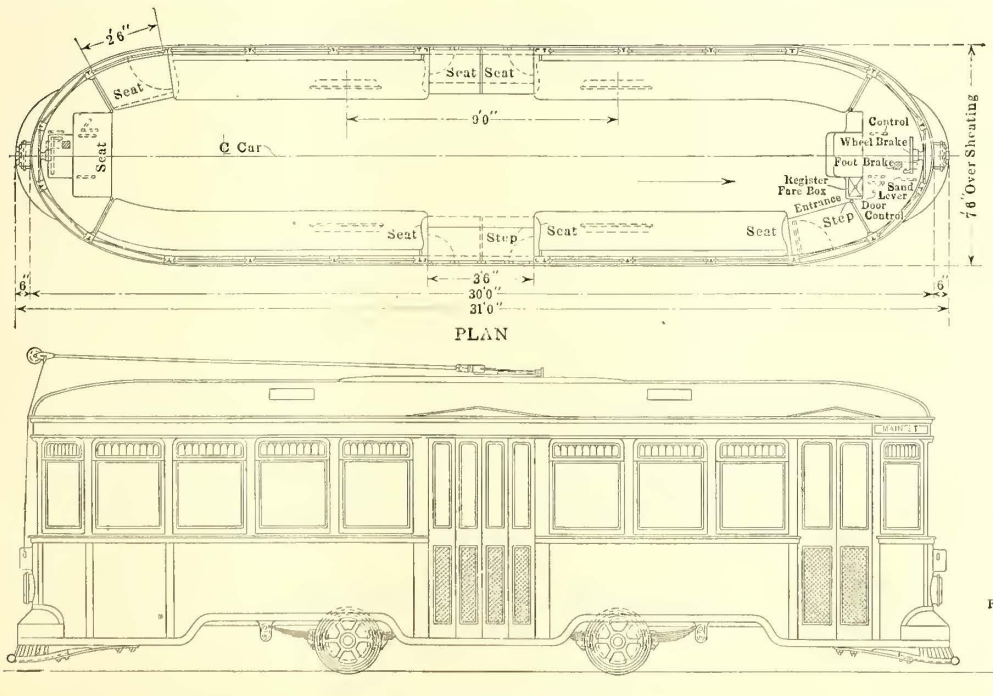
TABLE SHOWING PERFORMANCE WITH TWO-MAN AND ONE-MAN CARS

Two Man Operation, with a ratio of 75 per cent single truck and 25 per cent double truck car operation, based on 1,000,000 car miles per annum.

	Way and Structures	Equipment	Power	Traffic Expense	General and Miscellaneous	Total
Per cent of gross.....	6.0	6.8	10.6	26.0	18.6	68.0%
Cents per car mile....	1.32	1.50	2.35	6.20	4.50	15.87c.
Per annum						$158,700
Combined One and Two Man Operation, based on 1,200,000 or 20 per cent increase in car miles per annum.						
Per cent of gross.....	3.76	5.85	4.46	18.45	16.88	49.4%
Cents per car mile...	0.73	1.15	0.90	3.58	3.25	9.61c.
Per annum						$115,320
Estimated annual saving in operation.....						$43,380

Light efficient cars tend to reduce construction and operating costs in many ways, chief of which are the following:

1. Lighter and less expensive track required on account of less weight.
2. Less power station, conversion and transmission capacity required, amounting to from $1,000 to $3,000 per car.
3. Reduction in track maintenance cost, due to lighter weight and less pounding on special work and no slipping on curves.
4. Car maintenance cost reduced, due to smaller and better class of self lubricating apparatus.
5. Power consumption less, only 0.6 to 0.75 kw.-hr. per car mile against 1.25 kw.-hr. up for ordinary car equipment.
6. Platform labor less, due to employment less labor per car mile.
7. General and miscellaneous less, due to lower overhead charges, less insurance, less taxes, less supervision and accounting, and a marked reduction in the injuries and damages account, which expense has been shown



ONE-MAN CARS—PLAN AND SIDE AND END ELEVATION OF PROPOSED ONE-MAN, TWO-MAN CAR WITH SIDE DOOR, CONVERTIBLE FOR DOUBLE END OPERATION, FEDERAL LIGHT & TRACTION COMPANY

to be less than one-third that of two men operated systems.

8. A car easy of ingress and egress and otherwise attractive, thus encouraging traffic.

Pine Bluff, Ark.

By BYRON C. FOWLES, Treasurer and General Superintendent Pine Bluff Company

The electric railway system at Pine Bluff, Ark., has just put in operation twelve one-man cars. The car-miles run per day per car are 150, the average number of passengers per car-mile is three, and the number of transfer passengers per car-mile is 0.17. The cars have a seating capacity of thirty-two and make a schedule speed of 8½ m.p.h. The Johnson fare box is used, and fares are registered. Railroad crossings are protected by flagmen, so that there is no difficulty at these points, and no trouble has been experienced with disorderly passengers. The company has had these cars in service only since Dec. 12, but knows no reason why they should not be a success.

Oklahoma City, Okla.

By GEORGE W. KNOX, Second Vice-President and General Manager Oklahoma Railway

The Oklahoma Railway uses one-man cars on three small divisions where the traffic is very light, one car on each division. It also operates one-man service on the far end of three of its other city divisions. On each of these lines the car which runs to the end of the line leaves the city terminal with a motorman and a conductor. The conductor stays on the car until he meets the other car at the half-way point on the line. He then changes cars, taking charge of the incoming car at the meeting point. He uses a separate trip sheet for each car. When the motorman is returning from the end of the line he does not collect any fares, but the conductor goes through the car and collects fares when he boards the car at the half-way point. As there are no transfers beyond the point where the conductor leaves the car the motorman is not required to issue any transfers. The cars used in this class of operation are double-truck, with a seating capacity of about forty-eight passengers, and are equipped with folding doors and folding steps. The traffic on these lines while considerably heavier than that on the strictly one-man car line, is such that no difficulty is experienced in maintaining the scheduled speed, which ranges from 6.7 to 9.6 m.p.h.

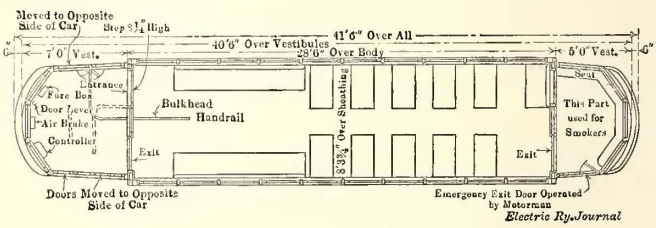
The cars on the one-man divisions were originally built for two-man operation. The only change made to them was the addition of folding doors and folding steps. They have been in operation about three years. The maximum speed is about 20 m.p.h., the scheduled speed is 5.6, 7.6 and 8.8 m.p.h. on the three lines. The average mileage per car per day is 135, and the average earnings 7 cents per car-mile. The seating capacity is twenty-eight. No fare box is used but the fares are recorded on a register. Transfers are issued at transfer points only. On one of the lines two men are used during the morning and evening rush hours, but on the other two lines one man only operates the car during the entire day. The motorman is instructed to announce the streets when the car is crowded or after dark, to help elderly or infirm passengers to board and alight and to extend the same courtesy and assistance as would be expected in two-man operation. The practice at railroad crossings is for the motorman to stop the car at a safe point, not less than 20 ft. from the crossing, take the controller handle with him and go ahead of the car to the middle of the track to ascertain if it is safe to cross. If he finds that this is the case he goes back and starts the car.

I consider one-man operation desirable only on lines having very light traffic, and, in general, the installation is not to be recommended where the success of the enterprise depends upon being able to operate with but one man to the car. However, with a line which was already built but found to be unprofitable with two-man operation, there is no good excuse for hesitating to operate with one man, as the cars may be operated safely and efficiently in that manner.

Lethbridge, Alta.

By ARTHUR REID, Commissioner of Public Utilities

All of the cars on the Lethbridge Municipal Railway, ten in number, are one-man cars. Some are single-truck and some are double-truck cars. They were originally of the pay-as-you-enter type designed for single-end operation, but they were changed for one-man operation by turning the car end for end and making the pay-as-you-enter platform the front end. The changes required are shown in the accompanying diagram, in which the solid lines represent the car as it is now and the dotted lines show the original position of the railings. As the platform which was formerly the rear platform is now the front plantform, the doors on each platform had to be transferred to the opposite side of the car. The door at the other end of the car, the small door, on what is now the rear end of the car, has been retained as an emergency exit door and is operated by the motorman. The cost of making the change was approximately $100 per car. The cars have been operating in this way eighteen months, and have a maximum speed of 25 m.p.h. and a scheduled speed of 12 m.p.h., and the average passengers per car-mile is 3.26.



ONE-MAN CARS—PLAN OF LETHBRIDGE CAR

The entrance and exit doors are operated by levers in front of the motorman. At present the steps are rigid, but plans are under way for operating the step in connection with the door mechanism. A Coleman fare box is used on the platform to receive the fares, and transfers are issued at points when the passenger is leaving the car. Passengers do not pay their fare as they enter, but when they leave the car. No trouble has been experienced with disorderly persons or with operating the cars over railroad crossings. There is, however, only one railroad crossing on the system, and that is on a branch track. The motorman is instructed to help elderly and infirm passengers off the car, if necessary, but does not announce the streets.

At first the public was doubtful as to the value of the system, but the attitude is now very favorable. The operation of one-man cars is considered on the whole safer than two-man cars, because passengers when boarding or alighting from the car are always under the eye of the motorman. In fact, the railway has not had an accident to boarding and alighting passengers since the system was put in force. Undoubtedly, the schedule would be somewhat slower than with two-man cars if the traffic were dense, but the system is quite small, having only 11 miles of track and carrying on an average about 2500 passengers per day, with very few transfers. At times, however, the traffic is very much larger than this, and the railway has carried as many as 14,000 passengers a day for three days at fair time

without accident and with very good success at maintaining schedule speed. Undoubtedly it is quite necessary to have a push button at every seat so that passengers may signal the motorman. The plan of passengers paying as they leave the car has the advantage of giving the passenger an opportunity to have his fare ready, but the disadvantage is that if a passenger gets off without paying, the fare is lost. Undoubtedly a transfer issuing machine would help the motorman to maintain his schedule, because the greatest amount of time now lost is that taken in issuing transfers.

Buffalo, N. Y.

By E. J. DICKSON, Vice-President International Railway

All of the city service in Lockport, N. Y., of the International Railway is performed by one-man near-side cars, and the saving in platform time is approximately one-half the cost of operation of double-end cars with two men. Eight cars are used, and they have been in operation since Dec. 29, 1912. They were purchased new for the purpose and were illustrated in the ELECTRIC RAILWAY JOURNAL at the time. The maximum speed is approximately 10 m.p.h., and the schedule speed is 7 m.p.h. The car-miles per car per day are 113, and the average number of passengers per car-mile is 3.2. Approximately 22 per cent of the total number of passengers are transfer passengers. The seating capacity of the cars is thirty-six each.

The cars are single ended but have an emergency rear door. The front platform is fitted with a folding door and step, mechanically operated, and a Dayton fare register and box are used. Transfers are issued when the fare is paid. No difficulty is experienced at railroad crossings, as all of the crossings are protected by flagmen. At first the attitude of the public was rather hostile, but now it is extremely favorable to one-man operation. The cars are run on a headway of fifteen minutes.

Atchison, Kan.

By J. W. WAGGONER, General Superintendent Atchison Railway, Light & Power Company

One-man cars have been operated on the railway system of the Atchison Railway, Light & Power Company for the past fifteen or sixteen years. They are the only cars we have and there are eight of them, all of the semi-convertible type and double-ended. In winter the doors on the rear platform are closed, and in summer the gates are closed, leaving only the front platform for entrance and exit. We have not found any other arrangements necessary to fit the cars for one-man operation. The schedule speed is 7 m.p.h. and the average number of car-miles run per day per car is 108. Each car has a seating capacity of twenty-eight, and the St. Louis Car Company's fare box, old style, is used, in connection with a regular fare register. Transfers are punched and issued at transfer points by the motorman. He also announces streets and is instructed to help elderly and infirm passengers off the car. We have a fifteen minute schedule which gives the motorman ample time to render any reasonable service to passengers. The passenger drops his fare, either ticket or cash, in the fare box as he enters the car, or if he has a transfer it is handed to the motorman. We have had no difficulty at railroad crossings, as the flagmen at those crossings flag the cars over. The public seems to be very well satisfied with the service. The only suggestion I have to make to any other company engaged in one-man car operation is that first-class motormen only should be employed. In one-man car service the operator should understand the operation of his car thoroughly

Greenville, Miss.

By R. B. CLAGGETT, General Manager Delta Light & Traction Company

The six cars regularly used on the lines of the Delta Light & Traction Company are all of the one-man type. They are double-ended, are mounted on single trucks, measure inside the body 16 ft. and were changed from double-end to single-end operation simply by the installation of a Tom Johnson fare box in each end of the car. The schedule speed made is about 8 m.p.h., although the cars are capable of running as fast as 14 m.p.h. Each car covers about 144 miles per day and averages 1.37 passengers per car-mile. Fares are rung up on a register, and but few transfers are issued. No trouble has been experienced at railroad crossings, as the motorman is instructed to use extreme care in going over them, and the important crossings have a railroad flagman. One-man operation has been used in Greenville ever since the line was started fifteen years ago.

Waco, Tex.

By R. B. STICHTER, Vice-President Southern Traction Company

At one time there were eighteen one-man cars in daily operation in Waco, this being the total number then in use. However, as traffic became heavier, a demand developed for larger cars and two-men operation in the more congested district. This resulted in some of the lines carrying two men in the business district and out to the last passing switch on the line. From this point out to the end of the line the car was operated by one man. Later practically all of the cars were changed over to two-man operation. It was our experience that one-man operation called for a little slower schedule; but not enough to be considered on lines requiring only three or four cars.

Our one-man cars had a seating capacity of twenty-four, twenty-eight and thirty-two passengers, and temporary seats providing for four additional passengers were placed in the rear vestibule, where smoking was permitted. Most of these cars were of the double-end type and were fitted with door and step control, operated by the motorman. Johnson fare boxes were used; these replacing the old Brill box, for which a double fare register was provided. Conductors were required to call streets and to give transfers when arriving at certain transfer points, no machine being used for the purpose. Passengers were required to pay fare as they entered the car by dropping it in the box.

I do not believe that we had any more trouble with disorderly passengers in the one-man operation than is ordinarily encountered with two-men operation. Our motormen were instructed to be of what assistance they could to old or infirm passengers; however, it is my belief that such passengers were acquainted with the fact that the cars were operated by one man, and generally provided assistance of their own when they used the cars. The motormen were instructed on approaching steam railroad crossings to bring the car to a full stop 50 ft. from the crossing so as to insure proper control of the car, then to approach within 10 ft. of the crossing, bring the car to a stop, look both ways, and if in the clear, to proceed.

The operation of one-man cars cuts the platform expense in half, and my experience leads me heartily to recommend this system of operation in the smaller cities and on pioneer lines in some of the larger ones. It is one of the resources that confront us in combatting the jitney service. With well-trained and experienced men, the one-man operation of cars is far safer and more reliable than the present jitney operation, and in my judgment the general public would so consider it.

Developments of the Future in Electrification

The Electrification of Steam Railroads Is Discussed by Engineers Prominently Identified with this Phase of the Electric Railway Industry from the Standpoint of Commercial Possibilities and of Impending Technical Developments in the Electric Locomotive and in Power Distribution

THE following series of articles deals with future possibilities of heavy electric traction from both the commercial and the technical sides. In regard to the former, the author who discusses it, A. H. Armstrong, writes in a distinctly optimistic vein, and is expectant of a considerable degree of activity in the immediate future in mountain-grade electrification. This field is considered the most promising not only because of the opportunity for attractive returns on the investment involved in electrification, but also because of the fact that here the physical limits of the steam locomotive have already been reached. On the technical side, an article by E. H. McHenry calls attention to the opportunities for improvements in the electric locomotive, this possibility of evolution, in fact, constituting one of the important indications of the extension of electric operation on steam railroads. The most important fundamental feature that is cited wherein the electric locomotive possesses an inherent advantage is that of its ability to handle heavy trains on fast schedules, and the author considers that but a very small part of the penalties now paid to attain express-service speed for freight trains apply to electric operation. On the subject of power distribution for heavy electric traction F. H. Shepard makes the important announcement that the present maximum contact-line voltage of 11,000 is likely to be subject to an increase in the near future, and outlines also some of the possible future considerations that have been brought to the front through experiences with the 5000-volt direct-current installation that was made last summer. In the following series of articles, therefore, each general phase of electrification has been discussed, and from the views expressed by the several authors there is ample evidence that the immediate future is going to see important changes as well as constantly increasing activity.

Some Aspects of Heavy Electric Traction

BY E. H. McHENRY
McHenry & Murray, Consulting Engineers

It has been stated that when an art reaches a stage of development at which no further progress is possible, it does not remain stationary but disappears and is replaced by some other form or method which possesses greater inherent qualities of continued evolution. If the steam locomotive has now reached this stage, its ultimate replacement by some new form of motive power is certain, and with our present knowledge we must assume that this will be some form of electric traction.

In past years the steam locomotive has several times appeared to have reached the ultimate practical limits of growth in horsepower and tractive effort, but each time some new development in design or method has made further advances possible, and it would be too bold to predict that the limit has even now been reached. Nevertheless, there is good reason to believe that it is close at hand, if not already here, as indicated by the present tentative experiments with electric traction in practical operation and the increasing difficulties and cost of adapting steam traction to the ever-growing requirements. Further development of the steam locomotive is so severely handicapped by the space and weight limitations, which appear to be inherent in any form of prime mover, that it does not seem likely to survive in the end in competition with a simpler and more convenient form of motor, in which energy supplied from an outside source is simply converted into work at the point of application. This is more particularly the case under conditions which permit large reductions of dead weights and the distribution of the present excessive concentrations of weight and pressure over more space and points of support.

In current practice higher steam pressures, compounding and superheating have greatly extended the horsepower capacity of the steam locomotive, but until recent years a corresponding increase in tractive power has only been gained at a cost of very high concentrations of weight and pressure within the restricted limits afforded by the rigid wheelbase. Axle loads of 30,000 lb. in 1880 have risen to 60,000 lb. and 65,000 lb. in 1915, with an extreme maximum of 73,000 lb., making necessary great changes in track standards and corresponding increases in the cost of track and track maintenance.

In the same interval the weight of rail sections have been much increased, but the rails have not kept pace with the increasing axle loads in either strength or quality, with the result that economy has been sacrificed and the margin of safety has almost disappeared.

The development of the Mallet and triplex locomotive types affords a partial relief from the restrictions imposed by the rigid wheelbase by distributing the weight of the locomotive over more driving axles, but the evil effects of the precedents already established still survive and in the later engines of this class the newly-regained margin of safety is again nearly absorbed.

All of the above considerations tend to the conclusion that the possibilities of future growth of electric traction are much less sharply limited than in the existing steam service.

With electric traction the weight and space limitation of the steam locomotive are largely avoided, as it is not necessary to overload the driving axles nor even to assume that all driving axles must be concentrated into locomotive units, as the possibilities of multiple unit control now utilized in passenger service can obviously be also extended to freight service, and it is altogether probable that in future the motive power will be distributed in the length of the train in order to avoid excessive draft strains and concentrated stresses in bridge members.

It may be added that the uniform turning moment of the electric motor permits a higher utilization of the available adhesion, which also tends to a reduction of the present axle loads. The available horsepower capacity will also be very much enlarged, as the source of primary power may be regarded as unlimited so far as

the requirements of any one train are concerned, and this will have the practical effect of eliminating many of the present limitations on train load and train speed.

Under favorable conditions, in which density is the chief factor, electric traction is already most economical in operation, but the general substitution of electric for steam traction will not depend so much upon its comparative economy under similar conditions as in its inherent and latent possibilities of future development and in its ability to occupy wider fields of usefulness. This point is strikingly illustrated in the development of electric street railways, in which the comparative cost and economy of electric versus animal traction were at first compared under similar service conditions, but in which the character of the service soon changed so greatly that no one to-day would even think of them as equivalents upon which economic comparisons could be based. Similarly, in the operation of standard railways it is probable that electric motive power will find applications in new fields still undeveloped in which the steam locomotive could not meet the requirements.

It is the writer's opinion that electric traction will find no rival in at least two fundamental features of high commercial importance. In light passenger service, the higher rates of acceleration, reduced weights and lower cost of train wages, fuel and repairs afford opportunities for more frequent train service than would be economically possible with steam traction, collaterally accompanied by higher gross and net earnings.

In freight service, the ability to operate heavy trains on fast schedules has a commercial value which is but little realized and which it would be difficult to overestimate. The higher rolling friction and wear of track and equipment form but a small part of the cost of high speed in freight service, which is principally due to the fact that the steam locomotive can rarely generate sufficient horsepower to utilize its tractive rating at speeds higher than 10 m.p.h. or 15 m.p.h., and only attains higher speeds at a sacrifice of train tonnage. This sacrifice is disproportionate to the gain in speed and may greatly increase the number of trains required to move the same tonnage, and as about one-half of the cost of operation varies directly with train mileage, it is evident that the cost per ton-mile will be much greater. In one case in the writer's experience, 4.6 trains were required to move the same tonnage at 35 m.p.h. as compared with one train at 18 m.p.h., thus more than doubling the ton-mile cost. This is not an unusual condition and it is safe to say that the train load of a great majority of all freight trains in the United States is less than that fixed by the resistance of the maximum grades.

The additional cost of high speed in express service and time-freight service is supposed to be compensated in the freight rates, but there must always be some rate of speed in each particular case above which a rate sufficiently high to compensate for the reduced train loading cannot be obtained, and below which a loss in traffic rates may be suffered. With electric traction but a very small part of this penalty for high speed need be paid, as the armature speed of the electric motor is almost independent of its weight and tractive effort, thus affording an opportunity to maintain full traction ratings at higher speeds than permitted by the limited horsepower capacity of the steam locomotives in common use. This is a fundamental distinction in favor of electric traction, as it is apparently possible to earn the higher rates now paid for fast service without added train mileage, with the result that the net earnings per train-mile will be much increased. In general, the commercial value of speed is less than that of its tractive equivalent, provided that it is sufficiently high to meet the requirements of the time schedules established for each particular class of service, and any available horsepower capacity in excess of such requirements may usually be converted with greatest profit into equivalent tonnage rather than into speed.

The fullest utilization of the inherent advantages of electric traction will not be obtained until the motor capacity can be more flexibly extended over a wider variable range of speed and tractive effort, in which respect the present motors of the series types are quite deficient. Their characteristics are such that the motor horsepower and speed rise and fall almost together, with the unhappy result that the available horsepower becomes less as the need for it grows greater.

In the operation of engine districts of relatively low resistance, with local sections of high resistance, which is the most common condition, the motors will be too heavy and too slow on the level sections; or, alternatively, too light to meet the tractive requirements on the sections with heavy grades. Under these conditions the electric motor is at a disadvantage when compared with the steam locomotive, which can always develop its full "adhesion rating" at lower speeds and constant horsepower without regard to the time or distance over which the maximum effort is exerted. This disability has already been overcome in some measure by special types of induction and series motors, which afford two or even more "steps" in speed at equal horsepower, and there is every reason to believe that a fuller development along the same lines will extend the range of practical application and afford a more nearly continuous gradation between the extremes of speed and tractive effort. The difficulty could also be met with the aid of some practicable form of mechanical gear changer, but the present prospects for such a development do not appear to be very encouraging.

The time factor is such an important element in the tractive rating of electric motors, that measurements of motor capacity in terms of continuous and hourly horsepower become almost valueless for practical use, and some method of service rating which recognizes the relation between horsepower capacity and the coefficient of adhesion of the weight on drivers would be most desirable.

In ordinary switching service, an electric locomotive can effectively utilize its full tractive weight on drivers with but one-fourth of the rated horsepower capacity in motors required to utilize the same tractive weight in service extending over much time and distance, as in the operation of long inclines. A rating of the kind suggested would simply express some time relation between the maximum and average values of the root-mean-square current as determined by the physical characteristics of the particular division or engine district to be operated, and would doubtless take the form of a coefficient to be applied to the continuous horsepower rating of the motor capacity. Means for correcting the lower power factor of systems using induction and single-phase motors, in order to reduce line losses and the first cost of apparatus, would be particularly desirable, and the possibility of accomplishing this result by locally supplying magnetizing current from the locomotive auxiliaries has been under consideration for some time past. A further extension of the same principle would apparently also afford local voltage regulation at the motors, which would be even more desirable and valuable than simple power factor correction.

Reference has already been made to the opportunities afforded by electric traction for reducing axle loads, which is necessary both in the interests of safety and

economy. Under the old rule of the Baldwin Locomotive Works, and the more refined rule submitted by Gustav Lindenthal before the New York Railroad Club on May 21, 1915, which takes the modulus of the rail section into account, the safe axle load for rails of 100-lb. section does not exceed 45,000 lb., as compared with the higher loads previously noted. A further and more comprehensive investigation of safe loads for the different rail sections in common use should afford valuable results. Better methods will doubtless be devised for cushioning impacts arising from the heavy motor weights, which is an important feature as the destructive effect of uncushioned impacts on motors, gears, wheels and rails is very large.

That these aspects of electric traction have not been more generally recognized is not surprising, as they occur more particularly in heavy freight service which as yet is but little developed in the field of electric operation.

Opportunities for Electrification

BY A. H. ARMSTRONG
Chairman Electrification Committee General Electric Company

The striking economies resulting from the electrification of the Butte, Anaconda & Pacific Railway, which constituted the first practical demonstration that electric operation of steam railroads could be made to pay direct profits on the investment involved, have had a far-reaching effect. Prior installations had been undertaken only because of considerations which, like those of the smoke nuisance or improved suburban service, were entirely aside from the question of profit, and in consequence electrification was very generally regarded more as a costly luxury than as a means for decreasing operating expense. But now it is being recognized by the various railroads of the country that there are a great many instances wherein the investment involved by electrification will prove to be thoroughly advantageous upon financial grounds alone and will produce an attractive return in the direct form of operating economies. This makes it certain that a material increase in electrified mileage is going to take place in the immediate future.

Some of the increase will undoubtedly come from the electrification of large railroad terminals. The popular demand for smokeless operation is very much in evidence at present, and where the proper conditions exist, such as the opportunity to take advantage of multiple-level stations and increased capacity of individual tracks, the work is going to be carried out. It is probable, however, that in urban districts from which the steam locomotive is banished there will be considerable trackage on which the traffic is too light to warrant the economical installation of an electrical contact system, and for work under such circumstances the use of electric units that are capable of self-propulsion when necessary, seems likely. Obviously, the cost of the equipment of sidings such as house tracks that are used but once or twice a week constitutes a heavy and quite unnecessary burden upon electrification, which is, primarily, a means for delivering large amounts of energy to moving trains.

Because of this, in fact, mountain-grade electrification appears to be a more important field of opportunity at the present time than terminal electrification. Indeed, steam railroad operators are turning at last to electric operation for the very good reason that their growing demands for tonnage and speed have gone beyond the maximum physical capacity of the steam locomotive, and it may be safely said that there is hardly a heavy trunk-line mountain grade in the country where electrification is not being seriously considered. This does not mean that electrification of every grade will be undertaken at once, because there are numerous factors, notably the difficulty of raising funds, that have always to be considered before actual construction can commence. Nevertheless, there are to-day a number of very active grade electrification projects in view, and there seems to be good reason to expect that several will be actually authorized within the coming year.

The reason for classing mountain-grade installations as the most profitable field, and the one in which the greatest activity is imminent is, in general, because of the relatively high speed at which the electric locomotive can exert its full tractive effort and the economies that are consequent thereto. The limitations of the steam locomotive involve a material loss in hauling power when the speed is increased above 8 m.p.h. or 10 m.p.h., and there is, in addition, an indirect loss that is especially important on heavy grades because the great weight of the machine cannot be utilized for adhesion at higher speeds, thus acting as dead weight which must be deducted from the revenue train-load behind the tender. For example, the recently developed "triplex" type of steam locomotive is capable of even greater tractive efforts than the latest designs of electric engines, and it is obvious that speeds of say 15 m.p.h. could be obtained with it on ruling gradients by reducing the tonnage of the trains that it was called upon to handle. However, when this is done the tractive effort becomes only some 10 per cent of the adhesive weight and the result is a most inefficient hauling machine.

To make electricity a commercial competitor of steam it is necessary only for two favorable conditions to apply—(1) sufficient tonnage, and (2) available power facilities. For the latter it may be said that a straight-away feeding distance of 200 miles is reasonable for synchronous machinery and up to that limit hydroelectric or other foreign power may be purchased; otherwise power stations must be built for the individual use of the railway, and this is always a serious handicap.

Regarding tonnage, a very approximate minimum limit may be set on roads with heavy grades, amounting to 15,000 tons daily in one direction. With traffic of this order it will generally pay to electrify, and where there is more than this on single-track roads the proposition should become very attractive. For double-track roads the minimum should not be appreciably different because, whether a line is double or single track, no more copper need be installed, and the power facilities and number of locomotives required are dependent upon the schedules irrespective of whether they are maintained on one track or two. Clearly enough, this minimum makes electrification a practical possibility on every Eastern trunk line that crosses the Alleghenies and on practically every road crossing the Continental Divide in the Western States.

Included in the latter are the Transcontinental systems, and in the case of these roads there are considerations due to location and character of traffic that make electric operation particularly advantageous. In the first place, steam fuel is generally high in price and poor in quality, and at the same time the mountain rivers provide an adequate supply of hydroelectric power at well situated points. The consequent saving, which is the largest single item in the list, should normally run to fully half of the entire cost of steam locomotive fuel. Repairs constitute another very important item, these frequently exceeding 20 cents per mile for a steam engine having only about

60 per cent of the tonnage-moving capacity of the electric machine and making 35,000 miles per annum under the most favorable conditions. Electric locomotives of a size similar to those now in service on the Chicago, Milwaukee & St. Paul Railroad, and having 450,000 lb. on drivers, should cost about 10 cents per locomotive-mile to maintain, making an annual mileage of at least 60,000. The average increase in train speed to be expected under electric operation brings with it reductions in other operating expenses that are obvious, and this constitutes a third item of importance.

These considerations apply with special emphasis, of course, directly to those divisions where heavy grades are encountered, but as a measure of the mileage thus involved may be cited the fact that the mountain country extends for 800 miles on the Chicago, Milwaukee & St. Paul Railway, or nearly twice the length of the very extensive electrification now nearing completion.

Logically, electrification should be made continuous, and all of the sections with heavy grades could profitably be coupled together even though this might involve the electrification of an intervening low-grade engine division, thus eliminating the disadvantage of maintaining a steam engine division that is placed between two electric engine divisions, and here it may be said that, on the Chicago, Milwaukee & St. Paul Railway, it is the intention to combine two steam divisions into one electric engine run totaling 220 miles in length.

The extent of the savings from this source can hardly be estimated at the present time, but that they should be important cannot be doubted. Even in the light of present experience there is no longer any question but that in mountain-grade electrification the whole division that includes the grade should be equipped and the steam locomotives eliminated completely. Combined steam and electric operation does not pay, except under extraordinary circumstances, and such installations are made entirely from motives of expediency rather than because of the direct return upon the investment.

Regarding opportunities for profitable electrification other than mountain-grade installations there should be mentioned the possibilities inherent in low-grade freight lines and in large switching yards. Both of these general fields look exceedingly promising, but the expression of any opinion as to the extent of the available economies or the probability of their exploitation in the near future would be speculative, because of the existing lack of definite data upon which to base conclusions. Electric yard service would have every thing in its favor from an operating standpoint and should show excellent returns, provided that fixed charges are not made prohibitive by having to equip tracks that are used comparatively seldom.

With regard to low-grade freight lines there are equally great benefits to be secured without encountering the disadvantage of infrequently-used tracks, and there ought to be something done in the near future both on Eastern trunk lines and on the level divisions of transcontinental lines after they have had their mountain divisions equipped. However, the physical need for electric operation is not so great on level routes, even though the traffic may be heavy and the load factor high. Notwithstanding the fact that the returns might be quite as attractive as those from a mountain-grade project there is not the same physical incentive to make the change so long as the less economical steam locomotive is able to meet the requirements of the traffic, and this the steam locomotive seems capable of doing in a satisfactory manner for a number of years to come.

Considerations in Railway Power Distribution

BY F. H. SHEPARD
Manager Heavy Traction Division Westinghouse Electric & Manufacturing Company

The well-defined tendency toward constantly increasing train loads in steam-railroad practice, coupled with the demand for higher speed wherever electrification of freight traffic is considered, makes the problem of delivery of energy to the electric locomotive a continually recurring one. Literally enormous demands for power are being made on existing installations of heavy electric traction, and yet there can be no doubt that these will be exceeded in the immediate future. On the electric zone of the Norfolk & Western Railway, for example, drafts of 12,000 kw. for a single train are of common occurrence, and in the passenger service on the Philadelphia main-line electrification of the Pennsylvania Railroad, as many as four heavy motor-car trains in one section may synchronize their power demands during acceleration, calling for a total input of about 16,000 kw.

Although the distribution and collection of such amounts of power are well within the capabilities of equipment designed according to present standards, the margin for a possible future increase in the train load or in the train speed is by no means unlimited, and of late it has become increasingly evident that provision should be considered for further demands if the utmost advantage is to be taken of the benefits of electric operation. The most obvious step in this direction would be an increase in line voltage above the present generally accepted maximum of 11,000, and in fact, there has already been some definite expression of belief by engineers that such a change should be made.

Undoubtedly there is much to be gained by an increase in contact line voltage even under existing conditions. It is true that the difficulty of insulation increases about as the square of the voltage, and with insulators fouled by exhausts of steam locomotives—a condition which occurs on many electrified track sections—this difficulty is of no mean importance. On the other hand, such troubles are generally more impressive in prospect than in practice, as exemplified by the success of the great increase in contact line voltage that was made when 11,000 volts was introduced ten years ago. As a matter of fact, there is no particular reason, aside from the deterrent effect of present custom, why a trial of 16,000 volts should not be made, and if this turns out satisfactorily, it should be followed by another increase to 20,000 volts on the contact line. European practice has already sanctioned 15,000 volts, and now that the need for a higher tension is beginning to appear in this country, it is safe to say that its introduction is going to be a matter of the future.

For railroad transmission lines, however, a similar increase in voltage is not called for. With the exception of the St. Paul installation, electrifications have thus far covered distances that were too short, in view of the power requirements, to warrant transmission at anywhere near the maximum in use for industrial lines. On the Norfolk & Western and the Philadelphia electric zones, a transmission voltage of 44,000 was found to be ample, and no decrease in copper could have been effected by a higher tension without sacrificing mechanical strength, smaller wires than those used being too subject to breakage. Of course, for longer distances a higher voltage would obviously have been necessary, because with traffic of the importance of that which is involved in both cases, it would have been unwise as well as unnecessary to take liberties with volt-

age regulation, as evidenced by the relatively short intervals of about 10 miles between transformer stations.

Incidentally, it might be well to call attention here to the origin of the rather unfortunate custom of calling these buildings "substations." The latter term conveys at once the impression of skilled attendants and rotating machinery costing some $35 per kilowatt, because of the familiar application of the term in city and interurban railway work. Yet the transformer stations on the electrifications in question are as foreign to such a definition as the pole-transformers on 2300-volt lighting lines which serve a number of adjacent residences with low-voltage current. The power apparatus involved might, if desired, be installed out of doors, and the cost of the equipment, amounting to some $5 per kilowatt, makes it serve directly as a means for reducing the feeder cost. The term "transformer station" is infinitely more applicable to such an installation, because, unlike the "substation" which acts as an auxiliary to the power station for the production of direct current, it is not indispensable to power operations, but serves instead the dual purpose of voltage regulation and prevention of inductive disturbance. The spacing is not dependent upon power losses.

