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JAMES H. MCGRAW, President.

J. M. WAKEMAN, 1st Vice-President. A. E. CLIFFORD, 2d Vice-President.

CURTIS E. WHITTLESEY, Secretary and Treasurer.

TELEPHONE CALL: 4700 BRYANT. CABLE ADDRESS: STRYJOURN, NEW YORK.

HENRY W. BLAKE, Editor.

L. E. GOULD, Western Editor. RODNEY HITT, Associate Editor.

FREDERIC NICHOLAS, Associate Editor.

CHICAGO OFFICE.....590 Old Colony Building
CLEVELAND OFFICE.....1015 Schofield Building
PHILADELPHIA OFFICE.....Real Estate Trust Building
EUROPEAN OFFICE...Hastings House, Norfolk St., Strand, London, Eng.

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Central States Interurban Map

A new map is always of interest, and the electric railway groups of the North Central States readily lend themselves to graphic presentation. No city of any size and hardly a county in Ohio, Indiana, Illinois and lower Michigan and Wisconsin is without its electric railway mileage. Some of the principal centers are even linked with more than one electric route. As a part of this issue we present a map which clearly shows the extent of electric interurban railway development in the Central States. It is noteworthy that, with a break of but 22 miles, and that now nearing closure, travel is possible on electric cars from Sheboygan, Wis., 52 miles north of Milwaukee, across the North Central States and into Central New York. Less than 50 miles of construction will complete the electric route from St. Louis to Chicago and the East. Several times electric cars have taken parties from Louisville, Ky., north to Detroit, Mich., and passengers might have journeyed 125 miles farther north to Bay City, had this extension of the trip been desired. The growth of the industry which has made these statements possible is not slackening. We look forward to seeing in the new year Canada linked electrically with the United States through the tunnels under the Detroit River. Missouri also will soon be joined with Illinois by interurban service over the new Mississippi River bridge at St. Louis, an electric railway enterprise. All these extensions are shown on the new map, and it is well worth while to examine the entire territory and so gain a new impression of the magnitude of the electric railway development.

Electric Railway Growth in the Western States

In 1909 the electric railways of the Rocky Mountain and the Pacific Coast States made substantial progress not only in extensions but in largely increased facilities for handling traffic on established lines. The West is large, and only a small part of the opportunity awaiting the investor has been grasped. The vast territory of the Pacific slope now is only beginning to receive the benefits of the rapidly increasing influx of settlers from the East that is following the remarkable revival shown by all lines of business in the West.

Only a few of the more densely populated business centers of the Western States are linked by electric railways. These cities have excellent local transportation facilities, which have been largely instrumental in the rapid urban expansion characteristic of the Far West, and scarcely one of these electric railway systems stood still during the recent lean period.

The great variety of operating methods in vogue in the Far West commands interest, as do the numerous undertakings that are novel from the viewpoint of the engineer. As typical examples of recent development in the Western electric railway field several interesting projects may be cited. In the

Rocky Mountain State of Colorado an example of heavy electric railroading is found on the Denver-Boulder division of the Colorado & Southern steam railway system. This division has been in electric operation since May, 1909, and to an engineer is particularly interesting because 11,000-volt current is distributed direct to the cars from a catenary supported trolley, without the use of step-down transformer stations. Traffic conditions on this road are largely indicative of many Western properties. The electric service so built up the passenger traffic during the first season of operation that not enough cars were available for handling the loads, even though steam coaches were borrowed and used as trailers. This upbuilding of traffic is, of course, characteristic of any electric line, and shows that electric service will initiate traffic in territory where the residents never before used parallel steam railroad facilities.

West of the Rocky Mountains, in the Salt Lake valley, similar electric railway conditions are found. The Utah Light & Railway Company has just completed rebuilding the Salt Lake City street railway system. Those in charge of the property are placing its operation on a most up-to-date basis, with new cars, shops, car houses, power stations and, most important of all, a new "work together" spirit. The growth of population in the Salt Lake valley has been so steady and local travel has so increased that a 40-mile standard-gage steam line, the Salt Lake & Ogden, is now being equipped for electrical operation between the cities whose names it bears. Also a quarry road, extending 14 miles up a canyon east from Salt Lake City, a year ago found it profitable to electrify, and now enjoys a steady passenger traffic, where before only rock was hauled. These roads and others have shown and will continue to demonstrate that in the West as well as in the East, though perhaps to a greater degree, an electric road will greatly stimulate traffic or originate it where there was none before.