This is not the case with the direct-current substation, where the first cost of the machinery makes a maximum spacing greatly to be desired, and this reason, together with the problem of current collection at the pantograph, provides a definite incentive in railway work to increase direct-current voltages. The step that was made some years ago from 600 volts—so long standard for interurban railways—to 1200 volts, was a marked success. Nevertheless, the imposition of more than about 1500 volts on a single armature involves material difficulties, notably that of commutation.

The practical limit in voltage for motor armatures is analogous in some respects to that which was found in generator design when the first attempts were made to increase alternator voltages. This early difficulty was overcome by the ingenious conception of the stationary armature with a rotating field, and that permitted the extension of generator voltage to the desired point. Yet the original voltage limits for a rotating armature have remained unchanged to this day.

Forward steps in direct-current railway voltage, therefore, have been made by combinations of 1200-volt armatures, and the advance reached a record height last summer with the successful operation of the 5000-volt Grass-Lake line of the Michigan United Traction. This installation has been working regularly since that time, and it has shown very gratifying results. But, of course, it is still no more than an experiment, and its commercial success is subject to a great many factors which are as yet wholly unknown.

In this connection it may be said that the problem of earth current voltages is one of major if not of vital importance irrespective of inductive interferences, and although harmonious co-operation between railroad engineers and the engineers of telephone and telegraph companies has been a conspicuous feature of recent electrifications, definite knowledge regarding all phases of action of extreme high-tension direct-current circuits can come only through practical experience.

Certainly, if direct-current voltages are increased greatly and substations are moved far apart, there is a probability of very great differences in earth potential wherever heavy drafts of current are taken from the line. How these will appear, and what their effect will be can only be determined by the slow process of experiment. In the same way the matter of surges is bound to be important with great increases in voltage. Also, voltage fluctuations in railway circuits, as well as the shorts that are bound frequently to come in, are wholly different from any conditions that are found in ordinary transmission problems, and it cannot be said in advance just what is going to develop. In fact, direct-current installations of extreme high voltage like that at Grass Lake are in just the same place as were the single-phase installations ten years ago. Their problems are before them, and these will have to be worked out by experience before they can reach the condition of a definite and precise art in which single-phase operation is to-day.

Rhode Island Arbitration Award

Increases Granted to Second-Year, Third-Year and Older Blue-Uniformed Employees, but None for Shop, Power-House and Other Employees

INCREASES of wages for blue-uniformed employees in the second, third and subsequent years of their service were granted in a decision handed down on Dec. 23 by the arbitration board sitting in the case of the Rhode Island Company, Providence, R. I. No increases, however, were authorized for employees of less than a year's standing in the car service, for the board regarded these men as apprentices. Beginning on Jan. 1, 1916, the hourly wage of blue-uniformed men in their second year's service becomes 26.5 cents, as compared to 26 cents before the arbitration took effect. The wage of third-year men becomes 28.5 cents, as compared to the former rate of 27 cents, and the wage of men in their fourth and subsequent years becomes 30 cents, as compared to 28.5 cents. Blue-uniformed men in their first six months continue to receive 23 cents per hour, and in their second half-year, 24.5 cents per hour.

No change is made in the wages of shop, power-house and other employees. Under the award, however, extra platform men are guaranteed a wage of six hours per day, the work to be performed within fourteen hours. Allowances are made of 25 per cent extra for the first hour or fraction thereof over fourteen hours and of 35 per cent extra for the second hour or fraction thereof and after, over fourteen hours. All soliciting of runs from other employees is abolished by the finding.

By agreement between the company and the union, the award is retroactive to June 1, 1915, and terminates June 1, 1917. In awarding back pay on the former basis, however, the board sets the compensation of third-year men at 27.5 cents per hour and of fourth-year and later men at 29.5 cents per hour, these two intermediate rates terminating on Jan. 1 in favor of the rates first quoted.

Comparison With Other Railways

In rendering its decision the board stated that a living wage must be considered in connection with the particular employment concerned and that the test of a fair and reasonable wage was a comparison with the wages received by blue-uniformed employees of other street-car companies. It felt that the wages of carpenters, masons, blacksmiths and painters and the like are not helpful in arriving at the proper wage to be paid motormen and conductors and should not be used in determining such wages. The board held, too, that the financial condition of the company should be taken into account in fixing wages, and it was considered evident that the railway is in poor financial condition. The board's outline of the company's history showed that there is a net of $2,000,000 in stock on which no

dividends are being earned and $3,500,000 in notes on which no interest is being paid. In 1915 there was no net income available for dividends but instead a deficit of $115,428, in part attributable to jitney competition in Providence and Pawtucket. The board, however, cited the Boston Elevated Railway and Bay State Street Railway arbitration findings as evidencing that financial condition should not be a bar to providing a fair and reasonable wage for the services performed.

The board felt that a fair and reasonable wage for a motorman and conductor working for the Rhode Island Company could best be determined by a comparison with neighboring companies of like character. The union contended that the wages of blue-uniformed men should be increased to a minimum of 30 cents per hour and to a maximum of 35 cents. The evidence contained an exhibit of comparative wages in thirty-two neighboring companies, twelve of which paid a higher rate than the Rhode Island Company. The lowest maximum wage paid by any of these roads was 30 cents per hour, while the maximum of the Rhode Island Company was 28.5 cents. Most of these roads did not reach their maximum until the sixth year, while the Rhode Island Company reached its maximum at the fourth year. The board decided that a fair and reasonable wage should not fall short of the lowest maximum of the twelve companies in Massachusetts paying a higher rate than the Rhode Island Company. It realized that the stockholders and the public both have certain rights and that the city of Providence has a keen interest in the situation, but none of these considerations ought to militate against the motormen and conductors being paid a fair and reasonable compensation.

Miscellaneous Employees

While a comparison of the shop, power-house and other employees with outside trades ordinarily would be more helpful than in the case of the blue-uniformed men, from the evidence before it, the board found that it could not intelligently make such a comparison. There are 105 classifications in the company shops and miscellaneous departments. Of the thirty-seven classifications recognized by the Bay State Street Railway, twenty-two bear the same name as those of the Rhode Island Company. Thirty-one of the fifty-eight Boston Elevated Railway classifications are the same as at Providence, and on the Middlesex & Boston Street Railway five classifications are the same. While the board was of the opinion that the wages for these miscellaneous employees should not be reduced, it did not find from the evidence that they are not receiving a fair and reasonable wage and therefore made no change in their compensation.

The company at present pays no guaranteed wage. As a result, a practice has arisen which prevails in few if any other companies, *viz.*, of soliciting work from the regular men. This practice is not favored by the company because it allows favoritism among the men. A popular man may thus obtain much more work than one who is less popular, although his senior in service. From the union point of view also it is undesirable because a spare man often boards a car and argues with the regular man to induce him to lay off a few hours so that the spare man may get a job. The board was of the opinion, therefore, that the need of a minimum wage had been clearly shown.

Future Needs of Company

In conclusion the board pointed out that the company's condition is critical. If it is to emerge successfully from its present position, it will require the active and earnest co-operation of the men and the active and earnest support of the public. The men, the board said, can be of great assistance in co-operating with the company at this difficult point in its career, and the public also can do its share. From 1912 to 1915 the receipts from transportation did not show the gain that was to be expected from the growth of the territory served and the extensions made. While the normal increase in transportation receipts should be about 6 per cent yearly, in 1913 the gain was less than 5.5 per cent, and in 1914 1.5 per cent, while in 1915 there was a loss. The board stated that the transfer system is to-day showing a continual increase in the percentage of transfer over revenue passengers and a consequent decrease in the number of revenue passengers, but as to whether the transfer privilege is being misused, it of course could not say.

After the publication of the award, the trustees of the company issued a statement commending the faithful and intelligent work of the arbitrators but expressing regret that they did not find it possible to give greater weight to the financial condition of the company. The trustees said that the company would do its best to carry the additional burdens placed upon it, in the bearing of which it hoped to have the co-operation of the city of Providence. The officers of the union issued a statement to the effect that the award gives to some of the blue-uniformed employees about $128,867 for the two years of its duration. About 800 men, or one-third of the union employees, are in the miscellaneous class, according to this statement and are not advanced in pay by the award.

Trade Directory of Central America and the West Indies

A complete revision and detailed classification of the names of importers and merchants in Central America and the West Indies, made by the American consular officers in co-operation with the bureau of foreign and domestic commerce, has been published as a section of a new edition of the World Trade Directory. The lists have been brought up to date and are presented in uniform style, with a finding index.

A new feature is the listing, so far as the information could be obtained, of (1) the American and other foreign agents of Central American and West Indian importing firms, and (2) of the names of the parent firms of branch houses located in various Central American and West Indian cities.

The directory does not aim to include the names of the exporters, nor are the names of manufacturers given, except those who are, or seem likely to become, purchasers of American materials or merchandise. The publication is a directory of Central American and West Indian buyers for use by exporters and manufacturers in the United States.

The directory is in octavo form, bound in buckram, and is sold at 60 cents per copy, to cover partially the cost of printing. Those who desire copies of the directory should communicate with Superintendent of Documents, Government Printing Office, Washington, D. C.

The Springfield (Mo.) Traction Company recently assisted in the moving of a cottage. The company supplied a work car which pulled the house along the tracks for three blocks. An employee of the company rode on the roof of the house cutting wires when necessary and repairing them immediately after the obstruction had passed the cut section.

New Electric Railway Track Built in 1915

Reports Received From Different Railway Companies Show a New Electric Mileage of 1044.22 Constructed During the Past Year—Falling Off in New Track Built, but Marked Increase in New Electrified Mileage

THE single-track mileage of new track built or electrified and placed in operation during 1915 by city systems, interurban lines and electrified steam lines is tabulated in the accompanying lists. The statistics are compiled from reports received from the railway companies themselves and the record is complete, except in the case of a few of the small lines whose replies were not received in time for inclusion in the list.

The following summary, compiled from the past annual statistics of the ELECTRIC RAILWAY JOURNAL, shows the single-track mileage of new track built, steam line electrified, and total new electric mileage placed in operation since 1907 in the United States and Canada:

	New Electric Railway Track Built	Electrified Steam Line	Total New Electric Mileage
1907	.....	....	1,880.0
1908	1,174.5	84.0	1,258.5
1909	774.7	112.4	887.1
1910	1,204.8	192.4	1,397.2
1911	1,105.0	86.5	1,191.5
1912	869.4	80.8	950.2
1913	974.9	119.0	1,093.9
1914	716.5	229.9	946.4
1915	596.0	448.2	1,044.2

The total mileage of new track, 596 miles, shows a decrease of 17 per cent from that recorded last year. This decrease, however, is offset by the high record electrified mileage during 1915 of 448.2 miles, which makes the total new electric mileage placed in operation 1044.2 miles, or a 9 per cent increase over the similar figure for last year.

Montana heads the list of States with 162.34 miles reported, 160.65 miles of which is included by the Chicago, Milwaukee & St. Paul Railway's recently opened main line electrification between Three Forks and Deer Lodge, Mont. Pennsylvania ranks second with 119.88 miles of track, 93.60 miles of which was contributed by the Philadelphia-Paoli electrification of the Pennsylvania Railroad. Michigan is third with 115.25 miles, which consists mostly of 58.33 miles of the Michigan Railway's new interurban line between Cooper, Plainwell, Martin, Shelbyville, Bradley, Wayland, Moline, Corinth and Fisher, and 40.65 miles of electrification of the Michigan Central Railroad's former steam line between Battle Creek and Allegan, making a total of 98.98 miles for this company. The second greatest new mileage placed in operation by any interurban railway was 80 miles constructed in Utah by the Ogden, Logan & Idaho Railway. This mileage included 74 miles between Brigham City, Honeyville, Deweyville, Collinston, Summit, Mendon, Wellsville, Hyrum, Logan, Smithfield, Richmond, Lewiston and Preston, Idaho, and 6 miles between Idlewild and Huntsville.

The total mileage of electrified steam lines is recorded at 448.2, as compared with 229.9 last year, or an increase of 95 per cent over 1914. Owing to the unusual number of companies which electrified track this year, a special list of these companies is given below. These railways are also included in the comprehensive table of companies below this text matter.

Electrified Line	Miles
Chicago, Milwaukee & St. Paul Ry.—Between Three Forks and Deer Lodge, Mont	160.65
Norfolk & Western Ry.—Between Bluefield and Vivian	94.82
Pennsylvania Railroad—Between Philadelphia and Paoli	93.60
Michigan Ry.—Electrification of Michigan Central R. R. between Battle Creek and Allegan	40.65
New York, New Haven & Hartford R. R.—Yards and sidings	28.00
London & Port Stanley Ry.—Between Westminster, Glanworth, Yarmouth, St. Thomas and Port Stanley	24.00
Southern Oregon Trac. Co.—Electrification of Rogue River Valley Ry. between Jacksonville and Medford	6.50
Total	448.22

The electric railways of Canada placed in service 54.73 miles of new track as compared with 59.67 miles in 1915, or a decrease of 8 per cent.

ARIZONA

	Miles.
Birmingham Ry., Light & Power Co.	1.10
	1.10

ALABAMA

Phoenix Railway Co. of Arizona	4.00
Tucson Rapid Transit Co.	1.50
	5.50

ARKANSAS

Pine Bluff Co.	.50
	.50

CALIFORNIA

Fresno Interurban R. R.—Fresno and suburban	4.50
Pacific Electric Ry.—Riverside-Corona extension	11.04
Peninsular Ry.	.23
Riverside, Rialto & Pacific R. R.	.41
San Francisco Municipal Ry.	4.16
San Jose Railroads	.10
Visalia Electric R. R.	2.20
	22.64

COLORADO

Denver Tramway	.14
	.14

CONNECTICUT

New York, New Haven & Hartford R. R.	28.00
Connecticut Co.	2.88
	30.88

DELAWARE

Wilmington & Philadelphia Traction Co.	.25
	.25

DISTRICT OF COLUMBIA

Washington Railway & Electric Co.	2.18
	2.18

FLORIDA

	Miles.
Central of Florida Ry.	1.00
Jacksonville Traction Co.	1.83
Miami Traction Co.	3.50
Pensacola Elec. Co.	.24
Tampa Electric Co.	.47
	7.04

GEORGIA

Savannah Electric Co.	.12
Georgia Ry. & Power Co.	1.00
	1.12

ILLINOIS

Centralia Traction Co.—Between Centralia and Wamac	.02
Chicago & Interurban Traction Co.—Harvey	.91
Chicago Surface Lines	18.00
City Ry.—Mt. Vernon	1.00
Evanston Rys.	.15
Metropolitan-West Side Elevated Ry.	1.50
Peoria Ry.	.85
Public Utilities Co.—Evansville	2.12
Rockford City Traction Co.	1.00
Sterling, Dixon & Eastern Elec. Ry.—From Dixon to new State Colony Grounds	2.00
Tri-City Ry.	1.43
	28.98

INDIANA

Gary, Hobart & Eastern Traction Co.	.50
Indianapolis Trac. & Term. Co.	1.60
	2.10

IOWA

Charles City-Western Ry.—Between Niles and Colwell	8.00
Iowa City Electric Ry.	1.00
Sioux City Service Co.	.50
Waterloo, Cedar Falls & Northern Ry.	2.00
	11.50

KANSAS

	Miles
Arkansas Valley Interurban Ry.—Between Burrton and Hutchinson	24.00
Hutchinson Int. Ry.	.80
Kansas City, Kaw Valley & Western Ry.—Between Bonner Springs, Linwood and Lawrence	24.00
Salina Street Ry.	1.00
Topeka Ry.	.50
	50.30

KENTUCKY

Louisville Ry.	3.02
	3.02

LOUISIANA

Orleans-Kenner Elec. Ry.—Between Southport, Shrewsbury and Harrahan City	11.50
	11.50

MAINE

Bangor Ry. & Elec. Co.	.05
	.05

MASSACHUSETTS

Bay State Street Ry.—Tewksbury	.15
Boston Elevated Ry.	.37
Springfield Street Ry.—Between Springfield and Westfield	.57
	1.09

MICHIGAN

Detroit United Ry.—Between Almont and Imlay City, 8.12 miles; Detroit, 4.05 miles; Flint, 3.31 miles	15.48
Grand Rapids Ry.	.39
Michigan Ry.—New electric line between Cooper, Plainwell, Martin, Shelbyville, Bradley, Wayland, Moline, Corinth and Fisher, 58.33 miles; electrification of Michigan Central R. R. between Battle Creek and Allegan, 40.65 miles	98.98
Michigan United Traction Co.	.40
	115.25

MINNESOTA

Duluth Street Ry.	1.90
Electric Short Line Ry.—Between Moline, Lyndale, Watertown and Winsted	22.00
Minneapolis, St. Paul, Rochester & Dubuque Elec. Traction Co.—Main line cut-off into city of Minneapolis	17.86
Wisconsin Ry., Light & Power Co.—Lacrosse, Wis.	2.00
	43.76

MISSISSIPPI

Hattiesburg Traction Co.	.34
	.34

MISSOURI

Metropolitan Street Ry.—Kansas City	9.92
Mexico Investment & Construction Co.—Between Molino and Santa Fe	7.00
	16.92

MONTANA

Anaconda Copper Mining Co.	1.39
Chicago, Milwaukee & St. Paul Ry.—Between Three Forks and Deer Lodge: 110 miles of main track; 50.65 miles of side tracks and yards	160.65
Missoula Street Ry.	.30
	162.34

NEBRASKA

Lincoln Traction Co.	2.00
	2.00

NEW JERSEY

Bucks County Interurban Ry.	.27
Public Service Ry.—Parkhurst St., Clinton Ave. to Broad St., Newark, .23 miles; Carteret extension, private right-of-way near Walnut St. to Carteret Ave and Woodbridge Ave., Roosevelt Borough, 1.47 miles	1.70
	1.97

NEW YORK

Black River Traction Co.—Watertown	.95
Brooklyn Rapid Transit System—3.88 miles of elevated third tracking; 9.47 miles of elevated extensions	13.35
Central New York Southern R. R.	.86
Hudson Valley Ry.—Saratoga Springs, .12 miles; Glens Falls, 1.36 miles	1.48
Interborough Rapid Transit Co.—Queensboro Subway	2.58
International Ry.	1.00
Ithaca Traction Corp.	.63
Manhattan & Queens Traction Co.	.50
New York State Railways	.56
Schenectady Ry.—Nott St. and Grand Blvd. extension	1.52
United Traction Co. of Albany	1.42
	24.85

NORTH CAROLINA

Atlanta & Carolina R. R.	11.00
Durham Traction Co.	2.10
Goldsboro Elec. Ry.	1.00
	14.10

OHIO

Cleveland, Alliance & Mahoning Valley R. R.—Between Newton Falls and Leavittsburg	6.00
Cleveland Ry.	15.00
Hocking-Sunday Creek Traction Co.—Between Chauncey and Athens	6.50
Northern Ohio Traction & Light Co.—City extensions	3.50
Portsmouth Street R. R. & Light Co.—Portsmouth	2.20
Springfield Ry.	2.50
Toledo, Bowling Green & Southern Traction Co.—Findlay	2.00
	37.70

OKLAHOMA

Bartlesville Interurban Ry.	2.00
Cushing Traction Co.—Between Cushing and Drumright	17.00
	19.00

OREGON

Pacific Power & Light Co.	1.00
Southern Oregon Traction Co.—Electrification of Rogue River Valley Ry. between Jacksonville and Medford	6.50
Willamette Valley Southern Ry.—Between Oregon City and Mount Angel	32.00
	39.50

PENNSYLVANIA

Hershey Transit Co.—Between Hershey and Elizabethtown	10.00
Lehigh Traction Co.—Relocation of track approaching Finland	.50
Mahoning & Shenango Ry. & Light Co.—New Castle, 3147 ft.; Leavittsburg, 600 ft.	.79
Lewisburg, Milton & Watsontown Passenger Ry.	.19
Pennsylvania R. R.—Electrification of Philadelphia-Paoli Division	93.60
Philadelphia Rapid Transit Co.	.30
Scranton & Binghamton R. R.—Extension to Brooklyn	10.00
South Fork-Portage Ry.—Between Wilmore, Summer Hill and Portage	4.00
Warren Street Ry.	.50
	119.88

RHODE ISLAND

Newport & Providence Ry.—Extension with steel bridge to grounds of U. S. N. Training Station, Newport	.18
Rhode Island Co.	.80
	.98

SOUTH CAROLINA

Columbia Ry., Gas & Elec. Co.	1.00
	1.00

TEXAS

Corpus Christi Ry. & Light Co.—City extension	2.00
Northern Texas Traction Co.—1.23 miles of city track; 1.68 miles of second track added along Dallas-Fort Worth interurban line	2.91
San Antonio Trac. Co.	.59
	5.50

UTAH

Ogden, Logan & Idaho Ry.—74 miles between Brigham City, Honeyville, Deweyville, Collinston, Summit, Mendon, Wellsville, Hyrum, Logan, Smithfield, Richmond, Lewiston and Preston, Idaho; 6 miles between Idlewild and Huntsville	80.00
Salt Lake & Utah R. R.—Between Springville and Spanish Fork	10.60
	90.60

VIRGINIA

Newport News & Hampton Ry., Gas and Elec. Co.	1.20
Lynchburg Traction & Light Co.	.67
Roanoke Ry. & Elec. Co.	.50
	2.37

WASHINGTON

Lewiston & Clarkson Transit Co.—Between Lewiston, Idaho & Clarkson, Wash.	2.15
Puget Sound Traction, Light & Power Co. (Seattle Division)	.28
Yakima Valley Transportation Co.	1.00
	3.43

WEST VIRGINIA

Monongahela Valley Traction Co.—Branch at Rivesville to coal mines	1.50
Morgantown & Wheeling Ry.—Between Cassville and Price	8.00
Norfolk & Western Ry.—Electrification of Bluefield-Vivian section	94.82
	104.32

WISCONSIN

Milwaukee Elec. Ry. & Light Co. and Milwaukee Light, Heat & Traction Co.—Milwaukee, 1.03 miles; Racine, .83 miles	1.86
Sheboygan Ry. & Elec. Co.	1.00
Chicago, Harvard & Geneva Lake Ry.	.42
	3.28

WYOMING

Sheridan Ry.	.59
	.59

CANADA

Brandon Municipal Ry.	1.27
Brantford Municipal Ry.	1.25
Cape Breton Elec. Co.	.01
Chatham, Wallaceburg & Lake Erie Ry.	.09
London & Port Stanley Ry.—Electrification between Westminster, Glanworth, Yarmouth, St. Thomas and Port Stanley	24.00
Montreal & Southern Counties Ry.—Between St. Cesaire and Granby, Quebec	15.00
Montreal Tramways	6.60
Peterborough Radial Ry.	.04
Port Arthur Civic Ry.	.12
Sandwich, Windsor & Amherstburg Ry.	.50
Three Rivers Trac. Co.	3.00
Toronto Civic Ry.	.75
Winnipeg Elec. Ry.	2.10
	54.13
Grand Total, United States and Canada	1044.22

Electric Rolling Stock Ordered in 1915

A Tabulation Showing the Number, Type, Over-All Length and Character of Construction of All Cars Built During the Year—Compiled from Official Returns Made by the Railway Companies

THE tables below show in detail the number of cars of all kinds, as well as electric locomotives, which were either purchased by electric railways or built in the company's shops during the past year. The list does not include freight trail cars for other than city or interurban lines, nor those used for interchange service. The total number of rolling stock equipments of all kinds ordered is 2782, a decrease of approximately 8 per cent from the number listed for the previous year. The tables, in accordance with the usual procedure, have been made up from the orders noted from week to week in the rolling stock columns of the ELECTRIC RAILWAY JOURNAL and from a canvass made at the close of the year of all the electric railways of the United States and Canada. These figures were checked against reports received from practically all of the car builders. This year about 90 per cent of all the electric roads in the country and practically all of the larger ones furnished data on blanks provided by the JOURNAL for that purpose. The size of the percentage of replies for any canvass which has to be conducted by letter and has to end on a definite date will be realized by all who have ever had to conduct similar inquiries, and for the co-operation of all the companies who thus furnished assistance the editors of this paper are deeply grateful.

The greatest number of cars ordered by any electric railway during 1915 was for 803 cars by the Interborough Rapid Transit Company, including 323 subway passenger cars, 478 subway car bodies and two dump cars. These combined orders rank second in number to only one other yearly total of orders ever placed by an electric railway, *i.e.*, that of the Philadelphia Rapid Transit Company in 1912 for 1000 cars. For 1915 the Pittsburgh Railways rank second with a total of 215 cars ordered, including 200 city and fifteen interurban cars. The Detroit (Mich.) United Railway stands third with 156 cars ordered, including 150 city and two interurban passenger cars and four miscellaneous cars.

The number of electric locomotives ordered was only forty-three, as against seventy-eight in the preceding year. The total number of cars of all kinds built in company's shops was 165 as against 228 in 1914. The chief work of this kind was done by the Twin City Rapid Transit Company, which built fifty-three cars and by the Public Service Railway which built fifty passenger cars.

The number of cars ordered by Canadian electric railways in 1915 was fifty-two compared with ninety-seven in the preceding year, or a decrease of 46 per cent. American car builders reported having received orders for seventeen cars from foreign electric railways, including fifteen for South America, one for Cuba and one for the Corregidor Islands. This foreign equipment included two closed passenger cars, eleven open passenger cars, three electric locomotives and one freight gondola car.

The number of one-man passenger cars ordered during the year was recorded at 77. As this figure includes only newly built cars, it is by no means an adequate measure of the increased popularity of the one-man car, owing to the fact that many cars already in service were reconstructed in 1915 into the one-man type.

Articulated cars are not included in the table, as they involve only slight remodeling of old cars with the addition of a new center section. The Boston Elevated Railway ordered forty-eight center-sections for this purpose; the Brooklyn Rapid Transit System, one center-section.

Purchases of six automobile trucks and four automobile buses, not included in the rolling stock statistics, were reported by the railways.

The following summary shows the records in condensed form for the past nine years, and gives the number of cars, classified in accordance to the service in which they are used, from 1907 to 1915:

Year	City Cars	Interurban Cars	Freight and Misc. Cars	Total
1907	3,483	1,327	1,406	6,216
1908	2,208	727	176	3,111
1909	2,537	1,245	1,175	4,957
1910	3,571	990	820	5,381
1911	2,884	626	505	4,015
1912	4,531	783	687	6,001
1913	3,820	547	1,147	5,514
1914	2,147	384	479	3,010
1915	2,072	336	374	2,782

Railway Company	*No.*	*General Type*	*Motor or Trailer*	*Length Over All*	*City or Int.*	*All-steel Semi-steel or Wood*	*One-Man?*
Alberta & Great Waterways Rys.	2	Gasoline Motor		55 0	Int.	All-steel	No
Albuquerque Trac. Co.	7	Ps. Clsd.	Motor	.....	City	Semi-steel	Yes
Anaconda Copper Mining Co.	1	Ps. Clsd.	Motor	51–4	City	.....	No
	5	Ps. Clsd.	Trail	45–10	City	.....	....
Androscoggin Elec. Co.	2	Ps. Clsd.	Motor	46–8	Int.	Semi-steel	No
	1	Express	Motor	36–3	Int.	Semi-steel	....
Anniston Elec. & Gas Co.	2	Ps. Clsd.	Motor	....	City	Steel	....
Arkansas Valley Int. Ry.	1	Ps. Clsd.	Motor	....	Int.	.....	....
	1	Express	Motor	48–0	Int.	Semi-steel	....
	2	Express	Trail	42–0	Int.	Semi-steel	....
Ashtabula Rapid Transit Co.	1	Ps. Clsd.	Motor	38–4	City	Wood	No
Atlanta & Carolina R.R.	1	Gasoline	Motor	.....	....	Wood	....
	1	Ps. Clsd.	Trail	.....	....	Wood	....
Austin Street Ry.	3	Ps. Clsd.	Motor	30–1	City	All-steel	No
Bartlesville Int. Ry.	1	Ps. Conv.	Motor	30–0	City	Semi-steel	Yes
Beaumont Trac. Co.	7	Ps. Clsd.	Motor	28–3½	City	All-steel	....
Binghamton Ry.	7	Ps. Clsd.	Motor	42–0	Int.	All-steel	No
	13	Ps. Clsd.	Motor	37–0	City	All-steel	....
Boston & Worcester St. Ry.	5	Ps. Open	Motor	45–0	Int.	Semi-steel	No
	5	Ps. Clsd.	Motor	48–2	Int.	Semi-steel	No
Boston Elev. Ry.	25	Ps. Clsd.	Trail	48–2½	City	Semi-steel	No
	1	Flat	....	40–0	City El.	All-steel	....
	3	Sn. Plow	....	42–0	City	Semi-steel	....
	2	Sweeper	....	41–10	City	Semi-steel	....
	3	Side-dump	....	41–½	City	All-steel	....
Brantford Munic. Ry.	3	Ps. Clsd.	Motor	....	City	.....	....
	1	Sweeper	Motor	28–3	City	Semi-steel	....
Bridgeton & Millville Trac. Co.	1	Pass.	Motor	43–2	Int.	Semi-steel	No
Bristol & Plainville Tramway	3	Ps. Conv.	Motor	36–0	City	Semi-steel	No
Brooklyn Rapid Transit Co.	16	Sweeper	Motor	29–8	City	Semi-steel	....
Brownsville St. & Int. Ry.	2	Ps. Clsd.	Motor	23 –0	City	Steel	Yes
Buffalo & Lake Erie Trac. Co.	10	Ps. Clsd.	Motor	45–1½	City	Semi-steel	No
Buffalo, Lockport & Rochester Ry.	1	Express	Motor	50–0	Int.	All-steel	No
Butler & Grove City Ry.	2	Internal Comb. Loco.	....	... ..		.....	....
Butte, Anaconda & Pacific Ry.	1	Ft. Loco.	Motor	80-Ton	..	.....	....
Carolina, Clinchfield & Ohio Ry.	1	Concrete Mixing Car	Gasoline Motor	.....	..	.....	....

Railway Company	No.	General Type	Motor or Trailer	Length Over All	City or Int.	All-steel Semi-steel or Wood	One-Man?
Carolina Pwr. & Lt. Co..	3	Ps. Clsd.	Motor	.. ...	City	Steel	....
Carolina & Yadkin River Ry.....	1	El. Loco.	Motor	.. ...	..	.....	....
Centerville, Albia & Southern Ry.....	1	El. Loco.	Motor	41–6	..	Semi-steel	....
Central of Florida Ry...	1	Ps. Clsd.	Motor	32–0	Int.	Semi-steel	....
	1	Pass.	Trail	28–0	..	.....	....
	1	Ps. Stor. Batt.	Motor	.....	..	.....	....
Centralia Traction Co...	2	Pass.	Motor	30–1	City	Both	No
Charleston Consol. Ry. & Ltg. Co.....	6	Ps. Clsd.	Motor	41–0	City	All-stee	No
Charleston Int. R .R....	2	Ps. Clsd.	Motor	.....	City	.....	Yes
	2	Express	Motor	45–0	Int.	.....	....
	2	Ps. Clsd.	Motor	47–3	Int.	All-steel	No
Charles City–Western Ry.....	2	Ps. Clsd.	Motor	.....	..	.....	....
	1	Pass. and Bagg.	Motor	48–0	Int.	.....	....
	1	Gasoline	....	55–0	Int.	All-stee	....
	1	El. Loco.	....	35-ton	Int.	All-steel	....
	3	Flat	....	36–0	..	Wood	....
	1	Sn. Plow	....	36–0	..	.....	....
	1	Sweeper	....	28–0	City	Semi-steel	....
	1	Gasoline Work	....	.....	..	.....	....
Chattahoochee Valley Ry.....	1	Ps. Clsd. Stor. Batt.	Motor	32–9	Int.	Semi-steel	....
Chattanooga Traction Co.....	2	Pass.	Trail	35–0	Int.	Semi-steel	....
Chicago & Joliet Elec. Ry.....	1	Line	....	.....	..	Semi-steel	....
Chicago & Milwaukee Elec. R. R.....	15	Ps. Clsd.	Motor	55–11	Int.	Semi-steel	No
Chicago & West Towns Ry.....	1	Ps. Clsd.	Motor	45–0	City	Semi-steel	....
Chicago, Harvard & Geneva Lake Ry.....	2	Sn. Plow	Motor	....	Int.	Steel	....
Chicago, Milwaukee & St. Paul R. R.....	9	El. Loco.	Motor	260-Ton..		.....	....
	2	El Loco.	Motor	70-Ton..		All-steel	....
Chicago, Waukegan & Fox Lake Trac. Co...	1	Ps. & Bagg. Gasoline Motor	.....	55–0	Int.	All-steel	....
Cleburne Street Ry.....	6	Ps. Clsd.	....	.....	City	....	....
Cleveland & Eastern Trac. Co.....	1	Ps. & Bagg.	Motor	54–6	Int.	Steel	....
	1	Pass.	....	.....	..	.....	....
Cleveland & Erie Ry....	2	Ps. Clsd.	Motor	51–0	Int.	All-steel	No
Cleveland Ry.....	130	Ps. Clsd.	Motor	51–1	City	Semi-steel	No
	2	Sweeper	Motor	28–3	City	Semi-steel	....
	3	Work	Motor	.....	City	.....	....
	6	Work	Trail	.....	City	.....	....
Cleveland, Painesville & Eastern R. R.....	1	Ps. Clsd.	Motor	50–0	Int.	Semi-steel	No
Cleveland, Southwestern & Columbus Ry..	4	Hopper Bottom	....	.....	..	.....	....
	4	Bagg. and Express	....	52–0	Int.	.....	....
Columbia Ry., Gas & Elec. Co.....	4	Ps. Clsd.	Motor	45–0	City	.....	No
Columbus Ry., Pwr. & Light Co.....	1	Street Flusher	....	40–0	City	Semi-steel	....
Connecticut Co.....	46	Ps. Conv.	Motor	44–6	City	Semi-steel	No
	46	Ps. Conv.	Motor	44–6	City	All-steel	No
	1	Express	Motor	41–0	Both	Semi-steel	....
Corpus Christi Ry. & Lt. Co.....	8	Ps. Clsd.	Motor	.....	City	.....	Yes
Cumberland County Pwr. & Lt. Co.....	1	Pass.	Motor	46–4	Both	St'l Un. Fr.	No
Cushing Traction Co...	2	Ps. Clsd.	Motor	45–0	Int.	All-steel	No
Dayton, Springfield & Xenia Southern Ry...	1	Flat	....	33–0	..	.....	....
Dayton Street Ry.....	1	Snow Sweeper	Motor	28–3	City	St'l Un.Fr.	....
Des Moines City Ry....	1	El. Loco.	Motor	60-Ton	Int.	Steel	....
	1	Sweeper	Motor	28–3	City	Semi-steel	....
	40	Ps. Clsd.	Motor	.....	City	Semi-steel	No
Detroit United Ry.....	2	Ps. Clsd.	Motor	58–3½	Int.	Semi-steel	No
	50	Ps. Clsd.	Motor	46–10	City	All-steel	No
	100	Ps. Clsd.	Trail	46–8¾	City	All-steel	No
	2	Line	Motor	38–10	Int.	Semi-steel	....
	1	Construc.	Motor	48–0	Int.	Semi-steel	....
	1	El. Loco.	....	32–7½	Int.	Semi-steel	....
Durham Traction Co...	3	Ps. Clsd.	Motor	26–0	City	Semi-steel	Yes
	3	Ps. Clsd.	Motor	31–0	City	Semi-steel	Yes
East Liverpool Trac. & Lt. Co.....	15	Ps. Clsd.	Motor	45–0	City	All-steel	No
Eastern Pennsylvania Rys.....	1	Dump				Steel	
	1	Ps. Conv.	Motor	46–0	Both	Semi-steel	No
Easton Transit Co.....	3	Ps. Conv.	Motor	48–0	Int.	All-steel	No
Empire United Rys.....	1	Parlor	Trail	52–6	Int.	Wood	No
	1	Sweeper	....	28–3	City	Wood	....
Ephrata & Lebanon Trac. Co.....	5	Dump	....	.....	.....	.....	....
Florida-East Coast Ry..	1	Ps.Gas-Elec.	Motor	70–0	Int.	All-steel	....
Ft. Dodge, Des Moines & Southern Ry.....	3	Ps. Clsd.	Motor	50–0	Int.	Steel	No
	2	Ps. Clsd.	Motor	32–0	City	Semi-steel	Yes
	2	Ft. Loco.	Motor	60-Ton	..	Steel	....
Goldsboro Elec. Ry.....	2	Ps. Clsd.	Motor	30–0	City	Wood	Yes
Grand Rapids, Holland & Chicago Ry.....	1	Express	Motor	52–0	Int.	All-steel	No
Hagerstown & Frederick Ry.....	2	Ps. & Smo.	Motor	48–1	Int.	Semi-steel	No
	1	Ps. Conv.	Motor	31–6¾	City	Semi-steel	Yes
	2	Ft. Loco.	Motor	.....	..	All-steel	....
Halifax Electric Ry.....	6	Ps. Clsd.	Motor	29–8	City	.....	....
Hammond, Whiting & East Chicago Ry....	4	Pass.	Motor	.. ...	City	Semi-steel	No
Hawkinsville & Florida Southern R. R.....	2	Gas-Elec.	Motor	.....	Int.	.....	....
Hershey Transit Co....	2	Ps Conv.	Motor	41–8	Int.	Semi-steel	No
Hocking-Sunday Creek Traction Co.....	8	Ps. Clsd.	Motor	.....	Int.	Semi-steel	No
Huntington R. R.....	1	Sn. Plow	Motor	30–2½	Int.	Semi-steel	....
Huntsville Ry., Lt., & Pwr. Co.....	4	Ps. Clsd.	Motor	.....	City	Steel	....
Hutchinson Int. Ry....	1	Gasoline	....	.....	..	.....	....
	2	Ps. Clsd.	....	.....	..	.....	Yes
Illinois Traction System.	50	Hopper Bottom	....	.....	..	.....	..
Indiana Rys. & Lt. Co..	1	Sweeper	Motor	28–3	City	Semi-steel	.. .
	2	Ps. Clsd.	Motor	25–0	City	Steel	Yes
Indianapolis Trac. & Term. Co.....	2	Sweeper	Motor	28–3	City	Semi-steel	....
Inter-Urban Ry.....	1	El. Loco.	Motor	60-Ton	..	.....	....
Interborough Rapid Transit Co. (also 974 trucks and 962 motors for composite cars transferred from subway to elevated).....	12	Ps. Clsd.	Motor	51–½	Sub.	All-steel	No
	478	Ps. Car-bodies	Motor	51–½	Sub.	All-steel	No
	234	Ps. Clsd.	Motor	51–½	Sub.	All-steel	No
	77	Ps. Clsd.	Trail	51–½	Sub.	All-steel	No
	2	Dump	...	28–11	Sub.	All-steel	....
Iowa City Elec. Ry. ...	4	Ps. Clsd.	Motor	28–0	City	Semi-steel	Yes
Iowa Ry. & Lt. Co	1	El. Loco.	Motor	50-Ton	Int.	.....	....
	2	Ps. Clsd.	Motor	32–0	City	Semi-steel	Yes
Ithaca Trac. Corp.....	1	Sprinkler	Motor	19–0	City	Wood	....
Jackson Lt. & Traction Co.....	5	Ps. Clsd.	Motor	25–0	City	All-steel	Yes
Jamestown, Westfield & Northwestern Ry....	1	El. Loco.	Motor	45-Ton	..	.....	....
Jefferson City Bridge & Transit Co.....	6	Ps. Clsd.	Motor	.....	..	.....	....
Kansas City, Clay County & St. Joseph Ry.....	4	Ps. Clsd.	Motor	59–0	Int.	All-steel	No
	2	Side-dump	....	40–0	..	Steel	....
	1	Ditcher	....	.....	..	.....	....
Kansas City, Kaw Valley & Western Ry ...	3	Ps. Clsd.	Motor	50–0	Int.	All-steel	No
	3	Express	Motor	.....	Both	Semi-steel	....
	6	Gondola	....	.....	Both	Semi-steel	....
	3	Flat	....	.....	Both	Semi-steel	....
	1	Sn. Plow	....	.....	Both	Semi-steel	....
	4	Work	....	.....	Both	Semi-steel	....
Lake Erie & Northern R. R.....	8	Ps. Clsd.	Motor	61–0	Int.	Semi-steel	No
	3	El. Loco.	Motor	60-Ton	Int.	.....	....
Lake Shore Electric Ry.	3	Ps. Clsd.	Motor	60–0	Int.	All-steel	No
Laredo Ry. & Elec. Co..	3	Ps. Clsd.	Motor	.....	City	.....	....
Lehigh Traction Co.....	10	Ps. Clsd.	Motor	47–2	City	All-steel	No
Lehigh Valley Transit Co.....	2	Box	Trail	43–10	Int.	Semi-steel	....
Lewiston, Augusta & Waterville Street Ry..	2	Box	Motor	40–0	.	Stl. Un. Fr.	....
	2	Box	Trail	36–0	..	Wood	....
	20	Flat	....	36–0	..	Wood	....
Lincoln Traction Company.....	1	Sweeper	Motor	28–3	City	Semi-steel	....
London & Port Stanley Ry.....	5	Ps. Clsd.	Motor	61–0	Int.	All-steel	No
	3	Ps. Clsd.	Trail	61–0	Int.	Wood	No
	1	Express	Motor	61–0	..	Wood	....
	3	El. Loco.	Motor	37–0	..	All-steel	....
	4	Box	....	34–0	..	Wood	....
	4	Flat	....	35–0	..	Wood	....
	3	Caboose	....	36–0	..	.....	....
London Street Railway.	1	Flat	....	30–0	City	Semi-steel	....
Long Island R. R....	45	Ps. Clsd.	Trail	64–4	Int.	All-steel	....
	1	Sweeper	Motor	28–3	City	Semi-steel	....
Marshall Traction Co...	3	Ps. Clsd.	Motor	33–3	City	All-steel	Yes
Maryland Electric Rys..	1	El. Loco.	Motor	46-Ton	..	.....	....
McConnellsburg & Ft. London Ry.....	2	Ps. Clsd.	Trail	44–0	Int.	Stl. Cork Lined	....
Menominee & Marinette Lt. & Trac. Co.....	1	Ps. Clsd.	Motor	36–0	City	Semi-steel	Yes
	1	Ps. Clsd.	Trail	35–0	City	All-steel	Yes
Metropolitan Street Ry.	50	Ps. Clsd.	Motor	44–10	City	Semi-steel	No
	2	Sweeper	Motor	28–3	City	Semi-steel	....
Miami Traction Co.....	4	Ps. Clsd. Stor. Batt.	Motor	26–1½	City	Wood	No
Michigan Ry.....	2	Ps. Clsd.	Motor	67–6	Int.	Steel	No
	10	Box	....	50–0	Int.	Steel	....
Minneapolis, St. Paul, Rochester & Dubuque Elec. Trac. Co.....	12	Ps. Clsd.	Trail	57–4	Int.	Semi-steel	No
	2	Gas-Elec. Ps.	Motor	.....	Int.	.....	No
	3	Gas-El. Loco.	Motor	.....	Int.	.....	....
	45	Box	Trail	36–0	Int.	Stl.Un.Fr.	....
Mobile & Ohio Ry.....	1	Ps. Clsd.	Motor	.....	Int.	Wood	Yes
Monongahela Valley Trac. Co.....	3	Ps. Conv.	Motor	32–0	City	Wood	No
	3	Express	Trail	30–0	Int.	Wood	....
Morgantown & Wheeling Ry.....	1	Box	...	35–6	Int.	Wood	....
Mount Vernon Ry.. ..	3	Ps. Clsd.	Motor	40–0	Int.	Semi-steel	No
Muscatine & Iowa City Ry.....	4	Ps. Gas-Elec.	Motor	.....	Int.	.....	....
Nassau County Ry.....	1	Ps. Conv.	Motor	33–4	City	Semi-steel	Yes
New York & Long Island Trac. Co.....	6	Ps. Clsd.	Motor	42–5	Int.	Semi-steel	No
New York Municipal Rys.....	100	Ps. Clsd.	Motor	67–0	Sub.	All-steel	No
New York Rys.....	1	Sweeper	Motor	61–0	City	.....	....
New York State Rys....	1	Ps. Clsd.	Motor	50–0	City	Semi-steel	No
New York, Westchester & Boston Ry.....	10	Ps. Clsd.	Motor	72–0	Int.	All-steel	No
	5	Ps. Clsd.	Trail	72–0	Int.	All-steel	No

Railway Company	No.	General Type	Motor or Trailer	Length Over All	City or Int.	All-steel Semi-steel or Wood	One-Man?
Northern Ohio Traction & Light Co	1	Bagg.	Motor	60–0	Int.	Semi-steel	....
	1	Line	....	40–0	Int.	Semi-steel	....
Northwestern Elev. R. R	122	Ps. Clsd.	Motor	48–0	City El.	Steel	No
Norton & Taunton St. Ry	7	Ps. Clsd.	Motor	30–1	City	.....	No
	1	Sn. Plow	....	41–0	..	.....	....
Norwich & Westerly Traction Co	1	Flat	Motor	44–0	..	.....	....
Ogden, Logan & Idaho Ry	12	Ps. Clsd.	Motor	61–8	Int.	All-steel	No
	6	Ps. Clsd.	Trail	61–8	Int.	All-steel	No
	2	El. Loco.	Motor	50-Ton	Int.	.....	....
Ogdensburg Street Ry	4	Ps. Clsd.	Motor	32–0	City	.....	Yes
Ohio Electric Ry	1	Ps. Clsd.	Motor	60–0	Int.	Semi-steel	No
Ohio River Elec. Ry. & Pwr. Co	6	Ps. Clsd.	Motor	40–0	City	Wood	No
Ohio Valley Traction Co	4	Ps. Clsd.	Motor	54–7¼	Int.	Stl. Fr.	No
	2	Express	Motor	50–0	..	.....	....
	1	El. Loco.	Motor	....	..	.....	....
Oklahoma Ry	8	Ps. Clsd.	Motor	40–11	City	All-steel	No
Otsego & Herkimer R. R	1	Express	Motor	50–0	Int.	Wood	....
Parkersburg, Marietta & Interurban Ry	2	Pass. and Bagg.	Motor	53–0	Int.	All-steel	No
Pennsylvania & Ohio Ry	1	Sweeper	.....	.....		.....	....
Petauma & Santa Rosa Ry	1	Box	....	36–0	..	Wood	....
	2	Flat	....	36–0	..	Wood	....
Philadelphia & Western Ry	3	Flat	....	35–0	..	Wood	....
	1	Sn. Plow	....	47–0	Int.	Wood	....
Phoenixville, Valley Forge & Strafford Elec. Ry	2	Ps. Conv.	Motor	31–6¾	Int.	Semi-steel	Yes
	1	Ps. Open	Motor	45–10	Int.	Wood	No
Pittsburgh Railways	150	Ps. Conv.	Motor	45–0	City	Steel	No
	50	Ps. Conv.	Trail	45–0	City	Steel	No
	15	Ps. Clsd.	Motor	52–8	Int.	Steel	No
Port Arthur Civic Ry	1	Sn. Plow and Sweeper	Motor	31–0	City	Semi-steel	....
Portsmouth St. Ry. & Lt. Co	1	Ft. Loco.	Motor	50-Ton	..	.....	....
Princeton Power Co	2	Pass. & Bagg.	Motor	43–0	Int.	All-steel	No
Public Service Ry	20	Ps. Open	Motor	48–8	City	Semi-steel	No
	1	Ps. Clsd.	Motor	51–6	City	Semi-steel	No
	29	Ps. Clsd.	Motor	47–0	City	Semi-steel	No
Rhode Island Co	2	Work	....	34–1	..	.....	....
	1	Work with Hoist	....	41–6	..	.....	....
	1	Crane	....	42–6	..	.....	....
Rio Grande Ry	1	El. Loco.	Motor	12-Ton	..	.....	....
Saginaw-Bay City Ry	1	Work	....	.....	..	.....	....
Salina Northern R. R	2	Int.Comb. Loco.	....	.....	..	.....	....
Salina St. Ry	2	Ps. Clsd.	Motor	.....	City	.....	....
Salt Lake & Ogden Ry	6	Ps. Open Excur.	Trail	.....	Int.	All-steel	No
Salt Lake & Utah R. R	2	Ps. Clsd.	Motor	60–0	Int.	All-steel	No
	2	Pass.	Trail	61–0	Int.	All-steel	No
	1	Express	Trail	42–0	Int.	All-steel	....
San Francisco Municipal Ry	1	Work	....	.....	..	.....	....
Sandwich, Windsor & Amherstburg Ry	2	Ps. Clsd.	Motor	34–0	City	.....	....
Sapulpa & Oil Fields Ry.	2	Ps. Clsd.	Motor	.....	..	.....	....
	1	Ft. Loco.	....	.....	..	.....	....
Scioto Valley Traction Co	1	Ps. Clsd.	Motor	59-0	Int.	All-steel	No
Scranton Ry	1	Sprinkler	Motor	32–8	City	Wood	....
Scranton & Binghamton R. R	4	Ps. & Smo.	Motor	48–1	Int.	Wood	No
Seattle Municipal Street Ry	1	Express	Motor	40–0	City	Semi-steel	....
Sheboygan Railway & Lt. Co	2	Ps. Clsd.	Motor	.....	City	Steel	....
	3	Gondola	....	.....	..	.....	....
	1	Sweeper	Motor	28–3	City	Semi-steel	....
Sheridan Ry	2	Flat	....	34–0	..	Wood	....
Shore Line Electric Ry.	10	Ps. Clsd.	Motor	46–5	Int.	Semi-steel	No
	1	Dump	....	.....	..	.....	....
Sioux Falls Traction System	2	Ps. Clsd.	Motor	.....	..	.....	....
Slate Belt Electric Street Ry	1	Dump	....	.....	..	.....	....
Somerset Traction Co	1	Box	....	40–0	Int.	Semi-steel	....
South Covington & Cincinnati St. Ry	1	Sweeper	Motor	27–8	City	Semi-steel	....
Southern Pacific R. R	4	El. Loco.	Motor	60-Ton	..	.....	....
Southern Public Utilities Co	7	Ps. Clsd.	Motor	26–0	City	Steel	Yes
	6	Ps. Clsd.	Motor	40–0	City	Semi-steel	....
Southwest-Missouri R. R	3	Ps. Clsd.	Motor	44–0	Int.	All-steel	No
Southwestern Gas & Elec. Co	3	Ps. Clsd.	Motor	42–0	City	Semi-steel	No
	3	Ps. Clsd.	Motor	32–8	City	Semi-steel	No
Springfield (Ohio) Ry	1	Sweeper	Motor	28–3	City	Semi-steel	....
Springfield (Mass.) Street Railway	1	Ps. Conv.	Motor	44–4½	City	Semi-steel	No
	2	Dump	....	44–5	..	Steel	....
Steubenville & East Liverpool Ry. & Lt. Co	1	Service	....	36–0	..	.....	....
Steubenville Ry	3	Ps. Clsd.	Motor	44–2	Int.	Semi-steel	No
Terre Haute, Indianapolis & Eastern Trac. Co	1	Ps. Clsd.	Motor	47–6	Both	All-steel	No
Three Rivers Trac. Co	6	Ps. Clsd.	Motor	32–2	City	Semi-steel	Yes
	1	Sweeper	Motor	.....	City	Semi-steel	....
Tidewater Power Co	3	Ps. Clsd.	Motor	31–0	City	Semi-steel	....
Tiffin, Fostoria & Eastern Elec. Ry	2	Ps. Clsd.	Motor	54–9	Int.	All-steel	No
	2	Ps. Clsd.	Trail	47–0	Int.	All-steel	No
Toledo, Bowling Green & Southern Trac. Co	1	Rail Bonding	....	.....	..	.....	....
Toledo & Western R. R.	1	Express	Motor	51–0	Int.	All-steel	No
	1	El. Loco.	Motor	60-Ton	Int.	All-steel	No
Toronto Civic Ry	4	Ps. Clsd.	Motor	34–0	City	Semi-steel	No
	1	Sweeper	Motor	28–3	City	Semi-steel	....
Toronto Suburban Ry	6	Ps. Clsd.	Motor	55–0	Int.	.....	No
Tucson Rapid Transit Co	4	Ps. Clsd.	Motor	26–6	City	.....	Yes
Tusealoosa Ry. & Utilities Co	1	El. Loco.	Motor	.....	..	.....	....
Twin City Rap. Tran. System	50	Ps. Clsd.	Motor	. ...	City	.....	No
Union Pacific R. R. (Kearney, Neb.-Stapleton Branch)	1	Gasoline Bagg. Mail & Express	Motor	70–0	Int.	Steel	....
	1	Pass.	Trail	70–0	Int.	Steel	....
Union Traction Company, Coffeyville, Kan	1	Express	Motor	40–0	Int.	Semi-steel	....
Union Trac. Co. of Indiana	2	Sweeper	....	.....	..	.....	....
United Railroads of San Francisco	1	Ps. Clsd.	Motor	47–0	City	Semi-steel	No
United Trac. Co. of Albany	15	Ps. Clsd.	Motor	33–4	City	Semi-steel	No
	3	Sweeper	Motor	28–3	City	Semi-steel	....
Valley City St. & Int. Ry	1	Ps. & Bagg.	Motor	52–0	Int.	Semi-steel	No
Walnut Ridge & Hoxie Lt., Pwr. & Transit Co	1	Ps. Clsd.	Motor	.....	..	.....	....
Warren & Jamestown Street Ry	1	Comb. Ps., Bagg. & Smoker	....	43–11¼	Int.	Stl. Fr.	No
Washington, Baltimore & Annap. Elec. R. R	5	Ps. Clsd.	Motor	....	Int.	All-steel	No
Water, Light & Transit Co. of Carrollton, Mo.	1	Pass.	....	38–0	Int.	Steel	No
West Penn Traction Company	2	Ps. Clsd.	Motor	58–0	Int.	All-steel	No
	1	Sweeper	Motor	28–3	City	Semi-steel	....
Wilmington & Philadelphia Trac. Co	31	Ps. Clsd.	Motor	41–0	City and Sub'n	Steel	No
Woodstock & Sycamore Trac. Co	1	Ps. Clsd.	Motor	.....	Int.	Wood	Yes
Wilkes-Barre & Hazleton Ry	10	Ps. Clsd.	Motor	52–3½	Int.	All-steel	No
Wisconsin-Minnesota Light & Pwr. Co	1	Ps. Clsd.	Motor	34–0	City	Semi-steel	....
Worcester Consol. St. Ry	1	Dump	....	44–5	Both	All-steel	....
Youngstown & Southern Ry	1	Comb. Ps., Bagg. & Smoker	....	54–7¼	Int.	Stl. Fr.	....

Accidents from Automobiles

The following statistics were compiled by Frederick Rex, of the Municipal Reference Library in Chicago, from the United States Census Bureau records. They were prepared for use in connection with the preparation of a municipal ordinance and show the total number of deaths from automobile accidents in cities of the United States having a population of 300,000 and over for the years 1913 and 1907, with percentage of increase in total for year 1913 over 1907, also the number of deaths from automobile accidents in Germany for the year 1912.

AUTOMOBILE ACCIDENT STATISTICS

City	Population in 1913	Number of Deaths from Automobile Accidents 1913	1907	Per Cent Increase in Number of Deaths from Automobile Accidents in 1913 Over 1907
New York City	5,198,888	305	55	454.5
Chicago	2,344,0·8	123	15	720.0
Philadelphia, Pa.	1,631,956	52	11	372.7
St. Louis, Mo.	723,347	45	5	800.0
Boston, Mass.	722,465	40	9	344.4
Cleveland, Ohio	622,699	44	5	780.0
Baltimore, Md.	574,575	18	3	500.0
Pittsburgh, Pa.	557,773	35	10	250.0
Detroit, Mich.	520,586	66	8	725.0
Buffalo, N. Y.	446,889	29	7	314.3
San Francisco, Cal.	440,995	32	15	113.3
Milwaukee, Wis.	408,683	17	3	466.6
Cincinnati, Ohio	398,452	16	5	220.0
Newark, N. J.	379,211	20	5	300.0
Los Angeles, Cal.	412,466	69	5	1,280.0
New Orleans, La.	355,958	12	1	1,100.0
Washington, D. C.	348,077	16	3	433.3
Minneapolis, Minn.	333,472	9	1	800.0
Total	16,420,510	948	166	471.0
Germany (1912)	64,925,993	442	..	....

Receiverships and Foreclosure Sales

Mileage Placed Under Receivership During 1915 Was the Largest in Five Years—Increase in Foreclosure Sales During the Same Period Did Not Show Such a Marked Tendency

HOWEVER well electric railways in general have been able to weather the storm of financial and business depression during 1915, it is to be expected that in such a period some companies, because of the accumulated burdens of regulation, of unrestricted jitney competition, of long continued deficits from operation in poor territory and of various inherent weaknesses of organization, should have gone down. Hence it is not surprising to find that the number of electric railways, or twenty-seven, whose finances in 1915 became involved to the point of receivership, was the largest in the last five years, although the year 1912 was a close second with twenty-six companies. The mileage involved in 1915, however, was more than double that of 1911, the most severe of the four years preceding, but the capitalization showed a much smaller increase. The record of receiverships for 1915 compares with the preceding four years (with certain minor adjustments therein for information only now available) as follows:

	Number of Companies	Miles of Track	Outstanding Stock	Outstanding Funded Debt
1911	19	518.90	$29,533,450	$38,973,293
1912	26	373.58	20,410,700	11,133,800
1913	18	342.84	31,006,900	47,272,200
1914	10	362.39	35,562,550	19,050,460
1915	27	1,152.10	40,298,050	39,372,375

The accompanying table shows the details of receiverships for 1915. An attempt was made at all times to take the figures from the most up-to-date sources, with a selection of the highest figures in some cases where financial authorities absolutely disagreed and no definite company information was ascertainable. It will be noticed from a glance at the table that eleven of the companies were small ones operating 10 miles of single track or less, and that the total for the year owed its size to the inclusion of several large companies. In regard to such companies, it may be said that at least two underwent receivership because of conditions not directly connected with the depression of the year. The Des Moines City Railway, for example, was placed in receiver's hands as a result of action by the bondholders to protect their interests pending a settlement of the franchise question. Now that the franchise is granted, it is expected that the receivership will be soon dissolved and money raised to rehabilitate the property. According to an official statement, this should not be difficult to do in view of the excellent showing which the company will be able to make as to earnings and equity. The other case was that of the Kansas City, Clay County & St. Joseph Railway, the receivership of which was ordered to protect a judgment for $1,500,000 damages to the Interstate Railway for the taking of right-of-way on which it held options. The company appealed from this verdict, and it was recently reported that the receivership would soon be discharged.

As to causes of certain other receiverships, it was stated that the Atlantic City & Shore Railroad was forced into such condition by unregulated and unrestricted jitney competition, in spite of appeals to the city for a fair protection, and the Gary & Interurban Railroad suffered losses on account of jitney competition and a 3-cent fare. The demise of the Clarksville & Dunbar Cave Railway, said never to have been profitable, was attributed to "Ford cars." The receivership of the Southeastern Ohio Railway, Light & Power Company finally resulted from the loss of revenue caused by the destruction of the bridge in Zanesville during the 1913 flood and the resultant interruption of through traffic. The proceedings in the case of the Empire United Railways, Inc., were friendly ones for the purpose of reorganizing the financial management of the company, adjusting the interest charges and providing money for future capital expenditures. The receivership of the Syracuse & South Bay Electric Railroad and the Syracuse, Watertown & St. Lawrence River Railroad, two financially distinct organizations operated under the same management, contemplated the consolidation of the properties and the issuance of new securities. The Fairmount Park & Transportation Company proceeding, also amicable, involved a reorganization and scaling down of capital.

Although the foreclosure sales of electric railways, 1915, numbered nineteen with a single-track mileage of 308.31 miles and thus ran far ahead of 1914 with eleven companies and 181.26 miles, the record was

ELECTRIC RAILWAY RECEIVERSHIPS IN 1915

	Mileage	Outstanding Stock	Outstanding Funded Dept
Aberdeen Railway	7	$90,400	$20,000
Albuquerque Traction Company	5.5	250,000	116,000
Ardmore Electric Railway	4.7	200,000*	.....
Atlantic City & Shore Railroad.	48.17†	1,000,000	950,000
Atlantic Shore Railway	95.16	1,000,000	2,535,250
Buffalo & Lake Erie Traction Company	168	7,154,100	10,518,500
Clarksville & Dunbar Cave Railway	5.5	50,000	25,000
Cleburne Street Railway	8	65,000	12,500
Cleveland, Youngstown & Eastern Railway‡	23.5	152,500	52,000
Choctaw Railway & Lighting Company	23.26	2,000,000	1,144,000
Des Moines City Railway	85	1,305,000	2,720,000
Empire United Railways, Inc...	246.22	11,600,000	9,832,400
Fairmount Park Transportation Company	10	1,750,000	750,000
Gary & Interurban Railroad	85	4,720,850	2,480,225
Kansas City, Clay County & St. Joseph Railway	83.6	4,000,000	3,135,000
Lima-Honeoye Light & Railroad Company	4.6	5,000	.....
Mt. Vernon Railway	9	10,000	40,000
North Branch Transit Company.	30	500,000	532,500
Norton & Taunton Street Railway	21.2	297,000	296,000
Otsego & Herkimer Railroad	65.66	500,000	1,164,000
Southeastern Ohio Railway, Light & Power Company	16.34	600,000	600,000
Southern Iowa Railway & Light Company	10	120,000	340,000
Southern Traction & Power Company	7	200,000	200,000
Syracuse & South Bay Electric Railroad	26.56	1,000,000	561,000
Syracuse, Watertown & St. Lawrence River Railroad	6.35	40,000	200,000
Taunton & Pawtucket Street Railway††	18.6	100,000	200,000
Youngstown & Southern Railway	38.18	1,588,200	948,000
Total	1,152.10	$40,298,050	$39,372,375

*Authorized amount; outstanding amount not ascertainable.
†Includes 2.6 miles leased and 40.47 miles operated under trackage agreements.
‡Receivership covered only the Chagrin Falls & Eastern Railway division from Chagrin Falls to Garrettsville.
††This company is not itself in receivership, but receivers have been appointed for all property covered by the old $200,000 mortgage of the predecessor Bristol County Street Railway, now held to be a valid lien assumed by the successor corporation. This mortgage is said to cover all the mileage of the present company.

only a little worse than 1913, with seventeen companies and 302.28 miles, and decidedly better than 1911, with twenty-five companies and 660.72 miles. The following table shows the complete comparative figures for the last five years:

	Number of Companies	Miles of Track	Outstanding Stock	Outstanding Funded Debt
1911	25	660.72	$91,354,800	$115,092,750
1912	18	267.18	14,197,300	10,685,250
1913	17	302.28	15,243,700	19,094,500
1914	11	181.26	26,239,700	44,094,241
1915	19	308.31	30,508,817	16,759,997

The detailed foreclosure sales during 1914 are published in the accompanying table. As in previous years, it has been found that some electric railways for which receivers had been appointed or against which foreclosure suits had been brought, were able to carry out reorganization plans without offering the property at public sale. All the various forms of reorganization, readjustment and change in ownership without formal foreclosure sales have been passed over. Regarding some of the companies included, however, certain points should be mentioned. The Pittsburgh, McKeesport & Westmoreland Railway was sold in February, 1913, but the purchaser did not make the required payments and consequently the company was again sold by the same receiver in June, 1915. The Warren, Brookfield & Spencer Street Railway, after four previous attempts, was finally sold in April, and the Fort Wayne & Springfield Railway, after being offered six times and sold twice (deposit forfeited in each case), was finally sold to the trustee in December. The sale of the Tri-State Railway & Electric Company properties covered about 15 miles of owned and controlled lines, the larger lines formerly leased by the company having been surrendered for separate operation. The properties of the Idaho Railway, Light & Power Company were sold under foreclosure with the exception of the 21-mile Boise Railroad, which was turned back to the former owners. The line of the Southern Traction & Power Company was bought at foreclosure by the city of Alexandria at an agreed-upon price and is now the Alexandria Municipal Railway.

ELECTRIC RAILWAY FORECLOSURE SALES IN 1915

	Mileage	Outstanding Stock	Outstanding Funded Debt
Aberdeen Railway	7	$90,400	$20,000
Albuquerque Traction Company	5.5	250,000	116,000
Birmingham, Ensley & Bessemer Railroad	32.8	4,153,000	2,650,000
Clarksville & Dunbar Cave Railway	5.5	50,000	25,000
Cleburne Street Railway	8	65,000	12,500
Cleveland, Youngstown & Eastern Railway*	23.5	152,500	52,000
Fairmount Park Transportation Company	10	1,750,000	750,000
Fort Wayne & Springfield Railway	22.85	668,467	298,997
Idaho Railway, Light & Power Company	64	16,092,600	7,743,000
Lincoln Railway & Light Company	5.5	150,000	55,000
Mansfield Railway, Light & Power Company	21.06	1,000,000	942,000
Minneapolis & Northern Railway	18	500,000	.....
Oklahoma Union Traction Company†	5	100,000	60,000
Pittsburgh, McKeesport & Westmoreland Railway	9	428,150	477,000
Southern Traction & Power Company	7	200,000	200,000
Tri-State Railway & Electric Company	15	2,575,800	668,000
Warren, Brookfield & Spencer Street Railway	20.1	150,000	145,000
Washington Interurban Railway	8.5	500,000	232,000
Washington-Oregon Corporation	20	1,632,900	2,313,500
Total	308.31	$30,508,817	$16,759,997

*Sale covered only division from Chagrin Falls to Garrettsville (see Table of Receiverships), which was scrapped. The remaining division from Chagrin Falls to Cleveland is now operated as the Cleveland & Chagrin Falls Railway.

†Only the 5-mile city section of this company was sold under foreclosure to the Tulsa Traction Company. The 15-mile interurban line under construction still continues under the Oklahoma Union Traction Company.

Mr. Prouty on Government Ownership

Considers It Doubtful Whether Regulation Will Give Latitude of Operation and Rate of Return Sufficient to Attract Private Funds

CHARLES A. PROUTY, director of the Interstate Commerce Commission division of valuation, in speaking on Dec. 28 before the Pan-American Scientific Congress, said that time alone would tell whether, under the present strict supervision of railroads by the government, enough private capital could be found for the transportation needs of the future. He stated that when the great private investments that now supply sinews for the American transport system were made government regulation did not exist, and he asked whether under regulation these investments of private capital ever would have been made. He confessed that he could not answer his own question.

Continuing, Mr. Prouty said:

"In the future large sums, perhaps as large as or larger than the present investment, must be had for the further development of public utilities. Can that money be obtained? Will private investors have sufficient confidence in the future of their investment to make it? Will the commission give the owners of a utility sufficient latitude in its operation, and will it allow a sufficient return so that the needed private funds can be had? This is the doubtful point, and the doubt can only be solved by actual experience.

"This much is certain, the rate of return must be very much in excess of the rate at which the government itself could borrow money for providing the same utility, and the question may finally be, 'Can the people afford to regulate their utilities, or is it better that the government furnish the service at first hand?'

"Experience shows that the only way in which the public can be protected and exact justice done to the utility is by prescribing in advance the conditions of the service, and the charge at which it shall be rendered. It finally has been determined after much discussion and litigation that this method of regulation may be employed. The legislature may prescribe the rule and the rate by direct enactment, or it may create a commission and invest it with that authority, but as a matter of fact most states and the federal government have used the commission form of regulation."

Copper Shortage in Germany

Germany's present shortage in copper may be remedied by government confiscation of copper used for distribution purposes on electric railway in the German empire, thus providing copper enough to last five years, according to an interview with A. S. Wertheim, a Hamburg merchant, appearing in a recent issue of the Norwegian trade journal *Farmand*. Mr. Wertheim is quoted as saying: "As far as copper is concerned, it is true that there is no abundance in Germany, and that is the reason why the German government, foreseeing a long duration of the war, is voluntarily buying household copper. If, however, there should really ensue a scarcity of copper the government need only turn to the street car systems in the provincial towns, which, with some little inconvenience to the public, would alone yield more copper than Germany could consume for army purposes and industries in five years."

The Prospect of the Jitney

The Writer Urges Railway Managers to Find the Reasons which Have Kept the Jitney On the Streets, in Spite of Its Manifest Drawbacks and Lack of Profits—After These Are Found Future Action Can Better Be Determined

By H. S. COOPER
Secretary Southwestern Electrical & Gas Association

NOW that the fever-flush of the jitney has passed and the street railway fraternity has the opportunity to draw a long breath, sit down and compare results, it might be as well to employ that interval in a calmer survey of the past and the present and a more careful consideration of its probable effects in the future. To say, as some do, that there will be no lasting results of any great importance is to ignore all principles of cause and effect. No such radical irruption of a new transportation factor into—and against—long established and approved transportation methods can occur and then vanish like a fog and leave no tangible results. And this is particularly true when that factor contains inherent merits which, no matter how much they may have been perverted in the past, are of a character that seem advantageous to the public at large.

The primary thought in all this matter must be the full realization of the fact that the public, the people as a whole, are the judge, jury and counsel of the court of last resort. That which the public as a whole desires it will obtain, and it will do so without any regard for the commercial or financial equities. If the conditions of urban and suburban transportation become such as will abolish every mile of street car track in the country, those miles will be quickly abolished without regard to the consequences to employees or security holders. In this respect the public is merciless. That which serves it best at the present moment is that which it will demand, and its demand is always a command.

This is a fixed condition, a stone wall of fact, and he who spends his time in butting it gets only a sore head for his efforts. The wise one will test the stability of that wall and, having satisfied himself as to that, will spend his efforts in surmounting it or going around it —if either is possible.

The jitney, while sudden in its effects, should not have been an entirely unlooked-for phenomenon. Many years previously the bicycle had given a lesson as to the possible effect of individual rapid self-transit, the motorcycle had begun demonstrating its long-distance possibilities, and, just previous to the jitney irruption, the private motor car had shown its appreciable diminishing effect on gross earnings. It needed only the additional stimuli of cheap motor cars and general unemployment to complete the necessary factors for the phenomenal rise of the jitney—to make it, like Minerva, full grown and armed at birth.