Journeying now into the Northwest, we find communities whose existence is dependent entirely upon the development of their natural resources by transportation facilities. Several such districts, large in extent, have no means of transportation other than by electricity. Such conditions of dependence on electric transportation are found in the Inland Empire country south of Spokane, Wash., in the environs of Vancouver, B. C., near Seattle and Tacoma, on the Puget Sound, and in the district of which Portland, Ore., is the center. In each of these communities population and electric transportation facilities have advanced hand in hand. One year a trolley line is built out of a big city and into a country almost desolate of human inhabitants. The road is advertised—they do that well in the West—and a year later, because of increased traffic, the schedule of cars has to be boosted. We recall one road, now partly built, which will extend 63 miles straightaway into the woods and river prairies of lower British Columbia. A good portion of the cleared right-of-way of this line looks almost like a mountain canyon with the tall timber on either side. Conservative estimates based on earlier experience show that this road will haul enough lumber out of the woods and transport enough household goods and supplies into the newly opened territory to pay operating expenses from the start, and with practically no initial population. As fast as the timber is cleared market gardens flourish and passenger traffic follows.

In California numerous lines might be indicated, any one of which has been instrumental in bringing about largely increased settlement of the nearby agricultural and residence districts. Of course, other roads unfortunately have been built across ranches many thousand acres in extent which have not been subdivided, and therefore the growth of traffic in these localities awaits the time when legal or personal barriers will permit the parceling of the land to newcomers.

Los Angeles and its nearby neighbors offer an example of a most wonderful electric railway growth brought about by favorable natural conditions of land, sea and sky. Here a suburban business has been developed that requires the operation of more than 1200 large double-truck interurban cars, and many passengers are hauled 40 miles twice a day. The electric railroads in and about Los Angeles have struggled to meet the demands of travel, and now, in spite of what in the East would be considered an abnormal development, construction work is still in progress.

These conditions, indicative of the growth of electric travel in the West, are not overdrawn. When one begins to build an electric road in a Far Western community he must be prepared to keep up with a marvelous growth in population. Experience has shown this condition to be true from the Rocky Mountains to the Pacific Coast and from British Columbia to Mexico.

The Electric Railway Situation

Revival in business has minimized somewhat the conditions which have been disturbing elements in the electric railway situation, but it cannot remove them entirely, and they still remain problems for solution. The revival in industrial conditions, which has gained greater strength in substantially all parts of the country, has restored the gross revenues of electric lines to normal levels, and the decreases or irregular gains of the last few years are succeeded by the consistent improvement in gross earning power which is the expected attribute of electric railway operation.

The turn of the year is an appropriate time for retrospect, calm judgment and prophecy. When the events of the last 12 months are considered from the historical point of view it becomes plain that they can best be treated through the columns of the *ELECTRIC RAILWAY JOURNAL* by discussion and statistics. While the problems of the electric railway industry as the new year opens are not radically different in kind from those that prevailed at the beginning of 1909, they have been altered somewhat in degree; and it is the progress toward solution and the need of proper consideration of the great questions involved that the contributors to the symposium in this issue discuss. A reading of the various expressions of opinion concerning "The Electric Railway Situation" shows a general appreciation of similar conditions which demand attention in all sections of the country.

When the problems are analyzed it is seen that their existence is due in part to faults and mistakes of the past and in part to causes that are economic in nature and beyond the control of the railways. The object of the review of the year, which occupies so large a part of this first issue of 1910, is to present the railway point of view of the existing difficulties. The questions considered are applicable, in varying measure, to properties of every character and in every locality.

With some of these properties an improvement has been made in various directions which point to ultimate distinct betterment in conditions; with others a keen appreciation of the necessities of the situation has been essential first in order that plans might be made to overcome, if possible, the effect of the development of increased costs and public demands. In a number of communities definite steps have been taken to increase fares, reduce transfer abuse, or remedy other conditions which were plainly in error, and in other cities preliminary plans for improvement are well under way.

The review of the problems of the year contained in this number was compiled with the idea that the best interests of the industry would be served if the material published should deal largely with problems which are common to all properties rather than with questions which are purely local. Yet the fact is that the most important questions affecting any one property are either of immediate concern to all the others or will require attention eventually. One of the real problems which is before the leaders of the industry is whether each property shall work out its own salvation or its failure as best it may, or whether the serious questions can be answered with better advantage to all by an inquiry on behalf of the combined properties, say through the American Street & Interurban Railway Association. This view of the subject is taken by Mr. Sergeant, who concludes his careful study of the problems of the times with the definite recommendation that the American Association make a searching inquiry into the cost of doing business under different circumstances and in different localities in order that a true basis for the establishment of fares may be determined. Mr. Ford thinks it is questionable whether in large cities, with unlimited transfers, the 5-cent flat fare provides as much as a reasonable rate of return.