Public utilities are a trustful tribe, and they fully showed this trait in the jitney emergency. They trusted in precedent; in the supposed inertia of the public; in the inability of the jitney owner to sustain his fixed-charges losses; in municipal ordinances, State legislation, commission rulings or judicial decision; in getting the public to take the viewpoint of the street railways; in the idea that the jitney was entirely a fair weather plant, which rains, frosts and snow would kill; that it was a novelty of which the public would soon tire; that good times and re-employment would relegate it to limbo —anything at all but that it might remain or become a permanent competitor to be seriously reckoned with.

One especial point that should have opened the eyes of the street railways was the peculiar fact that to none of the three parties most vitally concerned was it a financial betterment, or, to put the case more correctly and strongly, it was a financial detriment to the jitney owner, the public and the street railway. Reliable data prove that most of the jitney owners made only scant wages, the while they were steadily eating up their principal. The public spent a great deal more for its total of local transportation than it ever did before and received therefor no financial benefit. And, as for the railway, its losses have been cried to the house tops!

Such an unparalleled condition called for instant and careful analysis. If there were no financial reason for the jitney there must be another one or ones, there must be some underlying cause, some one or more of the constituents of personal transportation—safety, comfort, convenience or pleasure—that made the public not only take to the jitney but made an important portion of it stick to it.

And here, again, the street railways showed their unwise hopefulness—"the wish was father to the thought." They said: "It is the novelty of the thing; the fact of being able to ride in an automobile; of riding in the open; of the comparative high speed and decrease of time of journey length. As soon as the novelty wears off, as soon as the bad weather comes, as soon as proper regulation of the jitney is attained, then will the public flock back to the 'old reliable' and the jitney will be a thing of the past!"

Inadequate and imperfect reasoning! Because it takes into account only the present imperfect manifestation of the jitney and leaves out of the reckoning all its possibilities. With a vehicle costly to buy, maintain and operate; a vehicle designed and built for an entirely different purpose and use and sold at an extortionate profit, using as a propelling power a substance high in cost and limited in both natural and artificial supply, operated by owners unskilled in transportation operation and accounting, and having no commercial precedent or experience in the business, the jitney has not only made deadly inroads on the street railway earnings, but it has established for itself a place in the local transportation scheme that only needs a very little favorable change in its operative conditions to make it a strong, a lasting, and, perhaps, a deadly competitor of the street railway.

Let us look at some of these "favorable changes."

1. Lessened first-cost of vehicle.
2. Simplified construction.
3. Perfect adaptability to use.
4. Cheaper propelling power.

As to item No. 1, it is well known that the costs of manufacture and distribution of the automobile bear no reasonable commercial relation to the purchase price. These manufacturing and distributing costs are too well known, directly—or may be inferred indirectly from announced profits—to say that the present price of the vehicles cannot be decreased from 40 per cent to 65 per cent. The ability to maintain the present prices depends on patents, on designs and on constructive and selling organization. But patents expire or are legally

annulled, and constructive designs can be closely followed or copied, as can constructive, sales and delivery organization.

Items Nos. 2 and 3 are closely allied. The present automobiles were designed and built to be operated at fairly high speeds for long periods. While their mechanism allows them to be stopped, to reverse their direction and to run at lower speeds, it is of such character that any large use of it for these purposes (vitally necessary in jitney work) decreases its efficiency and increases its operating and maintenance cost in cumulative ratio. Also, the passenger carrying or weight carrying capacity of the automobiles has hitherto been gaged or limited by the average character of the roads it traverses and by the comfort and pleasure of its passengers.

Is it beyond possibility that the genius that evolved the automobile to its perfect adaptability for private use will not be able to evolve an equally perfect vehicle for public use on proper roadways—a vehicle of greater carrying capacity, of more simple construction, adapted to start, stop and run at lower speeds with efficiency?

Item No. 4 has been called an impossibility, or a possibility so remote as not worth figuring on. Is it? With the gigantic strides in every phase of invention and discovery, is it reasonable to rest supinely on a belief in the impossibility of a cheap substitute for gasoline as a motive power for the automobile? With every public need has come some fulfillment of that need, not always the perfect one but nearly always a presently sufficient substitute, and there is now manifesting itself a need — and a crying need — for a substitute, and a cheaper substitute, for motor gasoline; a substitute that shall not depend on purely natural sources for its supply, a substitute which it shall not be in the power of any combination or monopoly to control. Who is to say that alcohol or some similar substance, cheaply manufactured from hundreds of waste materials, may not be modified or adapted to equal or more efficient use as propulsive power for the automobile? Not only is such within the bounds of possibility, but, under the present and increasing demand for such, it would be no great surprise if next year or next month or the next instant it were put on the market.

It will therefore be seen that it is no far and distant cry to an improvement on the jitney that will make it a much more economical and efficient vehicle, and one that will be perfectly adapted to its uses.

Outside of the jitney vehicle itself lie other factors now inimical to its success, and which the hopefulness of the street railways has regarded as immovable obstacles. These are:

1. Vehicular congestion and its objectionableness.
2. The inability of the jitney to run successfully on unpaved streets.
3. The inability or unwillingness properly and economically to control or regulate the jitney.

The answer to all three of these items is: Whatever the public desires and demands, that same it will have and not count the cost. If it makes up its mind to jitney transportation it will endure much greater vehicular congestion that at present, and will find some method of obviating that portion which it will not endure. Likewise, if the public desires and demands jitney service to the suburbs, and lack of proper roadways hinders the fulfillment of that desire or demand, the public will itself build the necessary roadways and laugh at the cost. Similarly, if proper control or regulation of the jitney is a necessity to give the public the service it desires and demands, that control and regulation will come as inevitably as it has come to the street railways and to other public utilities.

In view of all the above it will be the part of wisdom for the street railways to place their ears very close to the ground and endeavor to locate the direction of the jitney movement. Before any measure of change in standard street railway practice is made, it is necessary to predicate in what direction, to what extent and how forceful and continuous that jitney movement will be. It will be little good for the street railway to point to the calamity that will overcome its security holders if its losses continue. The public will paraphrase the reputed Vanderbilt saying, and reply, "The security holders be damned!" It will be little good to spend long columns of print trying to prove to the public that its street railway is an economic necessity for the prevention of population congestion, the voting and tax-paying portion of the population will answer: "We will take care of that!"

What must be done is unbiasedly to find out the reason back of the jitney and so to change the street car, or its service, as to forestall the permanent installation of the jitney as a dangerous competitor to the street car. Nothing else will avail at this time, and the longer the street railway shuts its eyes and sits down and trusts to its hopes the harder will be its task to save itself. There are many who benefit by the present imperfect jitney; there are many more who would benefit by the perfect jitney, and among them are those who—in numbers, financial standing and brains—are not far behind those in the street railway business; among them are those who are "ag'in the public service corporations"—many of them sincerely so; among them are those who "vote as they feel," and who feel, wisely or unwisely, that the jitney supplies to them, in some way, a long-felt want. So that the street railway has, as factors against it, a large portion of those from Missouri, who must be shown by physical results if they are to be convinced, and it also has against it many whose interests lie, and will lie, parallel with the jitney, especially with the perfect or more perfect jitney.

If such proper investigation of the subject tends to show the worst—that the day of the present street railway is coming to an end—is it not better voluntarily to ascertain that fact and make preparation for it than blindly to ignore it and have it come as an unprepared-for catastrophe? If such investigation discloses that the jitney is a straw bogey, soon destined for the scrap heap, is it not better to be certain of that fact before extraordinary expense and needless changes are made in car equipment, routeing and schedules?

If the investigation proves that the jitney, in mild form, will be a permanency, will it not be best to have that fact settled in the minds of the street railway companies and for them to fix it in the minds of the public by action which recognizes the fact?

Any way that it is looked at, is it not better to change the attitude of nearly the whole street railway industry toward the jitney; to abstain from inspired legislation which cannot be enforced in extenso and which only leads to reprisals; to pretermit the useless appeals to the public on matters which it will not understand and about which it does not care even if it should understand them? Would it not be better to stop fighting the jitney by methods which affect it not at all, or else make a hero or a martyr of it, and to bend all present efforts to find out why it is and what it can be, and all future efforts to make the street car so efficient a substitute for it that there will be no further public desire or demand for the jitney except as an occasional and local adjunct of the street railway service? This is a contingency that will always exist in some localities, and of which a tactful handling by the street railway will always enable it to be controlled and will often enable it to be made a helpful adjunct to the railway.

COMMUNICATIONS

General Staff Considering Electric Railways in Preparedness Plans

H. M. BYLLESBY & COMPANY, INC.
NEW YORK, Dec. 27, 1915.

To the Editors:

Your excellent editorial of Nov. 20 on "Preparedness in Transportation" is as seed fallen on fertile soil.

The plans of the General Staff of the Army with respect to the rapid mobilization of troops and war material have been based upon the availability of standard steam roads with occasional use of electric transportation, but it is now certain that a complete survey of all lines must be made. There cannot possibly be anything approximating negligence in a matter so important. Your editorial and certain relevant suggestions are in the hands of the military authorities and will surely receive prompt attention.

As to the present degree of co-operation necessary, I will send you information at the earliest practicable date. GEORGE H. HARRIES, Vice-President.

The Lighting of Interurban Cars

THE TRAVELERS PROTECTIVE ASSOCIATION OF AMERICA
SAN FRANCISCO, CAL., Dec. 21, 1915.

To the Editors:

The fact that the interurban electric railway systems of the United States have been of great benefit to the commercial travelers of the country cannot be denied, and the further fact that the several electric lines are endeavoring to provide every comfort for their patrons is patent to every person using this means of transportation.

The commercial traveler is fully aware of the fact that the electric railway is rapidly being improved with every new electrical device tending toward the comfort of the traveling public as quickly as such new improvements are found to be practical.

There is one particular feature of electric railway transportation which I desire to bring to the attention of the electric railway companies of the United States through the medium of the ELECTRIC RAILWAY JOURNAL on behalf of the commercial travelers of the country and that is the present inadequate lighting facilities in use. This is particularly true on those lines employing the third-rail system. Every time the car passes a break in the third rail the light goes out. All cars which use the carbon system of lighting have a flickering, unsteady light.

The proposition of correct lighting of some of the roads in question has been under discussion by the commercial travelers, and it is the rule among them to refrain in a great many cases from patronizing electric lines at night if possible. The present methods of lighting employed are not satisfactory inasmuch as a passenger is unable to read and the strain caused by the flicker is complained of. In our opinion this could be avoided at a small cost to the electric lines if they would install some such sort of storage system as is in use by the steam lines.

Another annoyance to the passenger is the fact that in case of any interruption to the current, as now used for lighting, the car is plunged in darkness, whereas if a storage system of lighting were adopted the car would be lighted for a time at least, even though the supply of current was stopped for any reason.

The above is a suggestion advanced by the Travelers Protective Association of America to the electric lines, and we respectfully ask its serious consideration.

D. V. GELDER, National Chairman,
Railroad Committee Trans-Continental
Association District.

[NOTE.—Several plans, based on the use of storage batteries, as suggested by Mr. Gelder, have been tried, but, so far as we know, none has been successful or at any rate is in extended use at present. This letter, however, offers a suggestion to inventors.—EDS.]

The Causes of Rail Corrugation

SPRINGFIELD, MASS., Dec. 27, 1915.

To the Editors:

I have read with much interest the article entitled "Curved Heads for Girder Rails in Brooklyn," written by R. C. Cram, together with editorial comment which appeared in your issue of Dec. 25, 1915, but regret that neither Mr. Cram nor the JOURNAL has seen fit to refer to the fact that this subject was fully treated in an article written by the undersigned and published in your issue of Sept. 30, 1911, page 528, with editorial on page 520 of the same issue. A subsequent letter to the JOURNAL, in reply to the editorial comment, was published in your issue of Oct. 10, 1911, page 701.

It is, of course, gratifying to learn that the observations of Brooklyn Rapid Transit Company's engineers confirm the writer's theory which was based upon his own experiments, experience and observations in connection with rail corrugation in this country and abroad. While it is not my desire to seek personal advertisement, it would only seem fair to me that my article of Sept. 30, 1911, should have attention called to it. G. E. PELLISSIER.

[NOTE—Neither Mr. Cram in his article nor we in our editorial made any attempt to go into the history of the advocacy of rails with curved heads except to say that there was nothing novel at the present time in the idea. The most valuable feature of the Brooklyn test, in our opinion, was its practical demonstration, on an extended scale, of the advantage of the curved head in reducing corrugation. Nevertheless, we are glad to print the communication of Mr. Pellissier and to give him credit for his interesting exposition four years ago of the relation of the shape of the rail head to the extent of rail corrugation.—EDS.]

Clearing House for Safety Literature

FITCHBURG & LEOMINSTER STREET RAILWAY
FITCHBURG, MASS., Dec. 29, 1915.

To the Editors:

Your editorial in the issue of Dec. 25, relative to "Clearing House for Safety Literature," strikes a responsive chord in my heart, for it has been one of my pet ideas for several years, that the Claims Association should have a central agency through which it might give to each and every member company the benefit of what is being done in the line of public safety of all kinds and act as a clearing house for ideas along all lines that would conserve the interests of member companies.

Safety work is the foundation on which we are all building to-day, but some are going at it hit or miss without a definite goal in view, and my idea is, that the Claims Association could well have a central agency for this very purpose, and it could be run with little expense to any particular company, by a pro rata charge to each member company.

H. K. BENNETT, Claim Agent.

MIDYEAR MEETING
CHICAGO
FEBRUARY 4, 1916

ASSOCIATION NEWS

MIDYEAR MEETING
CHICAGO
FEBRUARY 4, 1916

Lists of Committee Chairmen for the Current Year Have Been Completed and the Transportation Committee Has Been Appointed—Secretary-Treasurer's Financial Statement Has Been Audited—Important Safety Code Conferences Are Coming

Committee Chairman for the Cnrrent Year

Secretary E. B. Burritt has just completed the list of chairmen of committees, with the exception of the Accountants' Association, as given below.

AMERICAN ASSOCIATION

Aera advisory board: H. C. Donecker, assistant general manager Public Service Railway, Newark, N. J.

Anthony N. Brady medal: Arthur W. Brady, president Union Traction Company of Indiana, Anderson, Ind.

Award of bronze medal for best paper presented before a company section: H. R. Fehr, president Lehigh Valley Transit Company, Allentown, Pa.

Company membership: George W. Knox, vice-president and general manager Oklahoma Railways, Oklahoma City, Okla.

Company sections and individual membership: Martin Schreiber, engineer maintenance of way Public Service Railway, Newark, N. J.

Compensation for carrying United States mail: (To be appointed).

Constitution and by-laws: George H. Harries, president Arkansas Valley Railway, Light & Power Company, Omaha, Neb.

Education: H. H. Norris, associate editor Electric Railway Journal, New York, N. Y.

Electrolysis: Calvert Townley, assistant to president Westinghouse Electric & Manufacturing Company, New York, N. Y.

Federal relations: Arthur W. Brady, president Union Traction Company of Indiana, Anderson, Ind.

Insurance: A. H. Ford, vice-president and general manager Cumberland County Power & Light Company, Portland, Me.

Midyear meeting and dinner: B. I. Budd, president Metropolitan West Side Elevated Railway, Chicago, Ill.

Operation of motor vehicles: B. I. Budd, president Metropolitan West Side Elevated Railway, Chicago, Ill.

Public relations: C. Loomis Allen, president Newport News & Hampton Railway, Gas & Electric Company, Hampton, Va.

Recommendations in president's address: Arthur W. Brady, president Union Traction Company of Indiana, Anderson, Ind.

Standards for car loading: S. W. Huff, vice-president Brooklyn Rapid Transit System, Brooklyn, N. Y.

Subjects: L. S. Storrs, president the Connecticut Company, New Haven, Conn.

Taxation matters: Henry S. Lyons, secretary Boston Elevated Railway, Boston, Mass.

Valuation: J. N. Shannahan, vice-president and general manager Newport News & Hampton Railway, Gas & Electric Company, Hampton, Va.

ENGINEERING ASSOCIATION

Block Signals for electric railways (joint): J. M. Waldron, signal engineer Interborough Rapid Transit Company, New York, N. Y.

Buildings and structures: C. F. Bedwell, assistant engineer Public Service Railway, Newark, N. J.

Electrolysis: Prof. A. S. Richey, Worcester (Mass.) Polytechnic Institute.

Engineering-Accounting (joint): L. P. Crecelius, electrical engineer Cleveland (Ohio) Railway.

Equipment: W. G. Gove, superintendent of equipment Brooklyn (N. Y.) Rapid Transit System.

Heavy electric traction: E. R. Hill, consulting engineer Norfolk & Western Railway, New York, N. Y.

Life of railway physical property (joint): Martin Schreiber, engineer maintenance of way Public Service Railway, Newark, N. J.

Power distribution: C. L. Cadle, electrical engineer, New York State Railways, Rochester, N. Y.

Power generation: J. W. Welsh, electrical engineer Pittsburgh (Pa.) Railways.

Special committee on use of association standards: H. H. Adams, superintendent of shops and equipment Chicago (Ill.) Surface Lines.

Standards: H. H. Adams, superintendent of shops and equipment Chicago (Ill.) Surface Lines.

Subjects: F. R. Phillips, superintendent of equipment, Pittsburgh (Pa.) Railways.

Transportation-Engineering (joint): Paul Winsor, chief engineer of mechanical and electrical engineering, Boston (Mass.) Elevated Railway.

To represent association at good roads congress, Pittsburgh, Feb. 22-25, 1916: J. M. Larned, engineer maintenance of way Pittsburgh (Pa.) Railways.

Way matters: C. H. Clark, engineer maintenance of way, Cleveland (Ohio) Railway.

CLAIMS ASSOCIATION

Employment: B. B. Davis, claim adjuster Columbus Railway, Power & Light Company, Columbus, Ohio.

Subjects: H. G. Winson, general claim agent Tacoma Railway & Power Company, Tacoma, Wash.

Ways and means: J. S. Kubu, claim agent New York State Railways, Utica, N. Y.

TRANSPORTATION & TRAFFIC ASSOCIATION

Block Signals (joint): J. W. Brown, assistant general superintendent Public Service Railway, Newark, N. J.

Develop uniform definitions: J. V. Sullivan, statistician Chicago (Ill.) Surface Lines.

Express and freight traffic: F. D. Norviel, general passenger and freight agent Union Traction Company of Indiana, Anderson, Ind.

Fares and transfers: C. S. Ching, chief instructor Boston Elevated Railway, Roxbury, Mass.

Passenger traffic: J. K. Punderford, general manager The Connecticut Company, New Haven, Conn.

Rules: C. E. Morgan, general superintendent Michigan United Traction Company, Jackson, Mich.

Rush-hour service: J. V. Sullivan, statistician Chicago (Ill.) Surface Lines.

Schedules and timetables: Edward Dana, superintendent of traffic Boston (Mass.) Elevated Railway.

Standards: L. H. Palmer, United Railways & Electric Company of Baltimore, Baltimore, Md.

Subjects: M. C. Brush, second vice-president Boston Elevated Railway, Boston, Mass.

Transportation-Accounting (joint): E. B. Peck, vice-president and comptroller Indianapolis Traction & Terminal Company, Indianapolis, Ind.

Transportation-Engineering (joint): W. A. Carson, general manager Evansville (Ind.) Railways.

Training of transportation employees: N. W. Bolen, general superintendent of Public Service Railway, Newark, N. J.

1916 TRANSPORTATION COMMITTEE

W. O. Wood, master of transportation, president New York & Queens County Railway, Long Island City, N. Y.

H. G. McConnaughy, director of transportation, Dearborn Chemical Company, 165 Broadway, New York, N. Y.

New England: R. M. Sparks, general passenger agent Bay State Street Railway, Boston, Mass.

New York State (exclusive of New York City): W. H. Collins, president Fonda, Johnstown & Gloversville Railroad, Gloversville, N. Y.

New York City: J. P. Kineon, superintendent Long Island Railroad, Far Rockaway, L. I.

New Jersey, Pennsylvania, Delaware and Maryland: W. B. Rockwell, manager Eastern Pennsylvania Railways, Pottsville, Pa.

D. C., Kentucky, Virginia and West Virginia: J. N. Shannahan, vice-president Newport News & Hampton Railway, Gas & Electric Company, Hampton, Va.

Indiana, Ohio and Michigan: R. P. Stevens, president Mahoning & Shenango Railway & Light Company, Youngstown, Ohio.

North and South Carolina, Georgia and Florida: W. H. Glenn, vice-president and operating manager Georgia Railway & Power Company, Atlanta, Ga.

Tennessee, Mississippi and Alabama: F. W. Hoover, second vice-president Chattanooga Railway & Light Company, Chattanooga, Tenn.

Texas, Oklahoma, Arkansas and Louisiana: L. C. Bradley, assistant district manager Stone & Webster Management Association, Texas District, Houston, Tex.

Colorado, Utah, Arizona and New Mexico: F. W. Hild, general manager Denver (Col.) Tramway.

Illinois and Wisconsin: G. T. Seely, assistant general manager Metropolitan West Side Elevated Railway, Chicago, Ill.

Minnesota, North and South Dakota, Iowa and Manitoba, Can.: J. J. Caufield, superintendent Twin City Rapid Transit Company, Minneapolis, Minn.

Missouri, Kansas and Nebraska: J. R. Harrigan, general manager Kansas City, Clay County & St. Joseph Railway, Kansas City, Mo.

Montana, Idaho, Oregon and Washington, and British Columbia: F. I. Fuller, vice-president Portland Railway, Light & Power Company, Portland, Ore.

California: G. H. Harris, general superintendent San Francisco-Oakland Terminal Railways, Oakland, Cal.

Eastern Canada (Ontario, Quebec, Nova Scotia): R. J. Fleming, general manager Toronto (Ont.) Railway.

Chicago Elevated Section

Four hundred and fifty members and guests attended the Christmas meeting of the Chicago Elevated Railroad Section held Dec. 14, 1915. G. T. Seely, assistant general manager, gave a short talk on "Subway Construction in the Eastern Cities." This paper dealt with the financing of subways rather than the actual construction details and showed, with the aid of lantern slides, the cost of subways in New York, Boston and Philadelphia, by whom the cost was borne, the manner in which the money was raised and the rate of return paid. Mr. Seely compared the physical conditions in the Eastern cities with those in Chicago. The remainder of the program was given over to entertainment, following which refreshments were served. A large Christmas tree appropriately decorated and illuminated gave a touch of the holiday spirit to the meeting and President H. A. Johnson and G. T. Seely were recipients of interesting gifts.

Coming Electrical Safety Code Conferences

W. J. Harvie, chairman of the association delegation to the conferences on the proposed national electrical safety code which is being promulgated by the National Bureau of Standards, has called a conference for Jan. 6 and 7 at the association headquarters in New York. He greatly desires to have in hand at that time constructive suggestions from electric railways. Communications should be mailed to him at once in the care of Secretary E. B. Burritt.

On Jan. 12 a conference will be held at the Bureau of Standards in Washington to receive particularly comments relating to overhead construction.

Secretary-Treasurer's Financial Statement

On account of the change in the fiscal year of the association, which now closes on Oct. 31, and of the time required for auditing, the financial statement of Secretary-Treasurer E. B. Burritt has just become available. This statement covers a period of thirteen months. It is given below with the amounts stated in even dollars:

CASH STATEMENT

RECEIPTS

(Thirteen Months Ended Oct. 31, 1915)

Cash in bank Oct. 1, 1914	$5,176
Admission fees	160
Company annual dues	53,002
Associate membership dues	14,625
Interest on bank deposits	385
Sale of annual reports	773
Sale of rule books	218
Sale of classifications	11
Sale of pamphlets	86
Sale of associate members' badges	228
Refund account midyear conference	200
Contribution account accountants' prize	25
Convention refund	70
Convention location bonus	3,000
Index bureau	732
Petty cash	602
Refund telegrams and telephones	22
Contribution to Fare Bureau	2,500
Aera advertising and cuts	10,417
Aera subscriptions	235
Sale of *Aera* binders	32
Accountants' course tuition fees	3,765
Sale of engineering manual and binder	297
Miscellaneous	107
ELECTRIC RAILWAY JOURNAL	344
Rules committee refund	41
Aera refund	6
Receipts during thirteen months ended Oct. 31, 1915	$91,884
Total cash, including balance of Oct. 1, 1914	$97,060

EXPENDITURES

(Thirteen Months Ended Oct. 31, 1915)

Salaries	$14,389
Printing and stationery	3,948
Postage	2,339
Miscellaneous office expenses	825
Rent of office	4,524
Telephone, telegraph and messengers	848
Express, freight and cartage	1,229
Travelling expenses, secretary	395
Travelling expenses, executive committee	922
Travelling expenses, other committees	1,383
Miscellaneous general expenses	2,033
1914 convention	704
1915 convention	2,783
1915 convention publicity	245
Annual report	1,214
Return of active membership dues	158
Return of associate membership dues	30
Furniture and equipment	1,104
Exchange	84
Accountants' Association, annual report	652
Accountants' Association, other expenses	737
Engineering Association, annual report	2,558
Engineering Association, other expenses	4,560
Claims Association, annual report	581
Claims Association, other expenses	981
Transportation and Traffic Association, annual report	1,249
Transportation and Traffic Association, other expenses	2,408
Membership pins	224
Petty cash fund	400
Rule books	31
Index Bureau	871
Accountants' course tuition fees	2,695
Aera	19,536
Fare Bureau	7,078
Washington representative	550
Badges	1,021
Engineering manual	716
Total expenditures for thirteen months ended Oct. 31, 1915	$86,004

EQUIPMENT AND ITS MAINTENANCE

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

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

Freeing Manholes of Gas

BY G. H. MCKELWAY
Line Engineer Brooklyn Rapid Transit System.

Practically always where conduit lines have to be built in streets in which gas mains have been laid, or even when the street containing the conduits does not contain a main but intersects other streets in which mains have been installed, there is trouble due to gas which escapes from the mains and finds its way into the conduits and manholes.

The gas company will, of course, claim that the pipes were in good condition at first and were damaged by electrolysis due to stray currents from the tracks of the railway company, but it is seldom true that the escape of gas is due entirely to the corrosion of the pipes caused by electrolysis. In nearly all cases the odor of gas will be noticed on the first opening of the streets for laying tracks or ducts, showing that it is already leaking from the pipes. However, whatever may have caused the leaks, they are almost certain to be found and to cause trouble in systems of conduits laid near gas mains. Measures must, therefore, be taken to keep the gas out of the manholes and to expel it after it has entered.

When the gas does get into the holes it not only hampers the linemen in their work, occasionally "knocking out" one or more of them, but sometimes explosions of gas in the holes blow off the manhole covers, endanger the lives of persons passing and damaging the cables.

A few years ago there was such an epidemic of gas explosions in manholes in New York City that the authorities ordered that all holes be ventilated and forbade the use of water-tight covers except in places where the conditions in regard to flooding were so bad as to make it useless to install any other kind. In the same city one explosion not only damaged the holes and all the cables in them, but tore up the street between the holes and killed several children who were playing there.

It might be supposed that if manholes were carefully built and the ducts surrounded by a heavy layer of well-made and well-placed concrete it would be impossible for the gas to get into the system, however strongly impregnated might be the earth outside. The writer has yet to learn of any such impervious systems, especially after they have been in operation for a few years, have been tunneled under for sewers and have had the concrete chipped away in places to permit of the installation of water or gas mains, to say nothing of holes broken in the concrete by picks or bars in the hands of careless workmen.

A number of years ago companies in several cities attempted to keep their conduit lines free from gas by connecting them with the chimneys of abandoned power stations, on the theory that the draft up the chimney would suck the gas out of the conduits. In practice the plan did not work out as well as had been expected, as it was found that although the gas was drawn up the chimneys out of the ducts, yet the same partial vacuum also drew in more gas from the earth surrounding the distribution system.

The induced-draft plan having proved a failure, the reverse of this, or the forced-draft system, is now being used, and with success. Its application to individual manholes is neither recent nor uncommon; instead, it is a standard practice with many companies. In its simplest form, which is the only one in which power in some form is not required, a blanket, coat, or other piece of cloth is hung over the manhole guard on the side away from the wind, thus forming a baffle which

FREEING MANHOLES OF GAS—HAND-DRIVEN BLOWER AT WORK

FREEING MANHOLES OF GAS—MANHOLE HOOD FOR USE IN PUTTING MANHOLE UNDER AIR PRESSURE

changes the course of the air slightly and forces it down into the manhole. While not a very effective method of clearing the gas from the hole this is better than none.

A much better plan involves the use of a fan to drive the air through a tube down into the hole. An accompanying illustration shows one of these blowers, a hand-driven one, at work. Whenever electric power is obtainable it is better to use a motor-driven fan, as man power is more expensive and less effective.

There are manholes so gassy that even a motor-driven blower alone will not suffice to drive out the gas fast enough to insure safety and comfort to men working in them. The best additional appliance for such cases is the cover shown in another illustration. This is simply a skylight or monitor made with an iron frame holding glass panes through which plenty of light can enter the hole, but through which the air from the fan, entering through a tube, cannot escape. The workmen in the hole work under a slight air pressure, as if in a caisson, although the pressure is very much less. The gas is thus driven from the hole and escapes through the ducts to other holes.

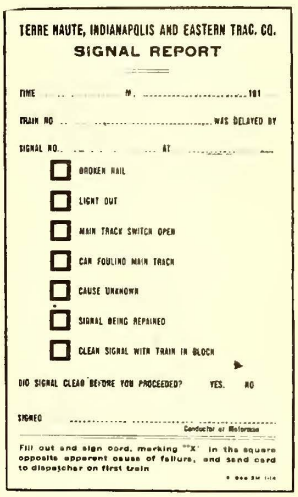
When the gas has to be expelled from an entire conduit system instead of a single hole the forced-draft system consists of a much larger fan and motor installed in a power house or substation and always forcing air into the ducts radiating from the station. This makes a very satisfactory arrangement, and, under favorable conditions, a slight movement of air can be noticed in manholes as far as a mile away from the station. The ordinary ventilated covers are unsuited for such a system as they permit too much air to escape. Where such covers have already been installed some of the holes in them should be plugged with bolts and washers.

Line Crews Maintain T. H., I. & E. Light Signals

BY A. SCHLESINGER
Superintendent of Distribution and Substations Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.

Widely separated territory protected by light signals on the various divisions of the Terre Haute, Indianapolis & Eastern Traction Company's lines made special supervision impractical and too expensive, and the work is being done by men from the regular line forces trained during the period of signal installation. At the present time there are thirty-eight light signals and nineteen indicators in operation. The protected territory includes 12½ miles on the LaFayette division, 13.8 miles on the Martinsville division, 3.2 miles on the Eastern division and 14.45 miles on the Brazil division. During the installation period men from the regular forces maintaining the overhead lines on these divisions were detailed to work with the contractors' gangs to familiarize themselves with the equipment. Since that time these men have acted as signal maintainers and a relatively high per cent of efficiency of signal operation has been obtained.

In all there are now in operation 43.95 miles of protected territory. On the Brazil division between Indianapolis and Terre Haute there are sixteen signals and eight indicators. The regular line force, including a foreman and two linemen, maintains this 50 miles of overhead and the signals. On this division the foreman was detailed to familiarize himself with the signal equipment, and is held responsible for its maintenance. On the Eastern division, including 76 miles of interurban railway and 11 miles of city lines, the regular maintenance force is made up of one foreman and three linemen. The length of this division necessitated a line car to transport the tools and the men to and from their work. During the installation of the two signals and one indicator on this division, one of the linemen was detailed to work with the contractor installing the signals. One foreman and one lineman on the Martinsville division, which includes 27 miles of interurban track, maintain the overhead lines and signals. Both men are familiar with the equiment, which includes twelve signals and six indicators. On the LaFayette division, with 86.5 miles of overhead lines and signals, one foreman, two linemen and one helper make up the regular maintenance force. The signal equipment on this division includes eight signals and four indicators.

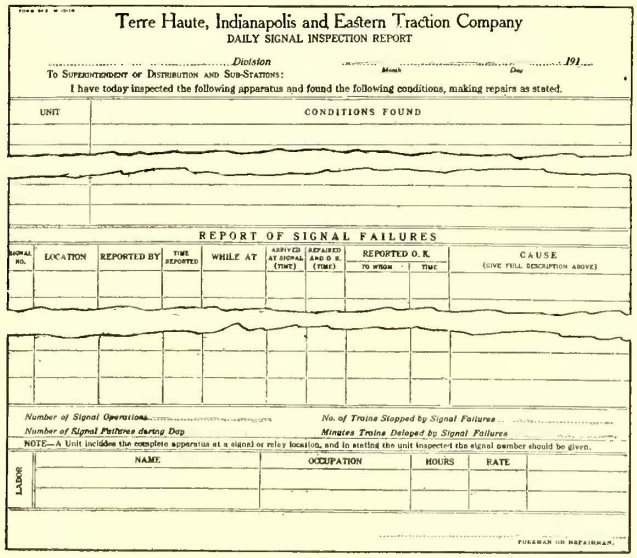

TERRE HAUTE, INDIANAPOLIS AND EASTERN TRAC. CO.
SIGNAL REPORT

TIME ..... M. 191
TRAIN NO ..... WAS DELAYED BY
SIGNAL NO. ..... AT .....
☐ BROKEN RAIL
☐ LIGHT OUT
☐ MAIN TRACK SWITCH OPEN
☐ CAR FOULING MAIN TRACK
☐ CAUSE UNKNOWN
☐ SIGNAL BEING REPAIRED
☐ CLEAR SIGNAL WITH TRAIN IN BLOCK
DID SIGNAL CLEAR BEFORE YOU PROCEEDED? YES. NO
SIGNED .....
Conductor or Motorman
Fill out and sign card, marking "X" in the square opposite apparent cause of failure, and send card to dispatcher on first train

TRAINMEN'S SIGNAL FAILURE REPORT

At least once every two weeks the signal maintainers are required to walk the protected territory and inspect bonds and signal mechanisms. On these trips the maintainer makes such repairs as he can with the tools and materials he carries with him, but when parts must be replaced they are ordered by telephone so that the signal may be restored to service promptly. Aside from what the maintainers may find, any signal trouble observed by the train crews is reported to the dispatcher, who in turn advises the maintainers. All trainmen are supplied with signal report cards, a reproduction of which is shown in one of the accompanying illustrations. This is filled in and mailed to the dispatcher in addition to telephoning him about the trouble. The regular line forces, and particularly the maintainers, keep in constant touch with the dispatchers so that in case of trouble they may be advised and proceed promptly to make repairs. As a check on the work of the signal maintainers, from time to time check cards are deposited in the mechanism cases by the motormen instructors or the division superintendents.

To keep the superintendent of distribution and substations informed regarding signal conditions, the daily


Terre Haute, Indianapolis and Eastern Traction Company
DAILY SIGNAL INSPECTION REPORT

.....Division ..... Month ..... Day .....191...
To Superintendent of Distribution and Sub-Stations:
I have today inspected the following apparatus and found the following conditions, making repairs as stated.

UNIT	CONDITIONS FOUND

REPORT OF SIGNAL FAILURES

SIGNAL NO.	LOCATION	REPORTED BY	TIME REPORTED	WHILE AT	ARRIVED AT SIGNAL (TIME)	REPAIRED AND O. K. (TIME)	REPORTED O. K. TO WHOM	REPORTED O. K. TIME	CAUSE (GIVE FULL DESCRIPTION ABOVE)

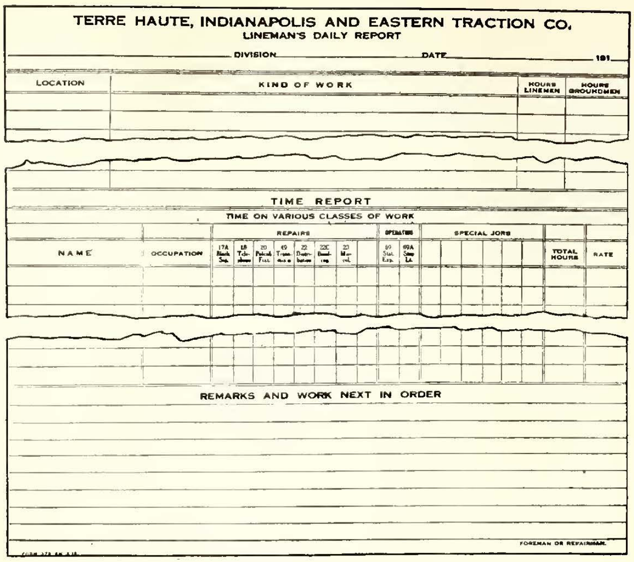
Number of Signal Operations..... No. of Trains Stopped by Signal Failures .....
Number of Signal Failures during Day ..... Minutes Trains Delayed by Signal Failures .....
NOTE—A Unit includes the complete apparatus at a signal or relay location, and in stating the unit inspected the signal number should be given.

LABOR

NAME	OCCUPATION	HOURS	RATE

.....FOREMAN OR REPAIRMAN.

T. H., I. & E. LIGHT SIGNAL MAINTENANCE—SIGNAL REPAIRMEN'S REPORT


TERRE HAUTE, INDIANAPOLIS AND EASTERN TRACTION CO.
LINEMAN'S DAILY REPORT
DIVISION DATE 191

LOCATION	KIND OF WORK	HOURS LINEMEN	HOURS GROUNDMEN

TIME REPORT
TIME ON VARIOUS CLASSES OF WORK

REMARKS AND WORK NEXT IN ORDER

FOREMAN OR REPAIRMAN

T. H., I. & E. LIGHT SIGNAL MAINTENANCE—LINE FOREMAN'S REPORT

signal inspection report form shown is filled out and mailed to him by the maintainer. All maintainers are required to send in these reports each day, regardless of whether there are any signal failures or not. In cases of line trouble, the dispatcher also fills out a form of report which is reproduced herewith. The line foreman is required to sign this dispatcher's report as a check on the information it contains and copies are furnished to the superintendent of distribution and substations, the division and general superintendents. In addition to the information regarding signal operation, this form also reports line trouble and defective telephones. Aside from this report the line foremen make out regular daily reports, a sample of which is illustrated. Besides containing the location and character of work done each day, this report also serves as a daily time sheet, containing a distribution of the time against the various accounts, and from these the time charged to signal maintenance is obtained.

From these various daily reports the superintendent of distribution of substations compiles a monthly report of signal operation on the entire system. A typical report on this form is reproduced on this page. To inform all parties interested, copies of this monthly report are sent to the general superintendent, the company that furnished the signals, the division maintainers and the roadmasters. Accompanying the report is an explanation of the various kinds of failures indicated. In this connection it has been the practice of this company to charge as failures any interruption to signal operation. Some consideration has been given to the desirability of changing the term "failures" to "signal interruptions," and include a special item to show only signals that have failed to give the proper indication. It is considered that the only time a signal actually fails is when it does not perform the functions for which it was designed.

Classification of Signal Failures for February, 1915

Brazil Division

Signal Department. One failure on the 6th at shops caused by maintainer working on signal at Torr's. One failure on the 8th at Dilleys on account of both green lamps burnt out.

Miscellaneous. One failure on the 11th at Boys' School, evidently due to switch-box contacts not working properly at west end of Dilleys. Probably switch box is out of adjustment.

Eastern Division

No failures reported.

Martinsville Division.

Blown fuses. One failure on the 24th at Centerton was due to blown fuse on stick relay energy.

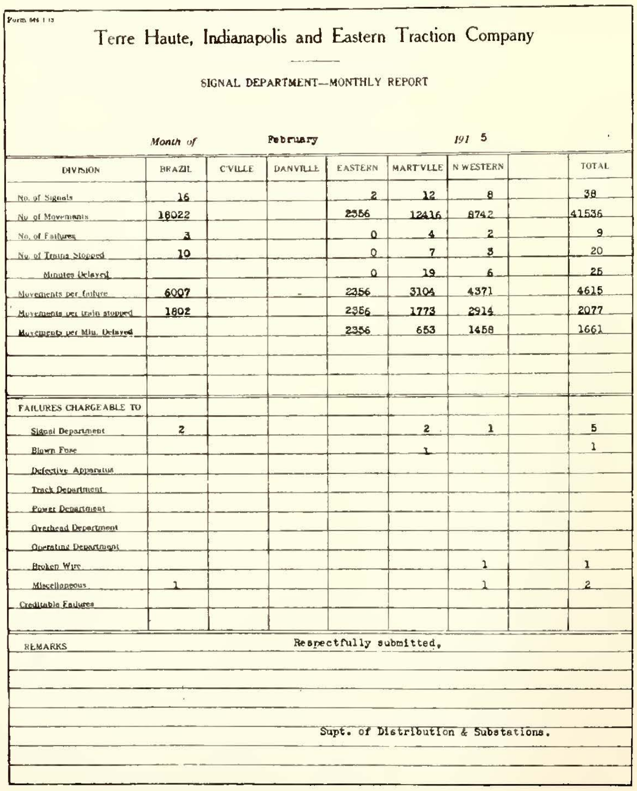
Signal department. One failure on the 3d at Bethany due to linemen working on signal at Centerton. One failure on the 4th at Martinsville on account of green lamps burnt out.

Broken wire. One failure on the 15th at Riverside due to broken control wire caused by train losing trolley pole.

Northwestern Division.

Signal Department. One failure on the 24th at Gravel Pit, due to green lamps burnt out.

Miscellaneous. One failure on the 23d at Eldridge, due to broken impedance bond terminal at Whitestown preliminary.


Terre Haute, Indianapolis and Eastern Traction Company

SIGNAL DEPARTMENT—MONTHLY REPORT

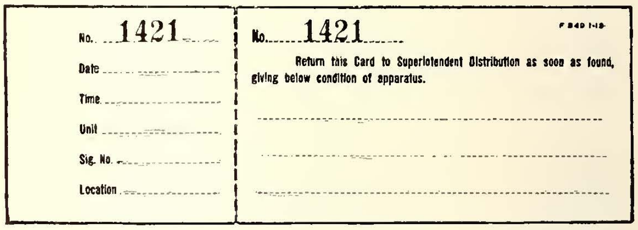
Month of February 1915

DIVISION	BRAZIL	C'VILLE	DANVILLE	EASTERN	MART'VLLE	N WESTERN		TOTAL
No. of Signals	16			2	12	8		38
No. of Movements	18022			2356	12416	8742		41536
No. of Failures	3			0	4	2		9
No. of Trains Stopped	10			0	7	3		20
Minutes Delayed				0	19	6		25
Movements per failure	6007		-	2356	3104	4371		4615
Movements per train stopped	1802			2356	1773	2914		2077
Movements per Min. Delayed				2356	653	1458		1661
FAILURES CHARGEABLE TO								
Signal Department	2				2	1		5
Blown Fuse					1			1
Defective Apparatus								
Track Department								
Power Department								
Overhead Department								
Operating Department								
Broken Wire						1		1
Miscellaneous	1					1		2
Creditable Failures								

REMARKS Respectfully submitted,

Supt. of Distribution & Substations.

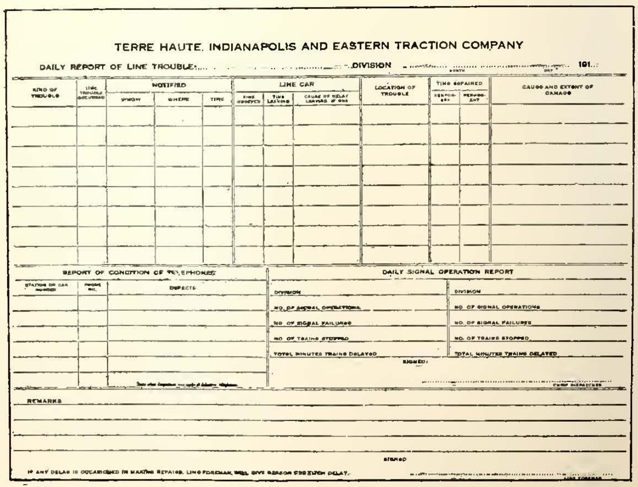
T. H., I. & E. LIGHT SIGNAL MAINTENANCE—TYPICAL MONTHLY REPORT ON SIGNALS


No. 1421
Date
Time
Unit
Sig. No.
Location

No. 1421

Return this Card to Superintendent Distribution as soon as found, giving below condition of apparatus.

T. H., I. & E. LIGHT SIGNAL MAINTENANCE—FORM USED TO CHECK MAINTAINERS


TERRE HAUTE, INDIANAPOLIS AND EASTERN TRACTION COMPANY
DAILY REPORT OF LINE TROUBLE DIVISION 191
REPORT OF CONDITION OF TELEPHONES
DAILY SIGNAL OPERATION REPORT
REMARKS

T. H., I. & E. LIGHT SIGNAL MAINTENANCE—DISPATCHER'S REPORT OF LINE TROUBLES

Although the method of maintaining light signals has been largely one of repairs rather than maintenance, the results have been satisfactory. In other words, the scattered territory and the few men required to maintain the signals have made it impossible to anticipate all trouble. It is contemplated, however, that as the territory grows and becomes continuous, a special signal organization will be formed. On the other hand, it is not believed that as high efficiency can be obtained on the average electric railway as on a steam railroad, because the installations are usually more complicated and the service much more frequent. Aside from these, however, the fact that the lines controlling the signals are usually placed on the same poles as the trolley and transmission lines, subjects them to greater hazards resulting in more frequent line disturbances.

Another interesting point arising in connection with the signal maintenance and operation on the Terre Haute, Indianapolis & Eastern Traction Company's lines is the question of when should a signal be charged with a failure. It has been decided that one defect can be the cause of only one failure, and, therefore, only one failure is reported against a signal until the repairman has had an opportunity to clear the defect. This plan was adopted because it was often necessary for several trains to pass a defective signal before a repairman could get to it to clear the trouble. This resulted in numerous recorded failures which were not a correct measure of the efficiency of the signals. In other words, poor maintenance would tend to reflect on the efficiency of a perfectly good signal mechanism when it should be charged to another cause. A typical monthly report and an explanation of the failures recorded are given on page 46.

Portland Weed Burner

By F. P. Maize
Master Mechanic Portland Railway, Light & Power Company, Portland, Ore.

The Portland Railway, Light & Power Company completed last June a gasoline weed burner which was built upon an old flat car. The burner was operated as a trailer. On the floor of the car were carried one air and five gasoline tanks. The gasoline was supplied to the burners at a pressure of 60 lb. per square inch through the medium of a National AA1 compressor. From the tanks supply pipes led to the fifty-one burners. These burners were set in two double rows in a center platform and in two wings of sheet metal which extended for a couple of feet on each side of the rails. The wings were hinged so that they could be lowered to any desired angle in conformity with that of the embankment. The center platform can also be raised to any desired height, either for inspection or clearance.

Preliminary tests were made at the speeds of 5 m.p.h. and 2 m.p.h. respectively. We found that it was practically impossible to burn off the weeds immediately as long as the stalks were green, even when the car was operating at only 2 m.p.h. We found it better to go over the ground first merely to singe the stalks. This singeing caused them to dry up and die within three or four days, according to temperature conditions, after which they burned up at once, even when the car was run over them at 5 m.p.h.

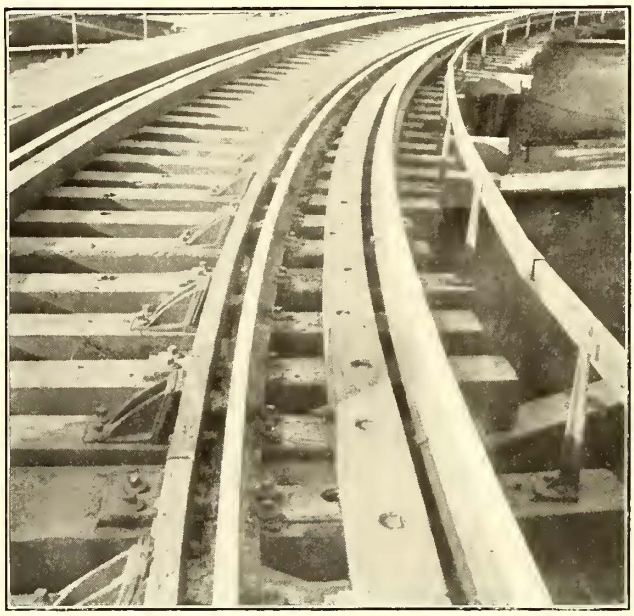
Engineers from England have been for some time in Sao Paulo studying the possible electrification of the Santos branch of the Sao Paulo Railway. Nothing has been decided, however, as yet. The abundance of waterfalls along the route would seem to assure the ultimate adoption of this power for the line.

Titanium-Treated Rails in Boston

The Boston Elevated Railway has been using ferro-titanium rails on its rapid transit and subway lines since 1911. The standard running rail for the rapid transit service at Boston is the 85-lb. A. S. C. E. section, with the following chemical composition specified: carbon, 0.80 to 0.95 per cent; manganese, 0.65 to 0.90 per cent; silicon, 0.10 to 0.20 per cent; phosphorus, not more than 0.04 per cent. To this composition is added 0.1 per cent metallic titanium.

Previous to making use of the titanium element, the Boston Elevated Railway considered it advisable to require a 20 per cent discard in order to insure sound rails for its service. Since making use of the titanium element, the company has accepted the standard discard of 9 per cent.

Rails are furnished in 33-ft. lengths, and the drop test required is a fall of 15 ft. by a 2000-lb. tup on a test rail not more than 6 ft. long, placed head upward on supports 3 ft. apart. About 4101 tons of ferro-titanium rail have been purchased for the rapid transit lines in the past four years.



CURVE ON RAPID TRANSIT LINE, BOSTON ELEVATED RAILWAY, AT HAVERHILL AND CAUSEWAY STREETS

Ferro-titanium rails are used on both tangent and curved track on the rapid transit system but not for guard or contact rails. Since the opening of the elevated service at Boston, in 1901, special study has been given to rail wear on account of the severity of service. Manganese steel rails are still in service on certain curves where the life of ordinary commercial rail was formerly less than two months. Manganese steel is also used for frogs, crossings and other special work, and both cast and rolled manganese steel rails are used in main line special work.

The comparative first cost of 85-lb. A. S. C. E. rails per foot as lately purchased by the company is:

Open-hearth untreated, 45.2 cents.

Open-hearth ferro-titanium, 43 cents.

Frictionless ferro-titanium rail (to match the 85-lb. A. S. C. E. rail), 43.3 cents.

Manganese rail, $6.82.

With the exception of a rolling of open-hearth steel rail received in 1908, open-hearth steel rails treated with ferro-titanium wear much longer than untreated open-hearth rails when subjected to the same traffic.

The specifications for open-hearth rail untreated call for a carbon element of from 0.75 to 0.85, but the specifications calling for open-hearth rail requiring an addition of 0.1 per cent metallic titanium for treatment, call for a carbon element of from 0.80 to 0.95, but not under 0.80.

In the accompanying view showing the curve on the rapid transit lines at Haverhill and Causeway Streets entering the North Station, south-bound track, a rail on the outside of the curve shows a wear vertically of 0.039 ft. after 281 days of service. The area worn off the head of the rail was 1.096 sq. in., and the traffic passing over it in the time named was 17,052,294 tons, giving a wear of 0.0643 sq. in. per million tons of traffic. The analysis of this rail was: carbon, 0.829; manganese, 0.786; silicon, 0.125; phosphorus, 0.030; sulphur, 0.030. The rail was treated with 0.1 per cent ferro-titanium.

The rail on the inside of this curve is a Frictionless rail (companion to the 85-lb. A. S. C. E. rail), of the open-hearth steel with ferro-titanium, and has a composition as follows: carbon, 0.950; manganese, 0.76; silicon, 0.080; phosphorus, 0.019; sulphur, 0.034. The vertical wear after 442 days was 0.051 ft. The square inches worn off the head of the rail section amounted to 0.9786. As the traffic during the time named was 36,777,638 tons, the square inches worn off per million tons were 0.0266.

In 1912 the company purchased 128 tons of ferro-titanium open-hearth rail for surface track use, consisting of 9-in. and 7-in. girder and girder guard rail.

This year the company purchased another lot of 179 tons of 7-in. and 9-in. girder and girder guard rail, of open-hearth steel, with 0.1 per cent metallic titanium added for the use on curves only. The girder rails are from 40 ft. to 60 ft. in length. The chemical requirements are as follows: carbon, 0.60 to 0.75; phosphorus, not over 0.04; silicon, not over 0.20; manganese, 0.60 to 0.90, treated with 0.1 per cent metallic titanium. These are practically the specifications of the A. E. R. E. A.

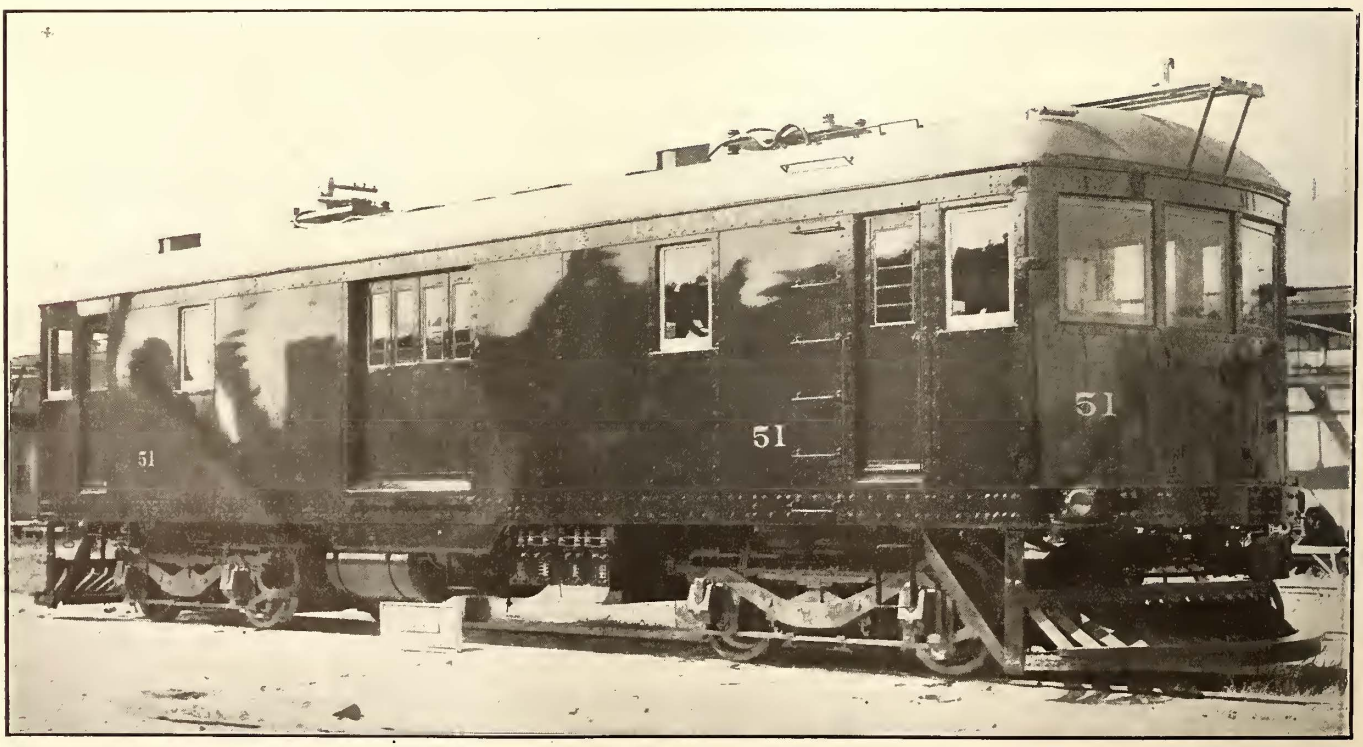
Ferro-titanium girder rail costs about $2 more per ton than untreated open-hearth rail. With this rail the company has always used specifications calling for a 9 per cent discard.

A 600-1200-Volt Steel Freight Locomotive

All-steel construction and 600-1200-volt electrical equipment are the interesting features of the new electric freight locomotive recently purchased by the Iowa Railway & Light Company, Cedar Rapids, Iowa. The locomotive is 50 ft. in over-all length and, equipped ready for service, weighs 57 tons. The underframe was built with 10-in. 40-lb. I-beam center and intermediate sills, and 10-in. 30-lb. channel side sills and bumpers. The cross-sills are 7-in., 14¾-lb. channels riveted to the tops of the longitudinal sills with the flanges up. The end sills are also 10-in. 30-lb. channels framed between the longitudinal sills with 6-in. x 6-in. x ⅝-in. angle connections. A ½-in. x 72-in. anti-telescoping plate and a 3/16-in. x 30-in. bumper corner plate are riveted to the top flanges of the bumpers and the longitudinal sills at each end of the car.

The body framing provides for two 6-ft. sliding doors on each side of the center and two 24-in. motormen's swinging doors at each end of the car. Four small drop sashes on each side of the car and sashes in the upper halves of the two sliding doors were provided to furnish natural illumination to the car interior where most of the auxiliary equipment is installed. At the center-door openings the side sills are reinforced by 10-in. 15-lb. channels riveted flange to flange and extending from intermediate tie to intermediate tie. The side posts are formed of 3-in. 5½-lb. I-beams which are continuous from side sill to side sill. This frame is inclosed with 3/16-in. rerolled steel plates with lap joints over the posts and securely riveted in place. The intermediate carlines are ½-in. x 1¼-in. bars extending between the side plates, which are formed of 3-in. x 3-in. x ⅜-in. angles fitted between the I-beam posts. The letterboard is continuous around the car and formed of ¼-in. x 9-in. sheet steel.

This all-steel car body is mounted on St. Louis Car Company's type 64 trucks, and it is equipped with a motorman's alarm gong, a St. Louis Car Company's vertical wheel brake, Tomlinson radial couplers, St. Louis steel pilots, pneumatic sanders and Peerless ventilators.

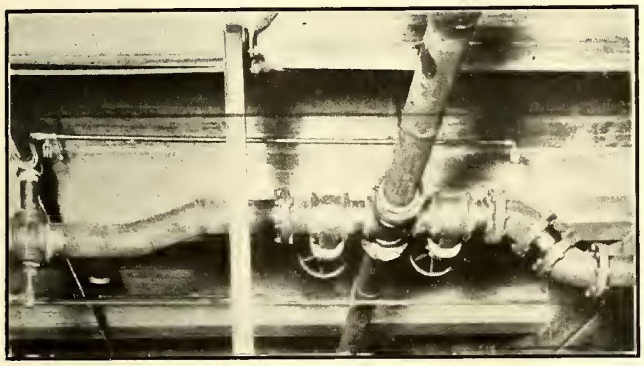


STEEL FREIGHT LOCOMOTIVE, IOWA RAILWAY & LIGHT COMPANY

The electrical equipment includes four General Electric type 207, 600-1200-volt motors rated at 145-hp. each. These are forced ventilated motors installed in connection with General Electric Type M control. Both the control equipment and the dynamotor air compressor are installed inside the car body. For the present the electrical equipment will be operated only at 600 volts, but all provisions have been made for the combined 600-1200-volt operation. The design of the control equipment permits operation on 600-volt energy with the motors in series, in series multiple and in multiple. On 1200 volts the control is arranged to operate the motors in series and in series parallel. This locomotive was built and equipped ready for service at the plant of the St. Louis Car Company, St. Louis, Mo.

Oxy-Acetylene Welds Replace Flanged Pipe Connections

Uses for oxy-acetylene welding are found almost daily, but a recent application in the sprinkler-pipe system of The Prest-O-Lite Company, Inc., Indianapolis, Ind., illustrates very forcibly that the field of usefulness is just beginning to be developed. In the accompanying illustration a welded connection is contrasted with the cumbersome flanged connections in the same pipe line.



VIEW OF WELDED AND FLANGED PIPE CONNECTIONS CONTRASTED

Two branches from a 6-in. water main in the sprinkler system became necessary in this company's plant. The main pipe was supported so close to the ceiling that offsets in the branches were required to clear the supporting concrete beams. Under ordinary conditions screwed fittings would have been used, but a drop of 7½ in. made the use of standard fittings with 6-in. pipe impossible. This connection was finally made by using regular 45-deg. flanged elbows and nipples, giving the pipe a 12-in. drop. The cost of the offset made in this manner, including materials and labor, was $17.50. Had it been possible to make the offset with standard screwed fittings the job would have cost $5.66.

The branch on the opposite side of the main, however, presented an altogether different problem. A downward offset of exactly 5¼ in. was necessary to clear pipes above and below the proposed new line. Neither flanged nor screwed standard fittings could be used, and an estimate was obtained on the cost of bending the pipe for the required offset. It was found that this would cost $18.60, including labor and material, and would entail considerable delay. As a last resort oxy-acetylene welding was employed, and three short sections of pipe, cut to the correct angles, were welded together to give the desired offset. This was done at a total cost of $3.40, which represents considerable saving as compared with the $17.50 flanged job and the $18.50 estimated for the bent pipe.

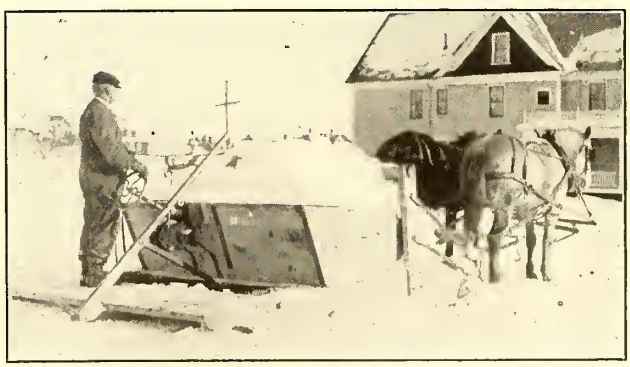
SNOW REMOVERS IN LEWISTON, ME.

Doing Away with Hand Shoveling in Snow Removal

The Lisbon Falls Manufacturing Company, Boston, Mass., has lately been developing an equipment for the removal of snow from the street which supersedes the hand shovel and dump cart method, with consequent savings in time and cost of labor. The equipment consists of a sled carrying a wrought-iron scraper which can be raised and lowered from the driver's position, a snow container and a movable bottom which can be opened and closed by a lever, shown in the accompanying illustration. The device is designed to be drawn by one, two or four horses, the latter two rigs being most serviceable. Depending upon the density of the snow, the capacity of the body varies from 1 cu. yd. with the single-horse outfit to 1.5 cu. yd., with two horses, and from 2 cu. yd. to 2.5 cu. yd. for the four-horse apparatus.

The over-all length and width of the four-horse outfit are 8 ft. x 7 ft. Oak is used in the wearing parts of the frame, the remainder being of white pine. The bottom of the snow container is lined with zinc. In the latest type of equipment the scraper is raised by hand wheel and worm, provision being made for locking the scraper in position at any point within its upward travel. The runners are inclined outward from the top on the inside at an angle of about 30 deg., to facilitate dumping snow, which can be done without stopping the rig. Two horses are usually sufficient to haul the snow remover any distance to a dumping place, but a pair of "snatch horses" are used to help draw the device along while it is being filled with heavy snow. The four-horse outfit is particularly adapted to service in larger cities, where longer hauls of snow are required. The runners are of metal and the body is of 1¼-in. plank, the boards on the bottom of the snow receptacle being 1 in. thick. The scraper has a wooden core, and is kept from dropping too far by a fixed chain attached to the cross-bar of the equipment.

The manufacturers state that one man with one two-

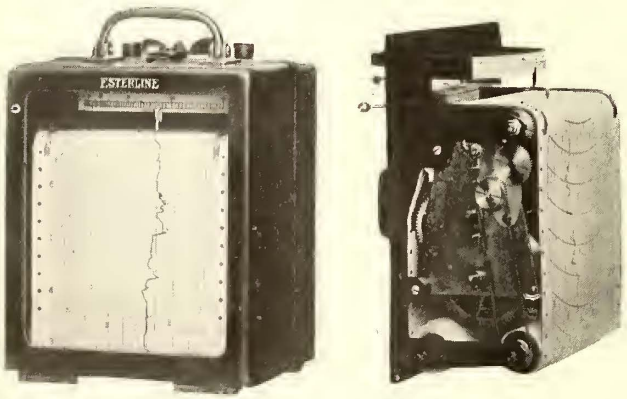


REAR VIEW OF SNOW REMOVER SHOWING MEANS FOR CONTROL

horse snow remover is equal to fifty shovelers and five two-horse dump carts. The snow is loaded and dumped by the driver as the horses walk; it leaves streets and gutters clear; requires no experienced operators, and is limited only by the endurance of the horses in its daily capacity. Recent sales include two equipments for the Rhode Island Company, Providence, R. I.; two to the Hudson Valley Railway, Glens Falls, N. Y., and seven to the Boston (Mass.) Elevated Railway. Other users are the Bay State Street Railway which has from ten to fifteen equipments located at Lowell, Lynn, Taunton, Brockton and Quincy, Mass., and the New York State Railways with four. The Lewiston, Augusta & Waterville Street Railway, of Lewiston, Me., has used fourteen outfits since their initial development about three years ago, and not a shovel or shoveler is required on the job. The Cumberland County Power & Light Company of Portland, Me., finds that with a two-horse machine snow can be piled 5 ft. or 6 ft. high in dumping, by having one rig follow another. The apparatus is known as the "Economy" snow remover by its makers, and was designed by Harry B. Ivers of Boston, Mass., until recently general manager of the Portland and Lewiston systems.

New Type of Graphic Meter

The Esterline Company, Indianapolis, Ind., has brought out a new type of graphic recording instrument known as the G. H. meter. It includes voltmeters and ammeters of either switchboard or portable type, weighing only 9½ lb. but designed for heavy service. The cases are of cast aluminum, and the front half is removable as in all other Esterline instruments, a brass handle being provided on the portable meters, and mounting studs on the switchboard types.



LIGHT-WEIGHT GRAPHIC METER FOR HEAVY SERVICE

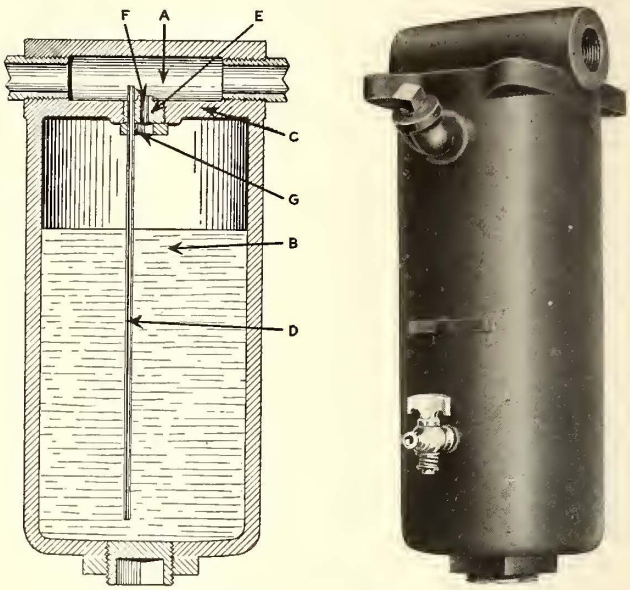
The charts are 26 ft. in length and are driven at a speed of either ¾ in. or 1½ in. per hour by an eight-day lever clock. A reroll is also provided for the used chart. A clear, open scale is obtained, this being 4½ in. in width and printed on perforated paper 6 in. wide. An indicating scale is also provided, enabling readings to be taken without opening the front.

The movements in the instruments are of the moving iron vane type, the armature being mounted in jewel bearings. The ink is contained in a large, stationary ink well, and a patented inking device enables a continuous record to be obtained with an all-metal pen, and with minimum friction. The clock movement, scale plate and all parts are mounted on a center casting, thus insuring true alignment and making all parts interchangeable and easily accessible for inspection or replacement. Although the price is remarkably low, accuracy and reliability have been maintained, and it is expected that these instruments will be used widely for checking voltage, current of street lighting circuits, etc.

Rectifier Prevents Frozen Air Brakes

Frozen air-brake systems are a rather serious difficulty encountered during low temperatures, and to obviate this trouble the air rectifier manufactured by the National Safety Device & Manufacturing Company, Chicago, Ill., has just been put on the market.

During the severe winter of 1914 and 1915 this device was thoroughly tested in service and gave entirely satisfactory results. It not only prevented the freezing of air but, in addition, softened the accumulated grease, gum and oil within the pipe system, which



RECTIFIER TO PREVENT FROZEN AIR BRAKES

was very beneficial to the working of the valves. The apparatus consists of a malleable-iron container 4½ in. in diameter and 12½ in. high, which weighs 19 lb., and is attached to the air-brake pipe system leading from the air-storage tanks to the engineer's valve. Freezing is prevented by the frequent automatic mixing of very small amounts of alcohol or other satisfactory mediums with the moisture in the air-pipe system, which in addition to raising the temperature lowers the freezing point, thereby preventing the formation of frost particles. As is generally known, condensed vapor frequently becomes frozen in an air-pipe system, in which case the brakes are rendered inoperative until the obstruction is removed. The inclusion of this device in the brake-pipe system does not interfere with or obstruct the air passages in any way.

In connection with tests, it was found that the following alcohol and water mixture gave the indicated freezing points:

Water, Per Cent	Alcohol, Per Cent	Freezing Point, Deg. Fahr.
100	..	32
80	20	10
70	30	— 5
60	40	—20
50	50	—35

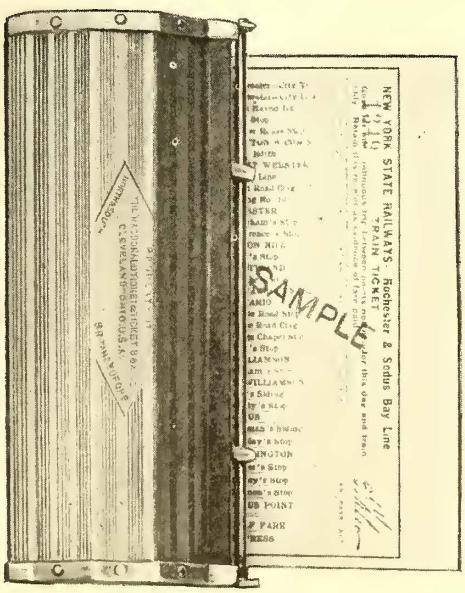
About three pints of either pure grain alcohol, or better, denatured alcohol which is just as satisfactory and much cheaper, may be placed in the container at one time. Based upon the tests made, this quantity is sufficient to last for from several weeks to three months. The principle of its operation in the air-pipe line is that of an ordinary atomizer. When the pressure in the air-brake pipe line is reduced by the operation of the engineer's valve, from 80 lb. to 70 lb., the air pressure in the container is also reduced, and this forces some of the alcohol into the air-brake pipe system.

The device consists of a malleable-iron casting with two compartments indicated on the accompanying cross-section as *A* and *B*. Communication between the two is through a hard brass tube, *D*, which is securely attached to the brass bushing *E*. This tube extends from a point about ¼ in. above the lower wall of the air-pipe line casting to within about ½ in. of the bottom of the container. In the center of the brass bushing *E* is an equalizing vent, *F*, which extends about ⅛ in. above the face of the bushing. That portion of the rectifier forming compartment *A* has two straightaway drilled and tapped outlets for ¾-in. pipe. If the air pipe on cars is smaller than this a bushing may be used satisfactorily, and if a larger size is desired these taps are increased as specified.