In any inquiry that may be undertaken concerning the cost of the service the element of value of the service should also be taken into account. Where there is extreme and assured density of traffic, month by month and year in and year out, the cost of the service, if full protection of all the property rights involved is certain, may be fairly regarded as a greater element in such an inquiry than in communities where the population is so small that consideration of the cost alone would not attract the investment required. Fares are more nearly uniform than costs of furnishing the service; and save where the system of accounts is prescribed by law the costs of providing the service are not determined by the same methods. If the costs of performing the service, if the elements which should be taken into account are questions upon which no analytical inquiry has been brought to bear by the companies themselves, the results of inaction may be seen in more experimental public inquiries of the nature of that which has just been imposed in Cleveland.

It is possible here to refer only incidentally to some of the questions discussed by the authors of the valuable papers published elsewhere in this issue. It should be added that the contributors to the symposium represent typical and prominent properties so located geographically as to give a representation to nearly every part of the United States and to most of the leading associations, as well as to widely differing classes of properties. We realize that many of our readers are students of the vital questions involved, and we offer our columns at any time for further discussion of these or kindred topics.

Passing to the statistical features of this number, attention will be directed to the figures of new track construction, which indicate a falling off as compared with the previous year. The returns are not complete, owing to the failure of some companies to respond to continued solicitation, but other causes are more directly responsible for the discrepancy. The figures of 1908 contained a large amount of new track construction, which was started before the panic and therefore had to be carried to completion to avoid heavy loss. This is true with respect both to extensions of existing properties and to new roads. New track construction is usually planned a year or two in advance, and since the financial and business conditions were not wholly propitious in 1908 for enterprises involving large outlays of capital, the effect is manifest in the returns for 1909. Our records as compiled, therefore, show an aggregate of 887.16 miles of new track construction during 1909. The returns from the same companies, however, show that the existing roads which made reports contemplate the construction of 1765 miles of new track during 1910. This figure, of course, makes no allowance for the total on account of projected properties that will carry their plans to completion during the present year.

Engineering Developments of the Year

Articles elsewhere in this issue describe the accomplishment in each branch of electric railway engineering in this country during the past year, and while all agree that there is nothing which can be considered as spectacular, the work undertaken has been solid and affords good foundation for future development. We had hoped that during the past 12 months a closer definition would have been made of the proper provinces and limitations of the four principal systems of electric operation, low-tension direct-current, high-tension direct-current, single-phase and three-phase. That this was not so may have been due to the fact that the number of new undertakings in which there was real opportunity for a choice was limited. On the other hand, the converse is equally true. Until the leading electrical engineers of the country are in closer agreement as to what can be done, and even what has been accomplished, so far as these different systems of electric traction are concerned, the managements of large corporations will be unwilling to make radical changes. The only large installation in which a choice of systems was reached this year was that of the Pennsylvania Railroad for its New York station and tunnels, and here the decision to confine electric operation to a limited terminal zone and the fact that the Long Island Railroad, which will also use the station and tunnels, was already far advanced in the work of converting its suburban tracks for low-voltage direct-current operation, made the selection of this system practically a necessity. The cause of steam railroad electrification in a new field of mountain grade operation has been advanced also by the successful initiation of the service of three-phase locomotives in the Cascade tunnel of the Great Northern Railway.

In electric locomotive design the use of side rods probably constitutes the most noteworthy improvement made during the year. It would be unsafe to say that the geared locomotive is doomed. It will undoubtedly be employed very generally in the future, but for heavy high-speed service the advantages of greater available space for motors, better distribution of

equipment and the reduction of dead weight on the axle which are gained by the use of side-rod connections more than counterbalance the slightly greater mechanical complications. In motors intended for heavy duty, as well as in generators, greater attention has been directed to increasing the output by forced ventilation, the practical result of which is the use of much smaller and less costly machines at a slightly increased cost of operation. The commutating pole motor is peculiarly adapted to operation with forced ventilation owing to its perfect commutation under extreme overloads. The limiting factor in the design of motors of this type is now the capacity of the insulation on the windings to resist high temperatures for long periods without deterioration.