The rectifier may be substituted advantageously for an additional air reservoir installed to obviate the difficulty of frozen air-brake systems. It requires less space beneath the car body, is just as easy to install and costs but little, if any, more than the air storage tank and fittings. Primarily the device was designed for use during the winter months, but the manufacturers state that it may remain on the car during summer without affecting brake operation in the slightest degree. On the other hand, if the container is supplied with alcohol during the warm months it will improve braking service by keeping the grease, oil and gum cut, thus giving a freer valve operation.

Cash Receipt Holder

Under the ordinary duplex system of fare receipts for cash fares paid on interurban railways, the conductor punches the initial station and destination with the month, day, etc. One portion of this duplex receipt is given to the passenger and the other portion is returned to the auditing department. The time required

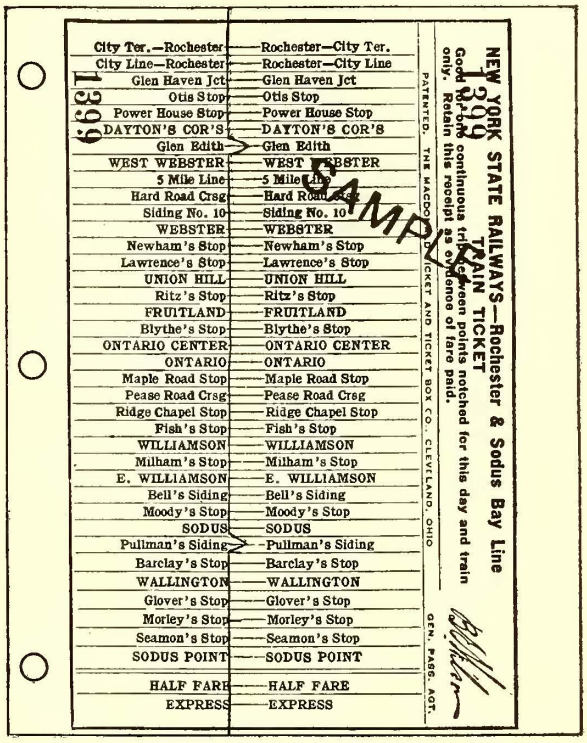


TICKET HOLDER AND PAD

to indicate these data is considerable, and the plan has not been found satisfactory in other ways, notably because the passenger's portion can be indicated separately from that of the audit stub.

A quick method of issuing train fares in which these difficulties are avoided is embodied in a device recently put on the market by the Macdonald Ticket & Ticket Box Company of Cleveland, Ohio. This is a holder made to contain a pad of 100 receipts, assembled in flat form as distinguished from the bevelled type previously used and equipped with a register locking device which records each time the holder is opened. The method of cutting the ticket from the stub used in this device eliminates the possibility of different amounts being indicated upon the ticket and on the audit stub. It has also been found that conductors can issue these tickets in one-third and one-half the time required with the old form of duplex ticket.

In practice, one or two holders are given to each conductor with the register locking device open and the reading of the register is recorded upon the cardboard



PASSENGER'S STUB AND AUDIT STUB SHOWING CUTTING LINE

back of the pad. This enables the conductor to insert a pad of tickets at any time without increasing the register reading and eliminates the necessity of loading and unloading of holders at one central office. The holder is provided with a number of index cutters, and before each receipt is issued the conductor sets the cutter opposite the station required and tears off the receipt which is given to the passenger. The other half of this receipt is thrown into the holder by the conductor by pressing both sides of the holder together. The stub thus remains inside the holder, secure from any form of manipulation, until it is removed by the auditing department.

The holder is made of aluminum, and while it is extremely light it is very strong and durable. Owing to its extreme lightness it can be made to cover a large number of stations by increasing its length without any perceptible increase of weight.

At a recent meeting of the standing committee of the Administrative Council of the Swiss State Railways, at which estimates for construction and operation in 1916 were discussed, the sum of $583,200 was included in the estimate as a projected expenditure for the introduction of electric traction on the Erstfeld-Bellinzona line. The program provides for the appropriation of still larger sums for electrical construction in future years, so that the completion of the entire length is expected to be made by 1920.

LONDON LETTER

Dearth of Men to Operate Tramways Presents Very Serious Problem—Some Women, Efficient as Conductors, Being Trained to Replace Motormen

(*From Our Regular Correspondent*)

In Glasgow the question of operating cars is daily becoming more serious, and it is the opinion of James Dalrymple, the general manager of the tramways, that it will be necessary to have women drive some of the cars. This is a field of operation in which women have not yet performed in Great Britain. The Board of Trade has requested information from the Glasgow Corporation on the subject. More than two months ago Mr. Dalrymple reported to the tramways committee that so many men were joining the colors that in a short time there would not be a sufficient number of motormen to maintain service. For several weeks now a few women have been at this work to enable the general manager to report when the subject comes up before the committee. The women who are now operating cars have been acting as conductors since the spring. More than a month ago they were sent to the Glasgow training school for motormen along with the men. They proved apt pupils. For a week or two before they were assigned permanently they drove a car in service with an experienced motorman at hand. The latest statistics from Glasgow as to the staff show that 2600 men have already joined the colors and that 677 more have been accepted for service under Lord Derby's scheme, so that within a very short time Glasgow will be confronted with the problem of employing women as drivers or reducing the number of cars in service, as it is impossible to get capable men. In summing up the situation, Mr. Dalrymple states emphatically that at least 100 women out of the present staff of 1000 could in a very few weeks qualify to operate cars.

The officers and employees of the London County Council who are serving with the forces approximate 7000 in number, and about 620 of the central administrative staff have in addition been enlisted or attested under Lord Derby's scheme. The officers of military age regarded as indispensable are under seventy in number. It is reported by the general purposes committee, however, that the number of men on the operative staff who may be regarded as indispensable in connection with the various services will be much larger than on the administrative staff of the Council tramway.

The present services of all-night tramcars of the London County Council involve a loss of about £1,000 a year. The total number of all-night cars in service is sixteen, which is five fewer than the number before the outbreak of war. The reduction in mileage amounts to 105 car miles a night. The number of passengers carried is approximately 2000 a night, and the revenue from these cars during October, 1915, was only 5.69d. a car mile. Hitherto workmen's fares have been charged on these cars, and it is proposed by the highways committee that, as an experiment during the present abnormal state of affairs, ordinary fares should be charged from Jan. 1.

The woman tramway conductor has made her appearance in Central London. During the past few weeks women have been at work on the London County Council single-deck tramway cars running from Highbury to the Victoria Embankment. So far only a few women have been employed. They serve on the subway cars alone. Within a short time, however, a considerable addition will be made to the number in this service. Women will be employed on the double-deck cars on the Woolwich and Eltham and other outlying services. ' Between thirty and forty women have been trained as conductors by the London County Council tramways department. Most of them are working at the Clapham and the Holloway depots. For the present women will not be used on the cars in the crowded main-line services.

In connection with the London Electric Railway facilities bill, which was passed in an amended form limiting the proposal to the pooling of the receipts of the City & South London, the Central London, London Electric, and Metropolitan District Railways and the London General Omnibus Company, representations were made by the London County Council to the Board of Trade that the companies should be required to keep a form of accounts which would show the transactions with the common fund, and thus enable the Council to ascertain the financial effect of the pooling arrangements in regard to any particular company. The Board of Trade, however, has declined. It points out that a statement of the receipts of the separate companies before they were paid into the common fund would serve no useful purpose.

The tramcars running between Colwyn Bay and Llandudno are of the single-deck type. It is the intention of the company to augment the service by putting on a number of double-deck cars, and the Board of Trade has intimated that it sees no objection to the proposal. The Council of Colwyn Bay, however, is opposed to the change. It points to the steep Penrhyn Hill between the two towns and contends that such cars would not be in keeping with the character of the district.

The Stockport tramways committee has decided to employ women conductors on its trams. Since the war began 105 drivers and conductors employed by the committee have enlisted. Women between twenty-five and thirty-five years of age are to be employed. They will be paid at the same rate as the men.

The tramway committee of the Edinburgh Town Council is considering a report by the burgh engineer on the subject of tramway breakdowns in the city. It has been agreed to send a representation to the tramway company in connection with the matter, pointing out the inconvenience caused by the breakdowns. The committee is inclined to the opinion that the delays are attributable to the state of the track, but the company asserts that the majority of the breakdowns are due to the employment of so many inexperienced drivers on account of the demands made by the war.

The references made in this letter to the dearth of men on account of the war show that the shortage of male employees is making itself seriously felt in Great Britain. Local papers contain many complaints about service and suggestions as to the achievement of better results. In Birmingham the irregularity of running has given rise to an appeal for volunteers to become motormen to take the places of those who have left for military service. Many applications have been received, and upward of a hundred men have been interviewed. Some of these men have finished their course of instruction and are driving cars under the direction of competent motormen. More than sixty women are cleaning cars successfully, while about 600 women have been engaged as conductors and are performing their duties admirably. The whole department, however, is still about 20 per cent below strength, and men continue to leave for military purposes. Irregular running is due, it is said, in most instances to new men, who drive with infinite caution. Delays are also caused by the necessity for covering thoroughly the routes on which the munition factories are situated. The city of Hull is suffering in the same way, but everything possible is being done to mitigate the inconvenience to the public. About seventy women are employed on the cars at Hull. They are giving satisfaction. Newcastle-on-Tyne, perhaps more than any other city, is suffering from war conditions. The authorities there are calling for volunteers to operate the cars, as they are extremely shorthanded and the services have had to be curtailed. One of the reasons for the complaints in Newcastle is the fact that 50,000 more workmen are now being carried each week than in previous years. These men are largely workers in the munition factories in the vicinity. Offers from volunteers have been received from many men whose occupations would not interfere with their giving a portion of their time for railway work.

In London many of the railways have cancelled suburban trains, thereby throwing an increase of traffic on other methods of transportation. The tubes are crowded with passengers. The number of motor 'buses has been reduced. The Council trams are fewer in number and are meeting with more frequent delays by breakdowns. The extreme darkness of London streets is, according to the officials, one of the most potent reasons for bunching and delaying cars at crossings. In short all the tramways of Great Britain are being worked with the greatest difficulty and with little hope of a return to their former efficiency until after the war.

A. C. S.

NEWS OF ELECTRIC RAILWAYS

NEW YORK COMMISSIONER RESIGNS

G. V. S. Williams Retires on Feb. 1—Governor Has Appointment of Two Members

George V. S. Williams has resigned as a member of the Public Service Commission of the First District of New York. The resignation was forwarded to the Governor on Dec. 28, and is to take effect on Jan. 31, 1916, at which time the term of J. Sergeant Cram expires. In a statement in regard to his resignation Mr. Williams said in part:

"For some time I have contemplated resigning from the commission and returning to the practice of the law, but, when the latest investigation was started, I felt that I could scarcely, in justice to myself, retire while under fire. Now that the investigating committee has gone into my actions and examined into my bank accounts I have decided to retire with the expiration of Commissioner Cram's term on Feb. 1.

"I hope that my successor will be spared investigations, charges, Grand Jury inquiries, and the like, and be permitted to do his work on the commission, for the public must realize that if public officials are to exercise their best judgment and full abilities, they must be free from continuous investigations. I do not mean to imply, however, that they should not be held to the fullest accountability for their public acts."

At the meeting of the Legislative investigating committee on Dec. 28 Chairman Thompson said he wanted the committee's attitude toward Commissioner Williams to go on record. The chairman made a statement in which he said:

"It was the intention of our committee to prefer charges against Commissioner Williams, but in view of the resignation, our committee will not feel called upon now to make any charges, nor to investigate further with particular reference to the commissioner.

"I believe the attitude of Mr. Williams as a Public Service Commissioner, and his personal view as to the manner of administration of the Public Service Law were wrong, and that his resignation has been a service to the State. I personally believe that his services would be of great value as an advocate in behalf of any public utility corporation."

Commissioner Williams was appointed on April 1, 1912. At the time of his nomination by Governor Dix he was counsel to the State Conservation Commission, and he was also an active member of the Brooklyn Democratic organization. Governor Whitman signed charges against Commissioner Williams, as well as against Commissioners McCall, Cram and Wood, last March, following the first investigation of the commission by the Thompson committee, of which Col. William Hayward, afterward appointed commissioner, was counsel. All four men appeared before the Governor at Albany and defended themselves. Commissioner Williams at one point coupled the Governor's name with men he called "cruel, piratical politicians" who were seeking his removal, and this so incensed the Governor that he threatened to remove Mr. Williams on the spot if he did not retract his statement. Two weeks later the Governor dismissed the charges against all four men. As a result of the retirement of Commissioner Williams on Feb. 1 and the expiration of Commissioner Cram's term on the same date, Governor Whitman will have had the appointment of four members out of the five. He has already appointed Chairman Straus and Commissioner Hayward.

SELECTING CHICAGO TRACTION COMMISSION

The subcommittee of which Henry B. Capitain is the chairman, has begun the work of selecting the three members of the Chicago traction commission who can be recommended to the local transportation committee, and later be confirmed by the Chicago City Council. Bion J. Arnold has tentatively been selected as the Chicago member of this commission, and William Barclay Parsons, New York, has been tentatively selected as the second member. The committee is considering a third member whose qualifications will make him especially fitted to round out a commission made up of the two members tentatively decided upon. The subcommittee is anxious to decide on the three members so that it can report to the local transportation committee, and obtain prompt approval by the Chicago City Council. This would permit actual investigation of Chicago transportation problems to begin early in January, 1916.

INCREASES IN WAGES IN NEW YORK

All the Principal Companies in the Greater City Raised Wages on Jan. 1

Increases in wages were announced on Dec. 24 by the Interborough Rapid Transit Company, New York Railways, Third Avenue Railway and the Brooklyn Rapid Transit Company. The increase of the Interborough Rapid Transit Company to the men in the station and transportation departments and the chief engineer's department is largely a horizontal one of 10 cents an hour, but in several cases is as much as 25 cents. Conductors are now paid as follows: first and second years, $2.35 a day; third year, $2.45 a day; fourth year, $2.55 a day; fifth year, $2.60 a day. The new rates are as follows: first and second years, $2.45 a day; third year, $2.55; fourth year, $2.65; fifth year, $2.70. Guards, who are now paid $2 a day for the first and second years, $2.10 for the third year, $2.20 for the fourth year and $2.30 for the fifth year, will receive $2.10 for the first and second years, $2.20 for the third year, $2.30 for the fourth year and $2.35 for the fifth year. Motormen have been paid $3 a day for the first year, $3.50 a day for the second, third, fourth and fifth years and $3.75 after the fifth year. They will be paid $3.25 the first year, $3.50 the second and third years, $3.60 the fourth year, $3.70 the fifth year, $3.80 after five years and $4 after eight years.

The present rate of pay per hour of the conductors on the electric lines of the New York Railways is as follows: first year, 24 cents; second year, 25 cents; third and fourth years, 26 cents; fifth year and thereafter, 27 cents an hour. This scale is to be increased 1 cent an hour for each period mentioned. The present pay for motormen of electric lines is 25 cents the first year, 26 cents the second year, 27 cents the third and fourth years and 28.5 cents the fifth year and thereafter. This scale is to be increased 1 cent an hour for each period mentioned. Conductors on storage battery lines now receive 22.5 cents an hour the first year and thereafter. In the future they will receive 23.5 cents the first year and 24 cents thereafter. Motormen on storage battery lines now receive 25 cents the first year and thereafter. Under the new scale they will receive 25 cents the first year and 26 cents thereafter.

The Brooklyn increase of wages is effective on Jan. 1. The increase applies to all motormen and conductors on the surface lines, all conductors and guards on the elevated and subway lines, all motormen on the elevated and subway lines who have been in service ten years or more, and miscellaneous transportation employees. The rate for surface motormen and conductors is increased uniformly 1 cent an hour, the new rates ranging from 25 cents to 29 cents an hour, depending upon efficiency and the period of service. The elevated motormen in service over ten years are advanced from $3.75 a day of ten hours to $4. The increase granted to elevated conductors and guards is by way of liberal time allowance, the compensation paid being for a minimum number of hours whether the employee is on duty for the full minimum time or not. In announcing the action of the company, T. S. Williams, president, called attention to the fact that this is the third general increase in wages during the last three and a half years.

On Dec. 29 the Second Avenue Railroad, which operates 25 miles of line in Manhattan, announced an increase of 1 cent an hour in the wages of motormen, conductors, switchmen and others. More than 400 men are affected.

ENTRANCE OF INTERURBAN RAILWAYS TO CINCINNATI DISCUSSED

In an interview with City Engineer Frank Krug of Cincinnati, Ohio, on Dec. 21. Charles L. Henry, president and general manager of the Indianapolis & Cincinnati Traction Company, stated that work on the extension to Cincinnati would be begun in the spring, if definite arrangements are made for the admission of the cars to the business section of the city. He suggested that a viaduct 3000 ft. long crossing the Cincinnati, Hamilton & Dayton Railroad and the Baltimore & Ohio Railroad at Queen City Avenue, be built to provide an entrance for his road. He advocated the city building the viaduct, as it may take advantage of condemnation laws which are not open to private corporations. He said that his company is willing to rent the viaduct and that it will advance $100,000 on its rental to make it easier for the city to take care of the construction work. It is estimated that a viaduct of the length required would cost $600,000. Mr. Henry's suggestions will be embodied in Mr. Krug's report to the Rapid Transit Commission.

Mr. Krug also conferred with Charles C. Harris of the Cincinnati, Milford & Loveland Traction Company. Mr. Harris expressed the desire of his company to have its cars enter the city by way of the belt lines. Financial conditions, however, made it difficult for the company to commit itself definitely to any proposition at the present time.

W. Kesley Schoepf, as the representative of the Ohio Electric Railway and Ohio Traction Company, informed Mr. Krug on Dec. 22 that these roads will make connections with the rapid transit belt when it is completed. Mr. Schoepf thought that the loop operating company should furnish the power. He told Mr. Krug that he had been informed that the Union Gas & Electric Company, on the completion of its plant, will be prepared to furnish the Cincinnati Traction Company with power at $40,000 a year less than it is costing now to generate it. He thought that power for the operation of the belt line could be secured from the same source. Mr. Schoepf agreed with Charles L. Henry that to carry city passengers on the interurban cars would defeat the purposes of the plan.

Mr. Krug conferred with H. E. Frost, auditor Cincinnati & Columbus Traction Company, on the same day. Mr. Frost estimated that the cost of making a connection for his road would be about $20,000. This completes Mr. Krug's interviews with representatives of the interurban roads. Each will submit estimates of the cost of making connections, and Mr. Krug will then prepare a report to be presented to the Rapid Transit Commission.

MULTIFARIOUS DUTIES

What It Means to Be Second Vice-President, Secretary, Treasurer, Auditor and Superintendent of a Company

Operators of small properties will appreciate the humor of a short article "Has Nothing on Roger," taken from the Thanksgiving number of *On the Cars*, which is published every now and then by the management of the Sioux Falls (S. D.) Traction System. The article follows:

"The newspapers are printing columns extolling Bill Harriman, son of the deceased railroad magnate, because although vice-president and director of dozens of railroads and heir to $75,000,000 he dons blue overalls and works as a section hand in the shops. He is given great credit because he eats out of a tin dinner pail and speaks to the workmen.

"Well our Roger, although he is a college man and vice-president, secretary and treasurer and superintendent and assistant to the president and general manager of the great Sioux Falls Traction System, does the same things as the wonderful Bill, also keeps the books, helps Jack Gibson run the immense shops of the system, runs on cars as motorman or conductor, greases the track if necessary, counts the nickels, but only draws one salary and inherits a goodly proportion of the abuse meted out in these latter days to street car operators, who are suckers enough to invest all the money they have and can borrow for the benefit of a community and city which sometimes seems to lay awake all night to concoct schemes to down them. However, the future has laurels in store for us all and Roger will come into his own. It is being recognized that he has all the virtues of Captain Brooks and his old dad with none of their vices and if he has to be a sort of scapegoat for the system he is young with lots of backbone and can stand it. You want to get acquainted with him. He can give aces and spades to Bill Harriman and beat him to it."

The Roger referred to is none other than R. C. Mills, whose official title is second vice-president, secretary, treasurer, auditor and superintendent of the company.

STUDY UNDER THE UNIVERSITY FOR SAN FRANCISCO MEN

Jesse W. Lilienthal, whose work in the interest of his men since he assumed the presidency of the United Railroads, San Francisco, Cal., has attracted nation-wide attention, recently made the following announcement:

"It is not the character of the job or the compensation that is paid for it, but the manner in which it is performed, that gives it dignity. In other words, a man should be judged not by the particular task that he is performing, but by the spirit, intelligence, industry and loyalty that he brings to bear upon it. At the same time, it is a laudable ambition for a man to want to advance himself; to acquire such learning and experience as will enable him to fill a position that earns larger compensation than he is getting. I, for one, am ready to encourage such an ambition. With that in view, I think it my duty to bring to your attention the plan of the University of California to extend to those who are at work some of the benefits of a broader education in a way that will not involve any interruption of the work from which they earn their livelihood.

"It is proposed to give courses of instruction in San Francisco at some place and time that will be convenient to workers by regularly accredited instructors of the university. Among the courses that might be expected to appeal particularly to employees of our company are mathematics, mechanics, electricity and languages. The subjects, however, can be selected according to the wishes of those who would care to take a course.

"For a course of fifteen lessons of one hour each the university makes a charge of $5 per person, or about 30 cents an hour. This is the only expense to the student, except the cost of text-books, which is from $1.25 to $2.25 for the entire course. It is proposed to hold meetings once a week, and, as already said, at such time and place as will be most convenient for the students. I should be willing to have the carhouses used for the purpose as far as practicable.

"The instruction would consist of lectures, demonstration experiments, and assignments of home work calculated to call for about five or six hours of such home study in each week.

"I am willing to help you arrange to do this in every way possible. If the idea should strike any of you favorably, I recommend that you arrange among yourselves for groups of fifteen, sending in to me the names of men composing such groups, the particular subject you would like to have taught, and the place and time that you would consider most convenient for you.

"I realize that many of you find your regular work so fatiguing that you would prefer to reserve all your leisure hours for recreation, but I have learned from my own experience that it is wonderful how much recreation can be derived from the stimulating influence that comes from learning new things, and perhaps some of you will prefer that kind of recreation to any other. If any of you do, I shall be happy to co-operate to have the instruction given in the most effective and convenient way possible."

BROOKLYN MECHANICAL DEPARTMENT SAFETY SHOWING

The report of the departmental safety committee of the Brooklyn (N. Y.) Rapid Transit Company mechanical department for the fifth quarter, dated Oct. 1, says that following the practice of several other departments the mechanical department finally determined that it would be to the best advantage of all concerned if membership in the Employees' Benefit Association became a definite part in the employ-

ment of all new employees of the department. Notice to this effect was issued on Aug. 6.

In the report William G. Gove, superintendent of equipment of the company and chairman of the safety committee of the mechanical department, calls attention to the offer of the company to pay half the premium upon $1,000 worth of insurance under the group plan for each employee. Mr. Gove urges the men to go in under the plan. He points out that he has been a member of the benefit association for some years past, and although he is not eligible under the plan whereby the company would pay part of his premium, he has applied for $5,000, the full amount permissible under the agreement between the railroad and the insurance company. Mr. Gove points out that under this insurance agreement the Brooklyn Rapid Transit Company has secured for its employees the option of annual renewals at the rates specified for at least twenty years and that the company is at liberty to make arrangements elsewhere if at any time during that period better rates can be obtained.

The total expenditure of the mechanical department for safety work is $9,985. Of this amount $2,172 was expended during the quarter covered by the report under review. Among the expenditures during the last quarter were $109 for the construction of boxes to transport supplies and to prevent injury from nails in kegs, etc., and $54 to purchase respirators for the use of those employed in cleaning parts of equipment with compressed air. Mr. Gove directs attention to the very creditable record as reflected in the accident tabulations of the department, which shows a total of 135 accidents at all shops. This compares with 146 for the previous quarter and 293 for the same quarter a year ago.

INJUNCTION AND DAMAGES IN WILKES-BARRE STRIKE

The Wilkes-Barre (Pa.) Railway has applied to Judge J. B. Woodward for an injunction to restrain strikers and officials of the union from interfering with the operation of cars, picketing and boycotting and has asked damages in the sum of $200,000 from the strikers and officials for loss of fares, destruction of property, etc. The company charges a breach of contract because the strikers refused to abide by the award of the board of arbitration. It is pointed out in the petition that arbitrators were named and an award filed, and it is contended that after the men had accepted payment on the award and had returned to work, a strike was called in violation of the agreement.

New Canadian Line Opened.—Operation has been begun by the Three Rivers Traction Company, a subsidiary of the Shawinigan Water & Power Company, on its 3-mile line in Three Rivers, Que.

Toledo Committee to Complete Hearings in January.—The street railway committee named by Mayor-elect Milroy of Toledo, Ohio, has arranged for four meetings in January, and these will complete the public hearings for the purpose of securing ideas from those who opposed the Dotson franchise. No meetings were held during the holidays.

Buffalo & Depew Railway in Operation.—U. L. Upson, superintendent of the Buffalo & Depew Railway, Depew, N. Y., informs the ELECTRIC RAILWAY JOURNAL that in the so-called strike on that property the platform men put their cars in the carhouse and walked away, and that he immediately secured new men, who are now operating the cars. Mr. Upson was not called upon to act as either motorman or conductor, as was previously reported.

Extension Asked Under St. Louis Ventilation Order.—The United Railways, St. Louis, Mo., made application to the Public Service Commission, on Dec. 18, for an extension of time until Oct. 1, 1916, for equipping all of its cars with forced ventilation heaters. The time accorded the company by the commission under an old order was until Oct. 15, 1915. At that time the company had equipped 1018 cars. It has since increased the number to 1075. The company has 1400 cars, and states that it is equipping them at the rate of twenty-five a month.

St. Paul Electrification in the Movies.—At the recent tests of the Chicago, Milwaukee & St. Paul Railroad's new electric locomotives operators from the *Hearst-Selig Weekly* and the *Pathé News* made several motion pictures. Exterior and interior views of the Great Falls power plant, the important substations, the last steam locomotive and the first electric locomotive over the electrified division were included in these reels, which contain between 500 and 600 ft. of film. The Hearst-Selig motion pictures are being exhibited at moving-picture theaters throughout the United States, and the Pathe pictures will be distributed throughout the world.

Work to Begin on Cleveland Subway.—Thomas Schmidt, secretary of the Cleveland Rapid Transit Railway, states that work will be begun on the proposed subway at three different points in January. An opening will be made at the Public Square, another on Euclid Avenue at East Fifty-fifth Street and a third on the same street at University Circle. Plans filed with the director of public service call for six stations on Euclid Avenue between the Public Square and University Circle. The line must be completed within thirty months after the work is started and must be in operation within forty-two months from that time.

Seattle Car Suit Decision.—The State Supreme Court of Washington, reversing the decision of Judge Frater of the King County Superior Court, has allowed a claim of $35,000 against the Seattle, Renton & Southern Railway for six cars which were sold to the railway by the Gordon & Henderson Car Company, Chicago, in 1909. Judge Frater refused to allow the claim on the ground that the contract for the cars had been entered into with the railway receivers appointed by the Federal court, who were afterward declared to have been appointed illegally. He agreed to approve the claim, however, provided it was assigned with the claims of the general creditors, instead of as a prior claim on the company's assets. This the claimants refused. In reversing the decision of Judge Frater the Supreme Court ruled that as the present State court receivers had ratified the contract the act of the Federal Court receivers in contracting for the cars was not void.

Changes in the Staff of the Society for Electrical Development.—A number of changes have been made in the staff of the Society for Electrical Development, Inc., New York, N. Y. George B. Muldaur, who had charge of the field co-operative work, has severed his connection with the society. H. W. Alexander, who is in charge of the editorial and the advertising departments, will undertake part of the work formerly done by Mr. Muldaur, assisted by G. W. Hill. The publicity work of the society has been handled by J. T. Kelly, who will remain with the society, and will, in addition to his former duties, undertake some of the work formerly handled by Mr. Alexander. W. W. Ayres and J. J. Reardon, who joined the staff for the electrical prosperity week campaign, have left the society, as has also C. Ridderhof, whose work consisted of the preparation of advertising copy, booklets, etc., and whose successor is C. H. Griffith, formerly with the McJunkin Advertising Agency in Chicago.

San Francisco Ferry Case Decided.—Judge Seawell, at San Francisco, Cal., on Dec. 17 granted the United Railroads an injunction against the operation of the "C" and "D" lines of the Municipal Railway over the outer loop at the ferry, but refused to grant the injunction sought against the same "C" and "D" lines on the outer tracks on lower Market Street from Sutter Street to the ferry. He held that the city and the United Railroads were joint tenants, with equal rights on these outer tracks, instead of the city being the servient tenant of the United Railroads, with an easement running only to the use of the tracks by the original Geary Street cars. Judge Seawell also upheld Judge Sturtevant's interpretation of the contract between the city and United Railroads for the use of electric power on the outer tracks, and for transfers, as applying only to the original Municipal Railways cars on Geary Street, and not applicable to the newer "C" and "D" lines, unless the United Railroads chose to extend its terms.

Speculating on Commission Legislation in New York.—The New York papers on Dec. 27 all contained stories about the prospects for legislation at the coming session growing out of the present inquiry into the Public Service Commissions. It is said that Chairman Thompson of the Legislative investigation committee will again introduce a measure designed to meet conditions which the investigation has brought to light. One of these will be a provision

which will tend to make it impossible for a commissioner to hold stock in a public utility corporation in the name of his wife or a relative. The commission proposed by Senator Thompson would have all powers which are lodged in state-wide commissions, but would have nothing to do with the building of new subways for New York City, his idea being to lodge the supervision of the building of new subways either in the hands of the Mayor or the Board of Estimate, preferably the latter. The salaries of the commissioners would also be cut from $15,000 to $10,000 a year.

Services Over the Late Mr. Goodrich.—Funeral services for Calvin G. Goodrich, late president of the Twin City Rapid Transit Company, were held at the family home in Minneapolis on Dec. 24, at 2.30 p. m. Burial was at Lakewood cemetery. Rev. Marion D. Shutter of the Church of the Redeemer led the impressive ceremonies. Rev. Mr. Shutter reviewed the life of Mr. Goodrich from the time he entered the employ of the company, up through the various stages which finally led to leadership of the concern. Quoting a street railway employee, he said: "Mr. Goodrich did not occupy the position of an employer, but was more our comrade. He rarely criticised an employee and was inclined to correct him by making suggestions of a better or more efficient way in which to do the work. He taught us with kind words. He was the fairest, squarest man I ever met." The pallbearers were all officers of the Twin City Rapid Transit Company. They were A. M. Robertson, third vice-president; A. W. Warnock, general passenger agent; G. L. Wilson, engineer of maintenance of way; W. J. Smith, master mechanic; E. A. Crosby, treasurer; D. J. Strouse, auditor; F. H. Scofield, engineer of power and equipment; W. Whiteford, purchasing agent; P. J. Metzdorf, park manager.

PROGRAMS OF ASSOCIATION MEETINGS

Wisconsin Electrical Association

The annual convention of the Wisconsin Electrical Association will be held at Milwaukee, Wis., on March 16 and 17. Headquarters will be at the Hotel Pfister. The Wisconsin Gas Association will meet on March 15 and be in joint session with the Wisconsin Electrical Association on March 16. The program for the meeting is now in preparation and will be announced later.

M. C. B. and M. M. Associations

The Master Car Builders Association and the American Railway Master Mechanics Association will hold their nineteen-sixteen convention at Atlantic City, N. J., on June 14 to 16, and June 19 to 21, respectively. The Railway Supply Manufacturers' Association will hold its exhibition at the same time and place, and have once more secured Young's Million Dollar Pier for the exhibition.

American Wood Preservers' Association

The twelfth annual convention of the American Wood Preservers' Association will be held at Hotel Sherman, Chicago, Ill., on Jan. 18, 19 and 20, 1916. The effect of the European war on the American timber industry will be discussed from the viewpoint of importers of creosote oil and users of this important wood preservative, as well as by representatives of American manufacturers of wood preservatives.

Northern White Cedar Association

The twentieth annual meeting of the Northern White Cedar Association will be held in the Empire room of the Hotel Radisson at Minneapolis, Minn., on Jan. 13 and 14. Among the topics to receive attention will be the matter of publicity for Northern white cedar products, in line with similar action by allied lumber interests. Plans will also take form for educating the trade to the advantages of dealing with its members, who sell only to recognized dealers, affording the greatest possible protection on purchases with a practical guarantee of quality.

Financial and Corporate

ANNUAL REPORT

San Francisco-Oakland Terminal Railways

The comparative statement of income, profit and loss of the San Francisco-Oakland Terminal Railways, Oakland, Cal., for the fiscal years ended June 30, 1914 and 1915, follows:

	1915	1914
Operating revenue	$4,341,891	$4,515,798
Operating expenses, including maintenance	$2,845,728	$2,929,920
Taxes and licenses	251,882	239,000
Operating income	$1,244,280	$1,346,877
Miscellaneous income	74,555	125,963
Total income before charging interest and depreciation of road equipment	$1,318,835	$1,472,841
Interest on bonds and notes	1,101,111	1,057,499
Balance	$217,723	$415,341

The decrease in gross earnings was principally caused by jitney bus competition during the first six months of 1915, which, it is estimated, diverted from the company at least $150,000 in revenue for this period. Had it not been for the jitneys, the operating revenues of the company would have been substantially up to those of the preceding year, the decrease being $173,907. Operating expenses were reduced $84,191, but taxes were larger by $12,881 and there also was a decrease of $51,408 in miscellaneous income, so that the total income fell off $154,005. Interest on bonds and notes increased $43,612, and the surplus for the year was $217,723, as compared with $415,341 for the preceding year, a decrease of $197,618.

The special charges against surplus during the year included $89,338 for depreciation on equipment, in accordance with the requirements of the Interstate Commerce Commission, and $96,318 reserve for advances to the Oakland Terminal Company. With $78,000 of interest charged to capital assets, the company carried $110,120 to profit and loss for the year. In previous years it had carried on its books credits for rebates on the contract for power with the United Light & Power Company, but, as it was found impossible to collect these rebates, the practice was discontinued during the last year and the credits theretofore set up were written off. If this method had been followed for the year ended June 30, 1914, operating expenses for the last fiscal year would have shown a reduction of $140,825 instead of $84,191, and the operating income would have shown a decrease of only $55,963 instead of $102,597.

The company also discontinued the policy of capitalizing interest on non-operative rights of way, as well as the policy of charging non-operative real estate properties with interest at 6 per cent. These two changes resulted in decreasing the amount of miscellaneous income. The balance sheet of the company showed an increase of $1,122,385 in property account, of which $1,010,437 was in road and equipment valuations. Most of these additions were on account of the new terminal and pier improvements, funds for which were provided in 1912. The funds on hand June 30, available for construction expenditures, amounted to $210,441, most of which consisted of the balance deposited in trust for the pier improvements. Substantially all of this has been expended since the close of the fiscal year.

It is said that progress is being made in the reorganization and the refinancing of the company and its subsidiaries, and the change in the contract for power, by which it will obtain a materially lower rate through the new contract with the Consolidated Electric Company, will result in further decreasing operating expenses. In case the proposed reorganization plan can be carried out, it is expected that the current fiscal year will show much improved earning power.

While the reorganization committee has not yet completed details of the plan, it will make the following provisions: The funded debt of the company will not be

scaled down; F. M. Smith will retain his stock equity; the $3,600,000 of Oakland Railways and Oakland Terminal notes will be extended; the new first mortgage bond issue will cover the operative properties to an amount to be later determined; the second mortgage bonds will have a prior lien on the non-operative properties to an amount to be later determined; at least six and possibly eight of the existing mortgages will be provided for in the new first motrgage bonds at par, and the remaining mortgages will receive a percentage in new first mortgage bonds and a percentage in new second mortgage bonds, these percentages to be determined later.

The six issues which will receive par for par in new first mortgage bonds aggregate $6,235,000, and the issues which will receive a percentage of both first and second mortgage bonds aggregate $7,563,000. The lowest percentages which have been considered in relation to any issue of the lower class bonds is 25 per cent in first mortgage bonds and 75 per cent in second mortgage bonds. The period for extending the Oakland Railways and the Oakland Terminal notes, both of which matured in 1912, is tentatively fixed at five years.

ST. LOUIS EARNINGS DECLINE

President McCulloch Estimates Decrease of $800,000 in Gross for 1915—General Depression and Drastic Service Regulations Said to Be the Causes

The gross earnings of the United Railways of St. Louis will be approximately $800,000 less for 1915 than for 1914, according to an official statement by President Richard McCulloch. The gross earnings of the company in 1914 were $12,450,924, and the net earnings from operations totaled $3,038,395. In commenting upon this showing President McCulloch says:

"The last year has been one of the most difficult in the history of the company. The financial depression caused by the war, resulting in the closing down of shops and factories and the curtailment of buying, forced a large number of men out of employment. When men are out of employment they do not ride; neither do their families ride. This naturally affected adversely the earnings of the company. In the face of the estimated decrease of $800,000, exactions in regard to service made by the Public Service Commission in its order early in the year, were particularly onerous. The standard of service which it set for the company was more drastic than has been required in any other American city by a regulating commission."

Circuit Judge Anderson recently affirmed the referee's report requiring that eight stockholders of the old St. Louis Transit Company, including the United Railways of St. Louis, must prorate a $45,119 judgment against the old company according to the amount of their unpaid stock subscriptions. The United Railways of St. Louis had pleaded that it was not responsible for accident claims against the old company, which it owns, but suit was brought by interests who had bought up various claims, to force the stockholders of the old company to pay for their stock in full, thereby creating funds to meet the claims. Previous reference to this case was made in the ELECTRIC RAILWAY JOURNAL of July 17.

SECURITIES FOR SAVINGS BANKS

The Massachusetts Public Service Commission has transmitted to the Bank Commissioner the following list of local street railways whose bonds are legal investments for savings banks: Boston & Revere Electric Street Railway, East Middlesex Street Railway, Fitchburg & Leominster Street Railway, Holyoke Street Railway, Springfield Street Railway, Union Street Railway (of New Bedford), West End Street Railway, Worcester Consolidated Street Railway and Boston Elevated Railway. The statutes do not require the commission to determine whether or not the provisions for maintenance and depreciation made by the companies have been adequate. The general intent, however, is that a company cannot qualify in the list unless it has annually earned and properly paid, without impairment of assets or capital stock, an amount in dividends equal to at least 5 per cent upon its outstanding capital stock in each of the five preceding years.

MICHIGAN RAILWAY LEASES LINES

Under New Arrangement Company Operates Directly About 550 Miles of Road, with 50 Miles to Be Added

The Michigan Railway, which built and has operated the third-rail 2400-volt line between Grand Rapids and Kalamazoo, Owosso and Bay City, Mich., and which also has operated the interurban road between Flint and Saginaw and Bay City, Mich., has leased the roads previously operated by the Michigan United Traction Company, extending from Kalamazoo to Jackson and Grass Lake and from Jackson to Lansing and Owosso. It has also leased and will operate the lines of the Grand Rapids, Holland & Chicago Railway, extending from Grand Rapids to Holland, Mich., and other Black Lake points, from which there is direct boat connections to Chicago and points on the west shore of Lake Michigan. Under the new arrangement, effective on Jan. 1, all of the roads will be operated as one property, under the active supervision of John F. Collins, vice-president and general manager. General office and headquarters will be maintained at Jackson. A previous statement regarding the relationship of these companies was published in the ELECTRIC RAILWAY JOURNAL of Oct. 9.

These developments will result in the company having one of the largest interurban railway properties in the United States, comprising about 550 miles of road. Its mileage will be increased to more than 600 miles when the connecting links from Owosso to Flint and Owosso to Saginaw are completed. The new plan will standardize and systematize all the lines. The company plans to do a general railway business, including fast freight and express and a high-grade passenger service. The management will continue its policy of developing the road to its largest possibilities, including the carriage of car-load freight, and physical connection and interchange of traffic with steam roads. The company is a subsidiary of the Commonwealth Power, Railway & Light Company, and is under the management of Hodenpyl, Hardy & Company, New York.

Birmingham Railway, Light & Power Company, Birmingham, Ala.—The directors of the Birmingham Railway, Light & Power Company have declared a semi-annual dividend of 3 per cent on the preferred stock, payable on Dec. 30 to holders of record on Dec. 24. This payment marks a resumption of dividends, which were suspended for both preferred and common stock in June, 1915, owing to business depression.

Cincinnati, Dayton & Toledo Traction Company, Hamilton, Ohio.—In response to the request of the Ohio Electric Railway that its lease of the Cincinnati, Dayton & Toledo Traction Company be modified, a number of bondholders of the latter company recently met in Cincinnati to discuss the matter. One of the bondholders suggested that a syndicate be formed to take over the $2,700,000 of outstanding consolidated mortgage twenty-year gold 5 per cent bonds at their market value, 70, a payment of 10 per cent of the purchase price to be made in cash and the remainder to be covered by collateral trust bonds secured by the entire present issue of bonds purchased by the syndicate. At 70 the outstanding bonds would aggregate $1,890,000. A deduction of 10 per cent of this amount, or $189,000, would leave a balance of $1,701,000 to be distributed to the bondholders in collateral trust bonds. On the new bonds the interest charge would be $85,050 instead of $135,000, which the Ohio Electric Railway is now paying. It is said that this proposal will be considered. A previous modification of the lease was made on June 23, 1913.

Cities Service Company, New York, N. Y.—By virtue of the recent financing through the sale of $5,000,000 of preferred stock and $2,500,000 of common stock to a syndicate for $5,000,000 in cash, as noted in the ELECTRIC RAILWAY JOURNAL of Nov. 20, the Cities Service Company is now in a position to liquidate all its floating obligations. When this has been accomplished, the only obligations prior to the preferred stock will be $7,000,000 of 7 per cent notes to mature in 1918, with the exception of such convertible debentures and debenture certificates as may not be converted. Under the new financing the company will have

outstanding on Jan. 1, 1916, a total of $31,168,426 of 6 per cent preferred stock, and in addition there will be outstanding $2,354,994 of 5 per cent debentures convertible into 100 per cent preferred and 25 per cent common stock, and $1,323 567 of certificates exchangeable for similar debentures. With all debentures and certificates converted there would be outstanding $34,847,751 of preferred stock. Following this is $17,218,380 of common stock, which with the conversion of all debentures and certificates will be increased to $18,138,211. According to the official circular of the company, it appears certain from the rapidly growing earnings of subsidiaries that even with the increased issues a better showing will be made in 1916 for the preferred stock, and the common stock as well, than in 1915. The debentures which the company will issue to liquidate the 9 per cent accrued dividends on its preferred stock up to Jan. 1, preparatory to resuming the cash dividends on Feb. 1, will be known as Series A 5 per cent convertible gold debentures, dated Jan. 1, 1916, and maturing on Jan. 1, 1966. They will be callable at any interest date at 102 and interest on thirty days' notice. The amount of debentures of the present series to be issued is $5,000,000, of which above the amounts to be distributed about $1,321,400 will be held in the treasury. The issue of additional debentures is made contingent upon specific rates of earnings.

Clarksville & Dunbar Cave Railway, Clarksville, Tenn.—Pursuant to a decree of foreclosure in the case of Robert Parks, trustee, against the Clarksville & Dunbar Cave Railway, the property of this company has been sold at a commissioner's sale for $3,000. E. B. Hamilton, representing the bondholders, was the only bidder. Immediately after the sale an order was issued on behalf of the bondholders that all operations of the defunct corporation should immediately be discontinued. According to information available at Clarksville, it is the intention to scrap or remove the plant unless there should be some immediate developments in the direction of purchase for continued operation by other interests. The railway is said never to have been profitable to the owners. The appointment of a receiver for the property was noted in the ELECTRIC RAILWAY JOURNAL of Dec. 4.

Cleveland, Youngstown & Eastern Railway, Cleveland, Ohio.—The Chagrin Falls & Eastern Railway division of the Cleveland, Youngstown & Eastern Railway was sold at foreclosure in 1915 by order of the court, and all the rails, trolley wires, etc., were sold for salvage. The remaining division, from Cleveland to Chagrin Falls, is now operated as the Cleveland & Chagrin Falls Railway.

Connecticut Company, New Haven, Conn.—Leonard M. Daggett has been appointed as one of the trustees of the Connecticut Company to succeed the late W. W. Hyde.

Dominion Power & Transmission Company, Ltd., Hamilton, Ont.—On Dec. 15 the last payment of one-half of 1 per cent, making a total of 10 per cent, was made on the $5,100,000 of limited preference stock of the Dominion Power & Transmission Company, Ltd., thereby making this common stock.

Empire United Railways, Inc., Syracuse, N. Y.—Statements have recently appeared in the Syracuse local papers to the effect that the Loasby bondholders' protective committee will oppose the retention of C. D. Beebe as head of the company. This report is in accord with the announcement of the committee noted in the ELECTRIC RAILWAY JOURNAL of Dec. 25, in which it was said that the committee was not inclined to favor any plan of reorganization contemplating a continuance of the present "management." It is understood that these reports concern merely the financial management, and no change in the physical or operating management is intended.

Glendale & Montrose Railway, Los Angeles, Cal.—The California Railroad Commission has issued an order setting a valuation upon the operative property of the Glendale & Montrose Railway. The production cost, less depreciation, is fixed at $189,408.

International Railway, Buffalo, N. Y.—The ten Buffalo & Niagara Falls Electric Railway second mortgage sinking fund bonds of July 1, 1896, amounting to $10 000, have been called for payment on Jan. 1 at 105 and interest at the Bankers Trust Company, New York.

International Traction Company, Buffalo, N. Y.—The initial dividend of seven-eighths of 1 per cent has been declared on the new $5,000,000 of 7 per cent cumulative preferred stock of the International Traction Company together with a dividend of one-half of 1 per cent on the old 4 per cent preferred stock, both payable on Jan. 15 to holders of record on Jan. 3.

Lancaster & York Furnace Street Railway, Millersville, Pa.—The Lancaster County Court, it is reported, has been asked to appoint a receiver for the Lancaster & York Furnace Street Railway. As noted in the ELECTRIC RAILWAY JOURNAL of July 24, the company defaulted the July 1 interest payment on its $150,000 of first mortgage 5 per cent twenty-year gold bonds of 1908.

Lehigh Valley Transit Company, Allentown, Pa.—For the year ended Nov. 30 the Lehigh Valley Transit Company reports the largest earnings in its history. Gross revenues from operation increased from $1,869,006 to $2,056,875, an amount of $187,869 over the previous year, and the net revenue increased from $816,313 to $926,040, or $109,727. The net income of the company increased $115,266, or more than 37 per cent. This is equal to the full 5 per cent on the preferred stock and nearly 3 per cent on the common. It is said that the net income as given in the above preliminary figures is substantially the same as will be shown in the final report. The company closed its year with no floating debt and with more cash and liquid assets than ever before.

Lima-Honeoye Light & Railroad Company, Avon, N. Y.—The property of the Lima-Honeoye Light & Railroad Company is to be sold at foreclosure in Rochester, N. Y., on Jan. 31. The appointment of the receiver, C. F. Bown, 19 Elwood Building, Rochester, was noted in the ELECTRIC RAILWAY JOURNAL of Dec. 4.

Little Rock Railway & Electric Company, Little Rock, Ark.—The directors of the Little Rock Railway & Electric Company have declared semi-annual dividends of 1 per cent on the $2,000,000 of common stock and 3 per cent on the $750,000 of preferred stock, payable on Jan. 1, the stocks being ex-dividend on Dec. 18. The previous semi-annual payments on the common stock have been at the rate of 5 per cent each.

Memphis (Tenn.) Street Railway.—The Memphis Street Railway announced that it would pay at maturity on Jan. 1 $906,000 of Citizens' Street Railway first mortgage bonds of 1887 out of part of the proceeds from the recent sale of two issues of gold notes.

New York (N. Y.) Railways.—In order to bring to an end the litigation arising out of the New York City Railway and the Metropolitan Street Railway receiverships the New York Railways has acquired the claims of the principal general creditors against the New York City Railway upon the basis of 45 per cent of the face amount of the claims. The company now offers to acquire the claims of all creditors which have not been acquired under the plan of reorganization of the Metropolitan company upon the basis of 50 per cent of the face amount allowed by the special master. Payment will be made on Jan. 15, provided the offer be accepted before that date, and approved assignments and releases be executed. The Guaranty Trust Company is asking for the deposit of assignments. Judge Lacombe in the United States Court recently took a step toward winding up the litigation over the old Metropolitan Street Railway in rendering an opinion in which he denied a motion to permit M. G. Palliser to intervene. Mr. Palliser in November, 1907, was appointed one of three receivers in the State Supreme Court, the others being Messrs. Dougherty and Fuller. They never succeeded in getting possession of the properties, which were administered by federal receivers. Messrs. Dougherty and Fuller recently resigned, and the judge found no reason to permit Mr. Palliser's intervention in the federal litigation after a lapse of eight years.

Northern Ohio Traction & Light Company, Akron, Ohio.—It is reported that B. Mahler, who for many years has been connected with the Northern Ohio Traction & Light Company, has sold his holdings in that corporation and resigned from the board of directors, in order to be able to devote more time to large real estate holdings.

Oakland, Antioch & Eastern Railway, Oakland, Cal.—The California Railroad Commission has issued an order authorizing the Oakland, Antioch & Eastern Railway to issue notes to certain stockholders who have advanced $90,911 to the company, and secure the same by pledge of bonds on a basis of 80 per cent face value of notes to 100 per cent face value of bonds.

Oklahoma Union Traction Company, Tulsa, Okla.—The foreclosure sale of this company previously noted in these columns covered only the 5 miles of city track, which section was taken over by the newly organized Tulsa Traction Company, as stated in the issue of Sept. 18. It is said that the 15-mile interurban line under construction is still in the hands of the Oklahoma Union Traction Company.

Omaha & Lincoln Railway & Light Company, Ralston, Neb.—The Nebraska State Railway Commission recently authorized the Omaha & Lincoln Railway & Light Company to issue $158,000 of additional securities, divided as follows: $125,000 of bonds, $22,000 of preferred stock and $11,000 of common stock. The original application asked for $175,000 but was later scaled to $160,000. The issues cover improvements and indebtedness.

Pacific Electric Railway, Los Angeles, Cal.—The Pacific Electric Railway has been granted authority by the California Railroad Commission to issue $1,402,278 of refunding fifty-year bonds and an extension of time until July 1, 1916, to issue $1,734,721 of bonds. The first amount is a portion of the $2,942,000 bond issue approved by the commission on Nov. 23, 1914, and the second a portion of the issue of $6,839,000 approved by the commission on April 8, 1913.

Pittsburgh, McKeesport & Westmoreland Railway, McKeesport, Pa.—Information just now available shows that the Pittsburgh, McKeesport & Westmoreland Railway was sold at foreclosure last June to interests identified with the Union Trust Company of Jersey City. This company was sold in February, 1913, but the purchaser did not make the required payments and James E. Secrist continued as receiver. A previous reference to this company was made in the ELECTRIC RAILWAY JOURNAL of April 24.

Public Service Corporation of New Jersey, Newark, N. J.—The financial statement issued by the Public Service Corporation of New Jersey for November shows a gross increase in total business of $307,664 or 10.10 per cent. The balance available—after payment of operating expenses, fixed charges, sinking fund requirement, etc.—for amortization, dividends and surplus, was $477,204, and the increase in surplus available for dividends over the corresponding month of 1914 was $56,739. For the eleven months ended Nov. 30, 1915, the gross increase in total business was $1,435 506, a percentage of increase of 4.42. The balance available for amortization, dividends and surplus was $3,472,337, while the increase in surplus available for dividends was $218,244.

San Francisco (Cal.) Municipal Railways.—The Board of Supervisors has issued a report showing that the actual receipts from all sources for the city railway fund of the San Francisco Municipal Railways from Dec. 27, 1913, to Nov. 1, 1915, were $3,545 066. The expenditures totaled $1.895.289, leaving excess receipts of $1 649 776. Transfers from this amount were made as follows: Stockton Street tunnel fund, $48 971; land purchased for Church Street line, $82.510; depreciation fund, $629 769; accident insurance fund, $36 219; investment fund, $200 000. and interest on redemption fund, $542,250; total, $1,521,720. The balance after these transfers was $128.055. From the investment fund of $200 000, city bonds which mature next July were purchased to the amount of $123 500. leaving $76.500 in the fund. From the $629,769 depreciation fund, $551,349 was also taken for investment in city bonds, leaving in the fund a balance of $78,420.

San Francisco, Napa & Calistoga Railway, Napa, Cal.—The California Railroad Commission has issued an order setting the reproduction cost less depreciation of the San Francisco, Napa & Calistoga Railway at $1,010,846.

San Joaquin Light & Power Corporation, Bakersfield, Cal.—The San Joaquin Light & Power Corporation has applied to the California Railroad Commission for authority to renew six promissory notes for a total of $86,722, at from 6 per cent to 7 per cent.

Southeastern Ohio Railway, Light & Power Company, Zanesville, Ohio.—The Southeastern Ohio Railway was incorporated on Dec. 22 with a capital stock of $800,000 to take over the property of the Southeastern Ohio Railway, Light & Power Company, which operates a line between Zanesville and Crooksville. Of the stock of the new company $400 000 is to be paid for the property and the remainder will be used in extending the line from Crooksville to New Lexington, a distance of 10 miles. The appointment of a receiver for the old company was noted in the ELECTRIC RAILWAY JOURNAL of May 15.

Third Avenue Railway, New York, N. Y.—F. W. Whitridge, president Third Avenue Railway, has recommended that the board of the company authorize the appointment of a committee to consider the matter of arranging for the conversion of the company's 5 per cent bonds into stock. He stated that by the end of December it will be possible with the funds in the depreciation account to purchase all the bonds remaining in the possession of the Central Trust Company as of Jan. 1, which were recently authorized by the Public Service Commission. "During the first six months of this year," said Mr. Whitridge, "the company will net more than $500,000. It will have in the depreciation fund $2,500,000 of 4 per cent bonds and in the general fund $1,125,000 in cash. This last amount will suffice to pay for all the extra work the company will be called upon to do for at least two years, and also will provide for any deficiency in the amount necessary to pay the dividends on the capital stock. Assuming, of course, that the monthly payment into the depreciation funds shall hereafter cease until that fund shall have been depleted by expenditures to make up for the depreciation, I think it desirable that the board should officially proclaim that this depreciation fund is not applicable to the payment of dividends."

Washington (D. C.) Interurban Railway.—Gustave Herre, Brooklyn, N. Y., on Dec. 23 purchased the Washington Interurban Railway from the receivers for $25,000. Mr. Herre, it is stated, was representing some of the bondholders, and the purchase was made with the idea of continuing the operation of the line. Previous notes regarding this company were published in the ELECTRIC RAILWAY JOURNAL of July 31 and Dec. 4.

Youngstown & Ohio River Railroad, Leetonia, Ohio.—The directors of the Youngstown & Ohio River Railroad have declared an extra dividend of one-fourth of 1 per cent along with the regular dividend of 1¼ per cent payable on Dec. 20 to holders of record on Dec. 15. This company has been authorized by the Ohio Public Utilities Commission to issue $200,000 of twenty-year first mortgage bonds to refund other securities.

DIVIDENDS DECLARED

Athens Railway & Electric Company, Athens, Ga., quarterly, 1¼ per cent, preferred.

Birmingham Railway, Light & Power Company, Birmingham, Ala., 3 per cent, preferred.

Chicago City & Connecting Railways, Chicago, Ill., 75 cents, preferred certificates.

Chicago (Ill.) City Railway, quarterly, 2 per cent.

Cincinnati, Newport & Covington Light & Traction Company, Covington, Ky., quarterly, 1⅛ per cent, preferred; quarterly, 1½ per cent, common.

City Railway, Dayton, Ohio, quarterly, 1½ per cent, preferred and common.

Elmira Water, Light & Railroad Company, Elmira, N. Y., quarterly, 1¾ per cent, first preferred; quarterly, 1¼ per cent, second preferred.

Halifax (N. S.) Electric Tramway, Ltd., quarterly, 2 per cent.

Honolulu Rapid Transit & Land Company, Honolulu, Hawaii, quarterly, 2 per cent.

International Traction Company, Buffalo, N. Y., seven-eighths of 1 per cent, first preferred; one-half of 1 per cent, preferred.

Kentucky Securities Corporation, Philadelphia, Pa., quarterly, 1½ per cent, preferred.

Little Rock Railway & Electric Company, Little Rock, Ark., 3 per cent, preferred; 1 per cent, common.

London (Ont.) Street Railway, 3 per cent.

Nashville Railway & Light Company, Nashville, Tenn., quarterly, 1¼ per cent, preferred.

Porto Rico Railways, Ltd., Toronto, Ont., quarterly, 1¾ per cent, preferred.

Public Service Corporation of New Jersey, Newark, N. J., quarterly, 1¾ per cent.

Republic Railway & Light Company, New York, N. Y., quarterly, 1½ per cent, preferred.

Scioto Valley Traction Company, Columbus, Ohio, quarterly, 1¼ per cent, first preferred and preferred.

Second & Third Streets Passenger Railway, Philadelphia, Pa., quarterly, $3.

South Carolina Light, Power & Railways Company, Spartanburg, S. C., quarterly, 1½ per cent, preferred.

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

Virginia Railway & Power Company, Richmond, Va., 3 per cent, preferred.

Western Ohio Railway, Lima, Ohio, quarterly, 1¾ per cent, first preferred.

ELECTRIC RAILWAY MONTHLY EARNINGS

Period			Operating Revenues	Operating Expenses	Operating Income	Fixed Charges	Net Income
ATLANTIC SHORE RAILWAY, KENNEBUNK, ME.							
1m.,	Nov.,	'15	$23,678	$20,295	$3,383	$606	$2,777
1 "	"	'14	24,267	26,025	†1,758	643	†2,401
AMERICAN RAILWAYS, PHILADELPHIA, PA.							
1m.,	Nov.,	'15	$455,364	.....	.....	.....	.....
1 "	"	'14	435,945	.....	.....	.....	.....
11 "	"	'15	4,924,016	.....	.....	.....	.....
12 "	"	'14	5,974,870	.....	.....	.....	.....
HOUGHTON COUNTY TRACTION COMPANY, HOUGHTON, MICH.							
1m.,	Oct.,	'14	$23,033	*$13,053	$9,980	$5,522	$4,458
1 "	"	'14	21,226	*13,621	7,605	5,605	2,000
12 "	"	'15	268,003	*160,260	107,743	66,681	41,062
12 "	"	'14	282,090	*181,843	100,247	67,105	33,142
NORTHERN TEXAS ELECTRIC COMPANY, FORT WORTH, TEX.							
1m.,	Oct.,	'15	$181,515	*$95,641	$85,874	$27,715	$58,159
1 "	"	'14	184,028	*93,382	90,646	26,565	64,081
12 "	"	'15	1,730,710	*1,038,188	692,522	330,119	362,403
12 "	"	'14	2,133,564	*1,191,454	942,110	310,103	632,007
PADUCAH TRACTION & LIGHT COMPANY, PADUCAH, KY.							
1m.,	Oct.,	'15	$25,313	*$15,337	$9,976	$7,511	$2,465
1 "	"	'14	26,099	*16,076	10,023	7,569	2,454
12 "	"	'15	289,478	*180,484	108,994	91,595	17,399
12 "	"	'14	305,397	*195,423	109,974	91,522	18,452
PENSACOLA (FLA.) ELECTRIC COMPANY							
1m.,	Oct.,	'15	$22,386	*$13,026	$9,360	$7,082	$2,278
1 "	"	'14	19,818	*13,540	6,278	7,346	†1,068
12 "	"	'15	249,557	*146,263	103,294	86,375	16,919
12 "	"	'14	274,860	*174,513	100,347	86,440	13,907
PHILADELPHIA (PA.) RAPID TRANSIT COMPANY							
1m.,	Nov.,	'15	$2,136,746	$1,192,258	$944,488	$815,532	$128,956
1 "	"	'14	1,959,824	1,138,109	821,715	806,903	14,812
5 "	"	'15	10,203,500	5,722,268	4,481,232	4,080,295	400,937
5 "	"	'14	9,870,600	5,696,067	4,174,533	4,040,939	133,594
PUGET SOUND TRACTION, LIGHT & POWER COMPANY, SEATTLE, WASH.							
1m.,	Oct.,	'15	$641,413	*$391,703	$249,710	$182,912	$66,798
1 "	"	'14	711,000	*412,550	298,450	177,850	120,600
12 "	"	'15	7,620,427	*4,754,318	2,866,109	2,170,491	695,616
12 "	"	'14	8,589,893	*5,047,956	3,541,937	2,113,183	1,429,754
REPUBLIC RAILWAY & LIGHT COMPANY, NEW YORK, N. Y.							
1m.,	Nov.,	'15	$289,151	*$167,266	$121,885	$58,838	‡$63,547
1 "	"	'14	241,625	*153,065	88,560	56,005	‡34,126
11 "	"	'15	2,800,428	*1,706,192	1,094,236	635,884	‡460,142
11 "	"	'14	2,741,626	*1,703 810	1,037,816	620,510	‡420,855
SAVANNAH (GA.) ELECTRIC COMPANY							
1m.,	Oct.,	'15	$67,962	*$44,492	$23,470	$23,273	$197
1 "	"	'14	67,529	*45,384	22,145	23,079	†934
12 "	"	'15	800,410	*519,859	280,551	278,552	1,999
12 "	"	'14	847,093	*562,803	284,290	274,495	9,795
TAMPA (FLA.) ELECTRIC COMPANY							
1m.,	Oct.,	'15	$84,803	*$42,938	$41,865	$4,211	$37,654
1 "	"	'14	83,008	*43,227	39,781	4,459	35,322
12 "	"	'15	978,006	*498,264	479,742	52,504	427,238
12 "	"	'14	973,427	*528,239	445,188	55,480	389,708

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

Traffic and Transportation

DETROIT SKIP-STOPS DISCONTINUED

Company Lays Its Case Before the Public in a Statement Dealing With the Matter

The Detroit (Mich.) United Railway has discontinued the skip-stop on Woodward Avenue. The cor pany has made a statement about the matter in part as follows:

"The Detroit United Railway stands ready to resume the skip-stop plant of street car operation on Woodward Avenue any time the authorities agree, and we sincerely trust that the authorities will see in the plan, as we see and as the police department sees, its excellence as a method of cutting down congestion as well as giving the patrons a faster and safer ride.

"We think that the agitation against the plan, because of the fear that a reduction in the number of stops in the heart of the city would create grave injury to certain business institutions, was not well founded.

"A store's business does not come primarily because the store is located on a corner where the car stops, as witness the fact that stores in the middle of the block, and in front of which cars do not stop, are equally successful in their trading. If car stops seriously affected a shop's business, and if the shop's business were the first factor to be considered, then the car should stop in front of every store.

"The function of the car is to carry its riders as safely, as speedily and as regularly as it can. The necessity of reducing the number of stops in the heart of the city is founded on this: As water cannot flow out of the bottle any faster than the size of the neck will permit, so street cars cannot reach points beyond until after they get through the congested districts. If only ten cars can pass Adams Avenue within a period when twenty are needed, then only those ten can serve the people to points beyond Adams Avenue.

"In addition to relieving car congestion and giving the people faster riding, the skip-stop plan is also a safety measure in that it greatly reduces the number of places where people move between the sidewalks and the safety zones, and hence cuts down the possibilities of coming in contact with cross traffic.

"Conclusive proof that the skip-stop plan produced a material reduction in running time is shown in some checks made recently of the operation of Woodward cars."

Although the Common Council discontinued the skip stop on the Woodward line, after three days' trial, the matter is to come up again shortly. Protests against the discontinuance of the skip stop to some of the Aldermen resulted in a reference of the whole matter of faster transportation, rerouting and extensions to the Street Railway Commission, which is to make recommendations to the Council. The commission will go over the recent traffic survey of Barclay Parsons & Klapp, New York engineers, and will make recommendations based upon their report.

AN INTERURBAN SAFETY CRUSADE

J. R. Harrigan, manager of the Kansas City, Clay County & St. Joseph Railway, has extended the safety-first work to the schools of Platte and Clay Counties, through which the interurban runs. For more than a year the organization under Mr. Harrigan has been doing effective educational work along the lines of safety first among the trainmen and other employees. The safety society of the road has forty members. There are talks at meetings, and as previously mentioned in the ELECTRIC RAILWAY JOURNAL recently there were specific prizes for trainmen with the best accident records. It seemed that the time was ripe for spreading the safety doctrine among the people of the communities served. The school boards of the counties granted the privilege of safety meetings at the public schools, and a series of such meetings was arranged. The first sessions were held recently at several schools in the two counties, and further programs are being outlined

which will include all the schools. After every institution has had one meeting, the list will be gone over again.

While the direct purpose of the meetings is to educate the children to keep away from the tracks and cars, an incidental result is the enhancement of public acquaintance with the road and its operators, thus creating a closer bond of sympathy between the patrons and the railway. Mr. Harrigan is having buttons made for distribution among the children, modeled after the safety-first buttons specially designed and made for the employees of the railway, on which will be the words "Stop—Look—Listen." The distribution of speakers during the first week of the educational campaign indicates the method employed in arranging programs as follows:

Liberty—J. R. Harrigan, general manager, high school; Lester Hall, attorney for the road, and J. H. Miller, general passenger agent, ward schools; Tom Lothen, negro porter at the Kansas City station, school for negro children.

Excelsior Springs—James S. Simrall of Liberty, prosecuting attorney of Clay County; Justin D. Bowersock, attorney for the road; R. S. Mahan, claim agent; W. S. Torley, auditor; Frank Munagle, publisher of the *Electric Railway Trainman*, ward schools.

North Kansas City—D. A. Miller, local attorney.

Avondale—J. A. Weimer, superintendent of transportation.

Camden Point—Dr. F. H. Matthews, surgeon for the road.

Dearborn—J. F. Holman, general freight agent.

Lone Star—R. S. Mahan, claim agent.

Fawcett—C. W. Fort, general superintendent.

DETROIT PASSES CAR CAPACITY ORDINANCE

An ordinance to limit the number of passengers which may be carried on a street car at any one time, based upon an allowance of 30 cu. ft. of air space to each passenger, has been passed by the Common Council of Detroit, Mich., and signed by the Mayor. The only exception in the ordinance is that it shall not apply where cars of a line are operated under a half-minute headway or less.

The Detroit United Railway protested to the Mayor that the ordinance should not be signed by him on the ground that under operating conditions in Detroit the riders would suffer severely under its provisions. At a hearing before Mayor Marx, it was agreed that the ordinance should not apply to the rush hour and its provisions will not be enforced until the authorities have done something towards re-routing and providing extension to relieve present congested conditions.

The measure has been passed as a health ordinance, but the company pointed out the inconsistency of considering cars operating twenty-nine seconds apart as sanitary irrespective of the load while when operating thirty-one seconds apart conditions are unhealthful if 30 cu. ft. of air space is not allowed each passenger.

SAFETY PRECAUTIONS BY AUTO DRIVER AND MOTORMAN

In its campaign against recklessness in automobile driving the San Pedro, Los Angeles & Salt Lake Railroad (steam) is making very effective use of a short treatise on this subject by Howard Elliott, secretary of its safety and efficiency committee. Among other things Mr. Elliott says:

"If auto drivers were as careful as street car drivers, collisions between automobiles and trains would be as rare as those between trains and street cars. Before a trolley car crosses a steam road at grade, where there is no human flagman, one member of the crew goes forward, looks both ways and listens. Suggest this procedure to the auto driver and he smiles. Yet there are more and stronger reasons why the auto driver should be more careful than the motorman.

"The motorman is prohibited from talking to passengers. There is no such prohibition for auto drivers. The motorman must pass a rigid examination as to eyesight, hearing, steadiness of nerve and sobriety. The auto driver is subjected to no such test. To the street car employee the passengers are so many 'persons.' Perhaps he could call none of them by name. Yet he protects his charges with extraordinary care. The law demands it, the rules of his company require it, and his best judgment dictates it. The autodriver's passengers are usually his kith and kin. Their lives are as precious to him as his own. If one should die, his heart would bleed. Yet he races across a railway track looking neither to right nor to left (as careful observation shows a vast majority do) and then calls unreasonable and unnecessary for his adoption those precautions which street railway companies take to safeguard the lives of those in whom they have only a passing interest."

WASHINGTON CHRISTMAS ENTERTAINMENT

Nearly 2000 children gathered at the National Theater, Washington, D. C., early on the afternoon of Dec. 27 and celebrated Christmas all over again, the occasion being the fifteenth annual Christmas festival of the Washington Railway & Electric Company and the Potomac Electric Power Company for the children of the employees. The feature of the entertainment was a series of Mother Goose tableaux and character dances produced under the direction of Cora B. Shreve, in which fifty of the company children participated, in addition to a number of Miss Shreve's pupils. The program also included vaudeville acts from local theaters. Gifts were distributed to the children.

Directors of the two companies and several invited guests were present. President Clarence P. King said in part:

"To-day is our children's day, and I represent them. This is the house of representatives—representing the home life of the Washington Railway & Electric Company and the Potomac Electric Power Company employees. The children bid me tell you that they have heard a lot about hard times, trouble, aches and pains, etc., during the past year, but that they do not mind little things such as colic, measles, mumps, whooping-cough, chilblains, stone bruises, and are here to-day in the full vigor of life, filled with the Christmas spirit. They want all of you grown-up people to have a good time, but particularly request me to caution you not to be too boisterous, and not to get the fidgets. Now let us have fun!"

The children were provided with car tickets to and from the theater, and a number of special cars were used to convey them.

One-Man Cars in Dubuque.—The Union Electric Company, Dubuque, Iowa, has recently remodeled eight of its single truck cars for one-man operation.

Opposition to One-Man Cars Carried to Commission.—The City Council of Urbana, Ill., has appealed to the State Public Utilities Commission of Illinois to compel the Urbana & Champaign Railway, Gas & Electric Company to employ two men on all cars.

Campaign in Brooklyn Against Spitting.—In the future persons who violate the anti-spitting ordinance in the cars or about the platforms of stations of the elevated lines of the Brooklyn (N. Y.) Rapid Transit Company will be handed by an employee of the company a leaflet of the Board of Health dealing with spitting.

Railway Buses Not Jitneys.—The city attorney of Topeka, Kan., in response to complaints of jitney owners, has ruled that the buses being operated by the Topeka Railway are not jitneys. The company installed two buses to transfer passengers, without extra charge, between the disconnected ends of two lines, pending the erection of a bridge. Jitney owners insisted that the company should pay jitney licenses.