Passing now to standard equipments for urban and interurban roads, the use of interpole motors is growing, possibly because of the increased interest in high-tension direct-current systems of distribution. With these motors there should be a reduction in commutator trouble, the most prolific cause for complaint in electrical equipments. These motors, of course, are equally well adapted for standard potentials. Multiple-unit control, in which the motor current is broken in contactors under the car body instead of in the controller on the platform, is also being more widely used for heavy interurban equipment, regardless of any immediate intention to begin train operation. So far as the rest of the car equipment is concerned, the most important subject for debate during the past year has been in regard to the design and in decreasing the weight of the car body. There is no doubt that general sentiment now favors a lighter car, certainly for city service, than was the case a few years ago, and that such a car can be constructed with due regard to strength is an opinion generally held. Closer scrutiny is being paid also to the weights of the parts carried on the car. The question of design, as distinguished from construction, has been practically confined to the different forms of prepayment entrances, and while no one form can be considered a standard, it is safe to say that the desirability of the prepayment idea for city roads is now settled. The plan has not yet been extended to any extent to the interurban field, and the line of demarcation as to its usefulness as regards cars in large cities and those on smaller systems and in suburban service has not been very closely drawn. Possibly next year there will be a different story.

In overhead construction there has been a distinct tendency toward the use of catenary work wherever a fair rate of speed is used. The adoption of this class of construction, and also of higher trolley wire potentials, has had a stimulating reflex action on the improvement of overhead insulation and appliances.

In power stations perhaps the most important development of the year has been the establishment of the exhaust steam turbine as practicable and economically desirable. Rateau, and possibly others, called attention several years ago to the peculiar fitness of the turbine for use with low-pressure steam, but it has principally been during 1909 that the results secured from the operation of such machines in railway power stations in Philadelphia and New York have become available. In steam turbines also the evidences of the trend to gain greater initial and operating economy by the construction of larger units are apparent.

In track construction, open-hearth steel is being favorably

considered in place of Bessemer steel for rails. The use of T-rail in paved streets is not meeting with as much opposition as formerly from city engineers, and its advantages from the standpoint of the railway companies are being more generally appreciated. Standardization of rail sections, although much discussed during the year, made little real progress. Preservative treatment for ties has attracted the attention of many track engineers more forcibly than ever before on account of the increasing price of timber. The cost of preservative treatment is slowly decreasing and facilities for applying it are being extended all over the country.

Outside of the electric trolley car the chief candidate for favor is the car driven by gasoline, either directly by an internal combustion engine or through the medium of a self-contained engine and electric generator in the car body and motors on the axles. The gasoline car has undoubtedly gained favor during the past year, not so much because of the number of installations, which have been few, but because of the desire for an independent unit, and also because of the general recognition of the efficiency and reliability of the gasoline engine. As yet the use of the new cars has been confined chiefly to installations where the trolley system is out of the question, as in some of the narrow streets of New York and on cross-country lines of very light traffic. It is safe to say that the gasoline car will never replace the trolley car where the headway between cars is short. But for light suburban railway lines there is opportunity for its use, though the burden of the proof of its adaptability for this service is still on its advocates.

Electric Lighting of Cars

The recent hearings before the Public Service Commission with respect to the lighting of the subway and elevated railway cars in New York City, resulting in the decision by the Interborough Company to return to the 16-cp plain incandescent lamp bulbs originally used in the cars, again remind us of the backward state of car lighting as compared with the refinements which during the past few years have been introduced into the art of interior illumination.

Railway cars, both steam and electric, are still illuminated, with few exceptions, in the same general manner as they have always been. The transition from kerosene lamps to Pintsch gas on steam railroads, though gradual, has been general, but it has been effected with no particular change in the location and distribution of the sources of light. Electric car lighting, beginning in the early days of the trolley on very similar lines, was improved a little, perhaps, by the fact that single lamp fixtures are more readily distributed throughout the car in electric lighting than in gas lighting. But even in the most modern and carefully developed instances of electric car lighting in vogue in interurban and rapid transit electric cars, the location and distribution of the lighting units is far from satisfactory, from the standpoint of the passenger who desires to read while riding, without fatiguing the eyes. And if one does not wish to read, but desires simply to rest, as is frequently the habit of long distance travelers and suburban commuters late at night, the long vista of glowing filaments becomes an annoyance little short of intolerable, no matter how comfortable the seats or how agreeable the temperature of the car interior. The difficulty is, of course, inherent in the dis-

tribution of the lighting units, in a long compartment with a low ceiling, and usually a dark background.

Two years ago there was only one device on the market which indicated any tendency toward diffusing and softening the light for car illumination, and the price asked for it was practically prohibitive, in competition with the ordinary system. The various attempts to utilize prismatic glass shades are not radically different in conception from former ideas, and in practice have not so far shown themselves to be a generally acceptable solution. The fact that even the most recently designed motor cars show no signs of departure from the former practice seems to indicate either a lack of interest among electric railway equipment engineers in tackling a hard problem, or a lack of disposition on the part of the manufacturers to take practical steps away from the beaten path.