San Francisco Municipal Line Changes.—Thomas Cashin, superintendent of the San Francisco (Cal.) Municipal Railways, has been authorized to inaugurate a six-day week for platform men of the city railways. This will give each operator one day off a week without pay, and will result in giving practically steady employment to from twenty-five to thirty men laid off since the exposition closed.

Spokane Bridge Collapse Kills Five.—The north span of the Division Street bridge across the Spokane River gave way on Dec. 18 under the weight of two passing cars of the Washington Water Power Company. One of the cars, carrying fifteen passengers, plunged into the river and five men were killed and ten injured. The other car, which had reached the end of the bridge, slid back until the rear end rested on the river bed. The two passengers and crew escaped uninjured. The Washington Power Company denied responsibility for the accident in a statement by Thomas G. Aston, claim agent. He said the city owned the bridge.

Seeking to Regulate Automobile Parking in Kansas City.—The board of control of the Kansas City (Mo.) Railways is seeking a way to regulate the parking of automobiles on streets with tracks, and to expedite the movement of vehicles. Street car traffic is seriously congested on two down-town streets in the busy evening hours because of the slow movement of automobiles and other vehicles on the tracks, such use of the tracks being necessary because of the occupation of the pavement next to the curbing by standing vehicles. It has been suggested that automobilists should not be allowed to stop their engines while the cars are on the narrower busy thoroughfares.

Not a Passenger Killed in Portland, Ore.—The records of the Portland Railway, Light & Power Company, Portland, Ore., show that not a single person has lost his life while a passenger on board one of the company's cars. The following statistics for passengers carried cover the period from Jan. 1, 1907, shortly after the Portland Railway, Light & Power Company acquired the various electric railway properties operating in and around Portland, up to and including Nov. 30, 1915: 1907, 60,093,139; 1908, 65,195,914; 1909, 77,019,803; 1910, 88,310,850; 1911, 91,600,993; 1912, 94,125,464; 1913, 93,908 891; 1914, 89,800,788; Jan. 1 to Nov. 30, 1915, 72,152,608. Total, 732,208,450.

Abandonment of Service Possible in Santa Monica.—In a letter to C. B. Kearsley, secretary of the Santa Monica Chamber of Commerce, Paul Shoup, president of the Pacific Electric Railway, Los Angeles, Cal., says in part: "We have fared very badly in Santa Monica in the last two or three years. On the one hand we have put at least $250,000 into improvements, and as against this our earnings have fallen off materially. Our good lines are no longer able to carry the weak ones. Naturally, it is best for you and best for us that the lines which earn the least should be dispensed with. What I am trying to avoid is the conclusion that now seems staring us in the face and which is that we will have to abandon our street car lines and local street car service entirely in Santa Monica."

Booze Fighting.—At least one electric railway has reprinted for circulation among its men the following from the *Illinois Steel Company Bulletin:* "For the married man who cannot get along without drinks, the following is suggested as a means of freedom from bondage to the saloons: Start a saloon in your own house. Be the only customer. (You'll have no license to pay.) Go to your wife and give her $2 to buy a gallon of whiskey, and remember there are sixty-nine drinks in a gallon. Buy your drinks from no one but your wife, and by the time the first gallon is gone she will have $8 to put in the bank and $2 to start business again. Should you live ten years and continue to buy booze from her, and then die with snakes in your boots, she will have enough money to bury you decently, educate your children, buy a house and lot, marry a decent man, and quit thinking about you entirely."

Illinois Traction to Protest St. Louis-Granite City Fare.—The St. Louis Electric Terminal Railway, which operates between St. Louis, Mo., and Granite City, Ill., and is part of the Illinois Traction System, will apply to the Missouri Public Service Commission or to the Interstate Commerce Commission early in January for authority to increase the passenger fare between St. Louis and Granite City from 5 cents to 10 cents. Under the franchise of the St. Louis Electric Terminal Railway, granted by the Municipal Assembly of St. Louis in 1907, the company is required to carry passengers between St. Louis and Granite City for 5 cents. The company probably will take the view, in presenting the case to the Public Service Commission or to the Interstate Commerce Commission, that the city of St. Louis exceeded its authority by attempting to legislate beyond its own jurisdiction, and that the section of the franchise imposing a 5-cent fare between a Missouri point and an Illinois point is illegal.

Dining Train for Shop Men.—For the accommodation of the workmen engaged in assembling the 478 new steel cars which are fast taking the place of the original composite cars in the New York subway, a unique lunch room has been fitted up at the Highbridge yard of the Interborough Rapid Transit Company. When the car bodies arrived they were complete in their interiors. Now, however, they rest on cribbing, stripped of all their furnishings to make way for the temporary order of things. One car divides responsibility with the kitchen, lunch counter and the steward's desk. The lunch counter is mid-length of the car, and alongside it is the desk. The other three cars comprise the dining rooms. The employees enter by the kitchen—or center door—give their order to the stewards at the counter, taking it along with them, together with a check for the amount. They then pass along to the cashier's desk, make settlement and proceed to the "dining room," to take their seats.

Volume One of Public Service News.—*Public Service News*, published in the interest of the Virginia Passenger & Power Company, Richmond, Va., since March 18, 1915, and distributed on the cars of the company, closed its first volume with the issue for Dec. 25, which appeared in holiday dress of red and green. The company said, in part, editorially: "The publication was experimental. From the beginning the little paper has made friends. Street-car patrons have apparently found in it material sufficiently interesting, informing and diverting to account for the constantly growing family of its readers. A statement of the general principle that guides this publication appears regularly in every issue. It is a standing invitation to every reader interested in a better Richmond and a better service from the public utility company to submit his views on how this company can help toward this end. In the coming year *Public Service News* will continue from time to time to lay before its readers timely and interesting information about things that concern the company and the city. At the same time it will not forget that the tedium of the street car ride is lightened by a bit of nonsense and a touch of wit."

The New "Transit."—*Transit*, which heretofore has been published by H. L. Hamersly, with an advisory committee of employees of the Lehigh Valley Transit Company, Allentown, Pa., and the Philadelphia & Western Railway, will hereafter be published by the Lehigh Valley Transit Company in the interest of both railways. The issue of the paper for January says editorially: "Starting with this issue, *Transit* will be published by the advertising department of the Lehigh Valley Transit Company. It will make its appearance the fifteenth of each month, to the number of 10,000 copies. More copies will be printed each month as demand requires; also its size, in number of pages, will be increased. While this monthly is not for profit, but for publicity and pleasure to passengers, a limited number of pages will be devoted to paid advertisements, as a number of dealers have shown their desire to avail themselves of its usefulness. The future policy of *Transit* will be to present uncommonly interesting articles dealing with transportation, light and power facilities and industrial farming and civic advancement in the territory served by the Lehigh Valley Transit Company. A place will always be found for articles touching on character, thought and optimistic prophecies on the future. Also photos, verse and humor will play an important part."

Near-Stop Side a Success in Storm.—The Newark *News* of Dec. 12 had the following to say about the near-side stop during the storm of Dec. 13 and 14: "According to the Public Service Railway division superintendents and supervisors all over the system were ordered Monday to observe how patrons took the near-side stop proposition when storm conditions existed. It was said that the reports of these officials were that pasengers experienced little or no difficulty in reaching the entrances to the cars, and seemed to have no complaint to make. It was pointed out by Newton W. Bolan, general superintendent of the railway, that the test of the near-side stop system was thorough. On Monday, he said, passengers had soft, slushy snow and rain to contend with, while yesterday (Tuesday) the heavy, frozen snow offered difficulties. The conviction was expressed that the patrons of the company were satisfied with the near-side stop system, and that no difficulties had been encountered during the past three days to crystallize public sentiment against it. The reports of the division superintendents and supervisors were that where cross-walks had been cleared, passengers walked on them out to the tracks, and then up the tracks on the space cleared by the track sweepers to the point where the rear of the cars come to a standstill. These sweepers brush free of snow a path about 20 in. wide outside the tracks."

Personal Mention

Mr. George V. S. Williams has sent to Governor Whitman of New York his resignation as a member of the Public Service Commission of the First District of New York, to take effect on Feb. 1, 1916.

Mr. Lynn R. MacBroom, formerly electrical engineer and general superintendent of the Rutland Railway, Light & Power Company, Rutland, Vt., is now manager of the electric light department of Burlington, Vt.

Mr. B. J. Fallon, engineer of maintenance of way of the elevated railroads of Chicago (Ill.), has been appointed chairman of the subdivision on city transportation and public utilities of the ways and means committee of the Chicago Association of Commerce.

Mr. Frank S. Briggs, superintendent of transportation of the Cumberland County Power & Light Company, Portland, Me., has been granted an indefinite leave of absence from his duties because of ill health. In the meantime Mr. G. M. Todd will act as superintendent of transportation of the company.

Mr. M. D. Evans has been elected secretary and assistant treasurer of the United Gas & Electric Corporation, New York City, to succeed Mr. Henry Morgan, resigned. Mr. Evans, in addition to continuing as first vice-president of the United Gas & Electric Engineering Corporation, has been elected secretary of the company.

Mr. Carl Sylvester, general manager of the Rio de Janeiro Tramway, Light & Power Company, Rio de Janeiro, Brazil, and formerly general manager of the Middlesex & Boston Street Railway, is on a vacation and business trip to the United States. Mr. Sylvester expects to remain north until the latter part of January or the first of February.

Mr. Louis M. Day, Chillicothe, has been appointed by Gov. Frank P. Willis as a member of the Ohio Public Utilities Commission to succeed Mr. Oliver H. Hughes. Mr. Day is an attorney and served two terms in the Legislature, in 1909 and 1913. He is a Democrat. The other members of the commission, Mr. Beecher W. Waltermire and Mr. Lawrence K. Langdon, are Republicans.

Mr. John A. Beeler, formerly vice-president and general manager of the Denver (Col.) Tramway, was waited upon at his home in Denver recently by a committee of employees. Mr. A. J. Krick, a motorman, was spokesman for the party. On behalf of all divisions and departments of the company he presented Mr. Beeler a twenty-three-jeweled gold hunting-case watch, with his initials in a raised monogram set with diamonds. Mr. Beeler spoke of his pleasant associations with the employees, and reviewed his own experiences extending over a period of many years as an employee of the company.

Mr. George Carson, claim agent of the Puget Sound Traction, Light & Power Company, Seattle, Wash., and president of the American Electric Railway Claims Association, has resigned from the company at Seattle. Mr. Carson has been connected for many years with street railways in New York, Chicago, San Francisco and Seattle. He was one of the organizers of the Pacific Claim Agents' Association, formed in 1909, and of the Pacific Claim Agents' Index Bureau, formed in 1912. A biography and a portrait of Mr. Carson were published in the ELECTRIC RAILWAY JOURNAL of Oct. 9, 1915.

Mr. Leonard M. Daggett has been appointed by Judge Mayer of the Federal District Court at New York one of the trustees of the Connecticut Company. Mr. Daggett takes the place of Mr. William Waldo Hyde, one of the original trustees, who died on Oct. 30. In accordance with the dissolution decree, the vacancy has been filled on the nomination of the surviving trustees, ex-Judge Walter C. Noyes, Mr. Lyman B. Brainerd, Mr. Charles Cheney, and Mr. George E. Hill. The appointment has been agreed to by Attorney General Gregory and Mr. Howard Elliott, president of the New York, New Haven & Hartford Railroad.

Mr. E. G. Connette, president of the International Railway and vice-president of the International Traction Company, Buffalo, N. Y., and Francis T. Homer, formerly connected with Bertron, Griscom & Company, New York, have been elected vice-presidents of the United Gas & Electric Corporation, New York, N. Y., to succeed Mr. R. E. Griscom and Mr. S. J. Dill, resigned. Mr. Connette has also been elected president of the United Gas & Electric Engineering Corporation to succeed Mr. J. S. Pevear, who has gone to Birmingham, Ala., as president of the Birmingham Railway, Light & Power Company to supervise the operation of that company. Mr. Pevear has been elected vice-president of the United Gas & Electric Engineering Corporation. The United Gas & Electric Corporation, of which Mr. Connette has been elected president, controls through ownership of common stock, the International Traction Company, which in turn owns and controls the International Railway.

Mr. F. M. Hamilton, who has been purchasing agent of the Puget Sound Traction, Light & Power Company, Seattle, Wash., since May, 1914, has been appointed claim agent of the company to succeed Mr. George Carson, resigned. Mr. Hamilton was born at Grafton, W. Va., on Oct. 15, 1875, received a graded and high school education and continued his studies under a private tutor. He studied medicine for two years, but abandoned the idea of becoming a physician to enter the service of the Baltimore & Ohio Railroad. From 1900 to 1905 he was with the Jones & Laughlin Steel Company, Pittsburgh, Pa., which owns and operates the Monongahela Connecting Railroad, successively filling the positions of yardmaster, assistant trainmaster, special agent and chief clerk to the general superintendent. Mr. Hamilton resigned from the Jones & Laughlin Steel Company to become manager of the American Car Tracing & Shipping Company, a private traffic organization. He removed to Seattle in 1907 and worked jointly for the Northern Pacific Railroad and the Pacific Northwest Demurrage Association, resigning to accept the appointment of traffic manager for the Alaska Exposition. At the close of the exposition Mr. Hamilton became assistant sales agent for the Roslyn Fuel Company, covering the States of Idaho, Oregon and Washington. Mr. Hamilton was appointed freight traffic agent of the Seattle division of the Puget Sound Traction, Light & Power Company in September, 1911, and continued in that position until he was made purchasing agent of the company in 1914.

Mr. W. B. Donaldson, assistant purchasing agent of the Puget Sound Traction, Light & Power Company, Seattle, Wash., has been appointed purchasing agent of the company to succeed Mr. F. M. Hamilton, who has been appointed claim agent of the company. Mr. Donaldson was born in Pittsburgh, Pa., on June, 1883. Being obliged to leave school after having finished the grammar grades he secured a position in a grocery store in Toledo, Ohio. Following this he was connected in turn with the general freight department of the Ann Arbor Railroad and Toledo, St. Louis & Western Railroad in Toledo for several years, and the Dillon-Griswold Wire Company, Sterling, Ill. In December, 1903, he entered Y. M. C. A. work and for three years was employed as an assistant secretary in the Young Men's Institute branch of New York Y. M. C. A., located on the Bowery. On Oct. 30, 1906, Mr. Donaldson entered the employ of the Seattle-Tacoma Power Company as clerk in the store room. From that position he was transferred to the purchasing department and when the head of that department resigned in May, 1909, Mr. Donaldson was appointed purchasing agent. This position he held until the consolidation of the Seattle-Tacoma Power Company and the Seattle Electric Company in April, 1912. He occupied the position of chief clerk in the purchasing department of the Puget Sound Traction, Light & Power Company until April, 1914, when, upon the appointment of Mr. F. M. Hamilton to the office of purchasing agent, Mr. Donaldson was advanced to the positon of assistant purchasing agent of the company.

OBITUARY

Charles C. Ostrander, in the service of the Louisville (Ky.) Railway since 1886 and for the last twenty years chief night inspector, is dead at his home in the city of Louisville of pneumonia.

Construction News

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

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

RECENT INCORPORATIONS

Kansas Southern Traction Company, Oswego, Kan.—This company has received a new charter in Kansas to construct a line from Parsons to Coffeyville and from Parsons to Columbus, about 70 miles. Capital stock, $100,000. The company has asked the Public Utilities Commission for permission to issue $1,360,000 in bonds for the construction of the line. Incorporators: Philip Strack, Parsons; Theodore Ritzo and Dominic Conti, Kansas City, Mo., and J. W. Everett and John M. Page, Topeka.

***Southeastern Ohio Railway, Zanesville, Ohio.**—Incorporated in Ohio to take over the property of the Southeastern Ohio Railway, Light & Power Company. Capital stock, $800,000. It is planned to extend the line from Crooksville to New Lexington, 10 miles. Incorporators: E. R. Meyer and W. H. Niekirk, Zanesville; Fred J. Fox and J. C. Heinlein, Bridgeport, and Samuel W. Harper, Wheeling, W. Va. Mr. Niekirk was secretary, treasurer and superintendent of the old company, which has been in the hands of a receiver for some time.

***Guthrie-Edmond Electric Railway, Oklahoma City, Okla.**—Incorporated in Oklahoma to construct an extension of the Oklahoma Electric Railway from Edmond to Guthrie, 15½ miles. Capital stock, $500,000. Incorporators: Burke Shartel, Charles Hoopes, Guy B. Treat, George W. Knox and E. J. Reichart, all of Oklahoma City and also of the Oklahoma Railway.

FRANCHISES

Los Angeles, Cal.—The Pacific Electric Railway has received a franchise from the Council to extend its proposed elevated tracks across San Julian Street, bringing the tracks to grade at San Pedro Street, so as to reroute cars north and south on San Pedro Street. The company has received a franchise granting permission to abandon its line beginning at Sixth and Beacon Streets, extending on Beacon Street to Second Street.

San Bernardino, Cal.—Bids will be received by the Board of Supervisors until Jan. 3 for a fifty-year franchise to construct and operate an electric railway on Orange Grove Avenue from Foothill Boulevard to Mesa Avenue.

Kankakee, Ill.—The Kankakee Electric Railway will ask the Council for a franchise to remove its tracks on Washington Avenue from Hawkins to Jeffery Streets.

Peoria, Ill.—The Peoria & Chillicothe Electric Railway has asked the Board of Supervisors for a franchise for its proposed line from Peoria to Chillicothe.

Hutchinson, Kan.—The Hutchinson Interurban Railway has received a franchise from the Council granting an extension of right-of-way on Lorain Street, south of Avenue B. The extension will be used for switching tracks for the Arkansas Valley Interurban Railway.

Cincinnati, Ohio.—The West End Rapid Transit Company has prepared a new ordinance to be submitted to the Council which provides for the same route as the one presented in September, but makes several changes in the conditions under which the grant is now sought. It does not mention the term of the franchise, but provides that the city may take over the property at the end of ten years by paying the cost plus 25 per cent. Other companies may use the tracks on a just and equitable basis, and construction work shall begin within eighteen months from the time the franchise is granted. C. E. Hooven is president, and Stanley Shaffer, secretary, of the company. [Oct. 23, '15.]

Warren, Ohio.—The Mahoning Valley Street Railroad has asked the Council for a franchise to build an extension of its line from the present interurban station at Main and South Streets to the city limits at the plant of the Trumbull Steel Company.

Youngstown, Ohio.—The Youngstown & Southern Railway has received a ten-year extension of time on its franchise, making the concession good for twenty-five years from the date of its passage.

Corvallis, Ore.—Ralph H. Moody, attorney for the Southern Pacific Company, reports that the franchise for the new tracks to be built in Corvallis by the Southern Pacific Company for the West Side line, which is to be electrified between Corvallis and Whiteson, has been agreed upon by the Council and the Southern Pacific Company. The electrification of the Whiteson-Corvallis line was announced nearly a year ago, but has been held up by the failure of the Corvallis Council to grant the necessary franchise. Mr. Moody announces that the company will begin the work of electrifying the line immediately.

Collingdale, Pa.—The Philadelphia & Garrettford Street Railway, a subsidiary of the Philadelphia & West Chester Traction Company, has received a franchise from the Council to construct a line through Collingdale.

Salt Lake City, Utah.—The Salt Lake Terminal Company has received a franchise from the Council to construct the necessary turnouts in First West Street, just south of South Temple Street, to give the Salt Lake & Ogden Railway and the Salt Lake & Utah Railroad access to the terminal site at the corner of South Temple and West Temple Streets.

Salt Lake City, Utah.—The Utah Light & Traction Company has received a franchise from the Council to extend its tracks from the present terminus at Wall and Second North Streets east past the front of the capitol and north on West Canyon Street to a point due east of the capitol, provided it will also extend them north to Fourth North Street and thence west to De Soto Street, thus extending on three sides of the capitol.

TRACK AND ROADWAY

***Pine Bluff, Ark.**—George B. Blanchard, consulting engineer, Chicago, has signed a contract with the free bridge commissioners to operate a steam, oil or electric railway from Pine Bluff over the free bridge to some point on the Mississippi River. The contract specifies that he is to have the road in operation by the end of eighteen months or forfeit $500 cash, which he has placed in trust. The contract extends for thirty-six years and six months. The first year's rental will be $5,000 and will increase $1,000 each year until 1921. After that the rental will be $15,000 a year.

Municipal Railways of San Francisco, San Francisco, Cal.—Construction of the Church Street extension of the Municipal Railways of San Francisco has begun. Barring unforeseen delays, the line from Thirtieth to Market Street will be in operation by May 1 next. The section between Twenty-second and Thirtieth Streets, which does not involve such heavy construction, is also expected to be ready by the same date. No objection to the use of Church Street tracks between Sixteenth and Market Streets is anticipated and it is expected that an agreement as to the use of Market Street to a connection with the Van Ness Avenue city line will be reached between the city and the United Railroads by the time the remainder of the Church Street line is ready for operation.

Connecticut Company, New Haven, Conn.—Operation has been begun by this company on its North End trolley line extending on Main Street, Grove Street, Broad Street, Washington Street, Farmington Avenue and Commonwealth Avenue, New Britain.

Caldwell (Idaho) Traction Company.—Business men of the city of Caldwell have decided to assume responsibility for floating a $25,000 bond issue of the Caldwell Traction Company, the money to be utilized in electrifying the Wilder branch of the Oregon Short Line Railroad. The proposed line to be electrified is 11 miles long and taps a rich farming section. The Caldwell Traction Company recently secured a fifty-year lease on the road and will begin the work of electrifying early in 1916.

Twin Falls (Idaho) Railroad.—A preliminary survey is being made and work will soon be begun by this company on the construction of a 20-mile extension to Castleford. The line will extend through Clover City.

Hammond, Whiting & East Chicago Railway, Chicago, Ill.—This company plans to rehabilitate 1½ miles of track in Whiting and 1 mile in East Chicago during 1916.

Indianapolis & Cincinnati Traction Company, Indianapolis, Ind.—It is reported that negotiations are being made with the city of Cincinnati relative to trackage rights, which will result in the completion of the proposed interurban lines between Indianapolis and Cincinnati. This will mean the extension of the Indianapolis & Cincinnati Traction Company's line from Rushville to Cincinnati at an approximate cost of $3,000,000.

Arkansas Valley Interurban Railway, Wichita, Kan.—Operation has been begun by this company on its extension from Wichita to Hutchinson. Plans are being considered to extend the line to Salina. Two routes are proposed, one from Newton north through Geossel, Canton, Roxbury and Gypsum, the other from Halstead north through Moundridge, McPherson and Lindsborg.

Atlantic Shore Electric Railway, Sanford, Me.—Connection has been made by this company at Biddeford with the Biddeford & Saco Street Railway. This gives a continuous trolley line from Waterville to Portsmouth.

United Railways & Electric Company, Baltimore, Md.—This company will construct an extension from St. Paul Street to Guilford.

Point Shirley Street Railway, Winthrop, Mass.—The Boston, Revere & Lynn Railroad contemplates establishing a steamboat line between Boston and Shirley, connecting at that point with its steam line and with the Point Shirley Street Railway, which it owns.

St. Paul (Minn.) Southern Electric Railway.—It is reported that this company proposes to build a line from Hastings to Rochester, 64 miles, during 1916.

Metropolitan Street Railway, Kansas City, Mo.—Committees have been appointed by the Elm Ridge Improvement Association to induce this company when it begins the extension of the Troost Avenue line from Forty-ninth Street to Fifty-third Street to continue it on to Sixty-third Street.

Salem-Pennsgrove Traction Company, Salem, N. J.—The Board of Public Utility Commissioners has announced its approval of the general plan of this company for the construction of a line from Salem to Pennsgrove. The Board concluded that the cost of construction of the entire road, including substations at Pennsville and Salem, should not exceed $554,505. Accordingly it approved a proposed issue of $224,000 of stock at par, $273,000 of first mortgage bonds at 90 per cent of par and $100,000 of second mortgage bonds at 85 per cent of par. It is proposed to begin immediately the construction of the road from Pennsgrove to Plant No. 3 of the E. I. du Pont de Nemours Powder Company above Pennsville [Sept. 25, 1915].

New York, N. Y.—The Public Service Commission for the First District of New York has authorized the chairman and secretary to advertise for bids, to be opened on Jan. 14 at 12.15 p. m., for the construction of Section No. 2-A of Route No. 12, a part of the Broadway-Fourth Avenue subway. Route No. 12 is generally known as the Eastern Parkway subway in Brooklyn, which is to be operated under the dual system contracts as an extension of the first subway by the Interborough Rapid Transit Company. Section No. 2-A covers a portion of the route which is to be operated by the New York Municipal Railway Corporation. It extends from Prospect Park Plaza at Flatbush Avenue to a point at the intersection of Flatbush Avenue, Ocean Avenue and Malbone Street. It will be a two-track line, and will connect with the Brighton Beach railroad at Malbone Street. The commission also authorized the New York Municipal Railway Corporation to award the contract for the reconstruction of the Brighton Beach line, to connect with this section of the subway, to the Inter-Continental Construction Company, the lowest bidder. The work will cost about $1,000,000, and is to be completed within twenty-four months.

Cleveland (Ohio) Underground Rapid Transit Company.—Work will be begun in January on the proposed subway system in Cleveland. The subway will be under Euclid Avenue and ground will be broken simultaneously at the Public Square, East Fifty-fifth Street and at University Circle. There will be six stations between Public Square and University Circle. The company's franchise, which expires on Jan. 23, 1916, unless work is started, provides that the line must be in operation within forty-two months after ground is broken. Thomas Schmidt, secretary.

Corry & Columbus Street Railway, Corry, Pa.—This company reports that during 1916 it expects to build 15 miles of new line between Columbus, Pa., and Sherman, N. Y.

Holston Valley Railway, Bristol, Tenn.—It is reported that this company, which is operated as part of the Bristol Traction Company, is securing right-of-way for an extension from Bull's Gap to Leadvale, 22 miles.

***Chattanooga, Tenn.**—A short route car line to East Chattanooga is a project that the members of the East Chattanooga Chamber of Commerce propose to undertake. A committee will be appointed later to promote the movement. Efforts will be made to interest the city and get an appropriation, if possible. At present, it is stated, cars reach East Chattanooga by a roundabout way, while by a direct route it is only 3½ miles from the heart of the city.

***Greenwood, Tenn.**—Plans are being considered to construct a line from Greenwood to Schlater via Itta Bena. It is also proposed to build an extension to Black Hawk. It is planned to have the line ready for operation by August, 1916. S. M. Anderson, Greenwood, is interested.

Memphis (Tenn.) Street Railway.—Officials of the Illinois Central Railroad stationed at the new industrial town, Nonconnah, Tenn., and other citizens of this new Memphis suburb, are preparing a petition addressed to T. H. Tutwiler, president of the Memphis Street Railway, asking for a new line. This would call for an extension of the Florida Street line of the company and in order to expedite the action of the company the Illinois Central Railroad has offered a free right-of-way into the new town.

Southern Traction Company, Dallas, Tex.—It is reported that during the early part of next year plans will be renewed by this company for the construction of an extension from Waco to Austin and thence to San Antonio.

Northern Texas Traction Company, Fort Worth, Tex.—This company expects to double track approximately 2 miles of its line between Forth Worth and Dallas during 1916.

***San Angelo, Tex.**—Eastern capitalists are investigating the street-car situation in San Angelo, and it is reported that plans are being considered to build an entirely new system. J. D. Sugg, owner of the San Angelo Power & Street Railway, recently offered to make the city a present of the line and equipment on condition that San Angelo pay this year's taxes and make the improvements demanded of him. The city commissioners refused to accept the gift and he discontinued the service.

Salt Lake & Ogden Railway, Salt Lake City, Utah.—This company reports that during 1916 it expects to build 4½ miles of new track, including 3 miles of double tracking of its present line and 1½ miles of new city track.

Appalachian Power Company, Bluefields, W. Va.—Surveys have been made and work will be begun at once by this company on the construction of an extension of its Bluefield-Graham line from Lee Street to the end of East Princeton Avenue, where it will connect with the Princeton-Bluefield Electric Railway.

SHOPS AND BUILDINGS

Cumberland County Power & Light Company, Portland, Me.—An extensive terminal station will be built at Portland by the Cumberland County Power & Light Company to be used by this company and the Lewiston, Augusta & Waterville Street Railway to handle their express and freight business. The headhouse will be two stories and the freight shed 140 ft. long. It is expected that the terminal will be completed about March 1. About $40,000 will be expended on the structure.

Kansas City, Mo.—It is said that the interurban railways entering Kansas City have agreed upon the section of the city in which a union interurban station shall be located. Proceedings have been begun for reducing the grade at Eighth and McGee Streets, so that the Kansas City, Clay County & St. Joseph Railway may have easy access to the presumed site, near Eleventh and McGee Streets.

Manufacturers and Supplies

ROLLING STOCK

Salina (Kan.) Street Railway will purchase one closed city car during 1916.

Grand Rapids (Mich.) Railway is expected to be in the market soon for ten and possibly twenty new city cars.

Visalia (Cal.) Electric Railroad expects to purchase during 1916 one electric locomotive.

Hutchinson (Kan.) Interurban Railway is building two front-entrance, one-man, single-truck cars.

Aurora, Plainfield & Joliet Railway, Joliet, Ill., has purchased material to rebuild one of its interurban cars.

Chicago & Interurban Traction Company, Chicago, Ill., expects to purchase one interurban motor car to replace one destroyed by fire.

Metropolitan Street Railway, Kansas City, Mo., it is reported, will exercise its option for fifty four-motor single-end city cars like those purchased during 1915.

Charleston Consolidated Railway & Lighting Company, Charleston, S. C., expects to purchase during 1916 two double-truck cars for suburban service.

Des Moines (Iowa) City Railway has ordered forty double-truck, center-entrance, semi-steel cars for city service from the McGuire-Cummings Manufacturing Company.

Arkansas Valley Interurban Railway, Wichita, Kans., has ordered from the Cincinnati Car Company an additional steel underframe trail freight car, a duplicate of the one previously ordered.

Hammond, Whiting & East Chicago Railway, Chicago, Ill., has purchased four semi-steel, monitor-deck, double-truck, pay-as-you-enter cars from the American Car Company, St. Louis, Mo. These cars will be equipped with four G.E.-80 motors and a General Electric control not yet selected. The cars have a seating capacity for fifty persons.

San Francisco (Cal.) Municipal Railways, through a request by the Board of Public Works from the Supervisors, has asked for an appropriation of $1,000 for the use of the engineering bureau in preparing plans for a lighter type of car for use on the heavy grades of the Union Street division.

Princeton (W. Va.) Power Company, Princeton, has ordered two all-steel combination passenger and baggage cars from the Cincinnati Car Company. These cars are arranged to seat forty-eight passengers, and will be placed in service on the new line between Princeton and Bluefield, W. Va.

Connecticut Company, New Haven, Conn., proposes to build during 1916 one 40-ft. double-truck motor line car for city and interurban service, four 41-ft. double-truck motor express cars, city and interurban. The company is now converting two single-truck closed cars into one center-entrance prepayment double-truck car.

Charleston (W. Va.) Interurban Railroad, has ordered from the Cincinnati Car Company two light-weight one-man cars for near-side operation, complete with Cincinnati long-base single trucks equipped with 24-in. wheels, seating capacity twenty-six passengers; two 45-ft. baggage express cars, ordinarily to be used in express service, but designed and equipped with a view to being used as locomotives and capable of hauling seven or eight standard freight cars; two 47-ft. 3-in. all-steel straight passenger interurban cars, seating capacity fifty-two, double-end operation, for the new Montgomery division.

TRADE NOTES

Edwin G. Hatch, New York, N. Y., has received a repeat order from the Illinois Traction System for a number of overhead protective crossing clamps, to be used at overhead three-phase line crossings.

Perry Ventilator Corporation, New Bedford, Mass., has had its ventilators installed on the fifteen new cars now being delivered by the G. C. Kuhlman Car Company to the East Liverpool Traction & Light Company, East Liverpool, Ohio.

American Mason Safety Tread Company, New York, N. Y., announces that, effective Jan. 1, 1916, Joseph T. Ryerson & Son of Chicago, will act as general Western distributors for its various types of Mason safety treads. A large stock of both lead and carborundum filled tread will be carried in stock for immediate deliveries.

Automatic Ventilator Company, New York, N. Y., has been appointed selling agent for the Flower Products, which include brush holders for railway motors, controller and air handles, D-shaped seamless steel bushings, etc., for the United States and Canada, with the exception of the States of Pennsylvania, Ohio, New Jersey, Virginia, West Virginia, Maryland and Delaware.

Track Specialties Company, New York, N. Y., announces that Warren Moore Osborn is now representing the company in the Chicago district, with headquarters in the McCormick Building, Chicago, Ill. R. L. Mason, who was formerly connected with Hubbard & Company, Pittsburgh, Pa., is now representing the Track Specialties Company, Inc., in the Pittsburgh district. His headquarters will be 1501 Oliver Building, Pittsburgh.

Paul M. Lincoln, whose connection with the Westinghouse Companies in their operating and engineering activities dates back for more than twenty-three years and whose resignation from the Westinghouse Electric & Manufacturing Company was announced in the ELECTRIC RAILWAY JOURNAL of Nov. 13, 1915, has again become associated with this company, and now holds the title of commercial engineer in its sales organization. Mr. Lincoln is well known in engineering circles through his active work in the American Institute of Electrical Engineers, of which he is a past president. He is a well-known writer on technical subjects and has also been indentified with educational work for some time, filling the chair of professor of electrical engineering of the University of Pittsburgh.

ADVERTISING LITERATURE

National Tube Company, Pittsburgh, Pa., has issued a folder which contains illustrations of its exhibit at the San Francisco Exposition, which received the grand prize for its tubular products and fittings.

Delta-Star Electric Company, Chicago, Ill., has issued descriptive Leaflet No. 910, showing its special high-tension disconnecting switches, "unit type" indoor equipment, suspension type disconnecting switches, and surge arresters.

Electric Service Supplies Company, Philadelphia, Pa., has issued a folder describing its Keystone lamp guards, suitable for protecting lamps in mines, tunnels, subways, locomotive or car pits, as well as for other general uses where a wall type is required.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a reprint of a paper entitled "Notes on Electric Power Development," by E. M. Herr, president of the company, which was presented at a meeting of the Railway Club of Pittsburgh on May 28, 1915.

Armstrong Cork & Insulation Company, Pittsburgh, Pa., has issued a cardboard-bound booklet which discusses thoroughly the chief insulating qualities of its Nonpareil corkboard. The catalog also analyzes the other qualtiies of this material, which include non-absorbence of moisture, sanitary and odorless quality, compactness, strength and slow burning and fire-retarding qualities. The catalog describes a number of tests which have been conducted, the results of which support the above contentions for quality.

C. W. Hunt Company, Inc., West New Brighton, N. Y., has issued Catalog No. 15-4 which contains specifications of its pivoted bucket conveyor, with plates giving conveyor details valuable to engineers in laying out a boiler house. Two of the illustrations are of particular interest in showing the adaptation of the conveyor buckets to railway power houses. One illustration shows a view of the run of conveyor buckets as installed by the Rochester Railway & Light Company, Rochester, N. Y. The other two illustrations are taken from an installation in the power house of the Springfield Street Railway, Springfield, Mass. One of these illustrations show the coal passing through a rotary filler into a conveyor after being crushed. The coal is then elevated to a hopper in the tower, and taken by cable railway to the storage bin over the boiler.