If one wishes to determine the extent to which illumination, when good, is used on cars let him look in a well lighted car and see the number of people who are reading papers. We believe those so occupied will average 50 per cent of the passengers during all the hours in which the lamps are used, whether the car is an electric car or a steam railroad coach. It is a fact, however, that in steam railroad car lighting, progress towards anything better than the oil lamp was extremely slow, and was inspired more by considerations of safety from fire than by any particular regard for the eyesight of the passenger. It is, therefore, not surprising that the lighting of electric cars should be treated from a similar point of view. We venture to believe, however, that the time has now arrived for the expenditure of some intelligent work on car illumination by equipment engineers. As the present system is defective not in the quantity of light but in the manner of its distribution, the cost of an improved system should not be greatly, if any, in excess of that now in use. Even at a slight increase in cost we believe that many railway companies would look upon any real improvement as upon any other step to attract travel by making the cars more attractive. The field should prove a fruitful one for the inventor.

Presentation of Grievances

We believe that every broad-minded electric railway manager is pleased to have real grievances, for which his company is responsible, brought to his attention, whether they affect the public or his own employees. No one is omniscient, and if the hardships are real they should be remedied or ameliorated if possible. If this cannot be done, the situation should be explained to those making the complaints, whether they are within or without the organization. In dealing with the class of grievances which relate to employees, many managers have adopted the practice of appointing a committee to listen to accounts of alleged defects in the service, or, where the manager himself attends to these matters, of having a committee of employees present directly to him the claims which require his attention. Where either plan is followed it is the obvious duty of the person presenting the grievances to be sure that his cause is just. Otherwise, he puts himself as well as his complaint in a ridiculous light.

A short time ago a representative of this paper was present during a discussion between the general manager of a large Western property, comprising both interurban and city divisions, and a committee from a group of carmen who were employed at a small city division and were urging the cause of

one of their number, the president of their local organization, who had been discharged for running his car over several steam railroad crossings without flagging them. Two members of the committee repeatedly called the attention of the general manager to the high grade of the men who make up their body, and emphasized the earnest desire on the part of all the men to abide strictly by the rules of the company. The general manager whom they were addressing agreed with the committeemen that organized men, as well as all other men, should be progressive and should abide by the rules. After a little fatherly talk on this subject by the general manager, two of the committeemen quickly volunteered assurance that all rules of the company were being observed by the men they represented. Immediately the general manager asked one of the two spokesmen, both of whom were in uniform, for his rule book and asked the other for his pad of accident blanks. The company's rules, subscribed to by the men, required that both rule book and accident blanks should be carried whenever uniforms were worn. One man, who had boldly pleaded the cause of another that had been discharged for running railroad crossings, did not have his rule book. The other did not have his accident pad, and both were in uniform. Then followed a lecture from the general manager of undoubted good to the men, and with an obvious moral.

This case well illustrates a statement made recently by a well-known railroad man, that if men persistently and maliciously break the rules of the company they cannot reasonably expect any organization to be successful in protecting them in their positions. As in any other well-regulated business, a railway system must maintain strict discipline if it is to be successful.

We are prompted to review here some of the charges frequently calling for discipline, and charges that have placed soliciting committees in embarrassing situations when seeking the mitigation of punishment. One of these is the practice of giving transfers to employees riding on badges, for which, it is needless to say, no reasonable excuse can be offered. Under the rules of practically all companies the badge is sufficient for free transportation. If the employee does not desire to make known his identity by showing his badge, he should pay his fare, thus permitting the conductor to keep his own record clear. On another road motormen have frequently to be admonished for running ahead of time. On a steam road this practice would mean dismissal. Of course, the danger to life is not so great on a street railway, but there are excellent reasons why cars should not precede their schedule time. Principal among these is the desire of the transportation department of any company to afford a uniform and reliable schedule as a means for retaining the high regard of the public which it serves.

A paper which has for its avowed object the welfare of transportation men has said that drinking on duty and spending time in saloons are serious charges and that no committee has been able to justify this most dangerous conduct—which usually results in a grievance case being “thrown upon the mercy of the court.” It is easy for one to hold up to the light the faults of another, but we may not be overstepping our province if we suggest that it is hardly within the province of a grievance committee to extenuate avoidable violations of the rules. It can endeavor to mitigate too rigorous a regulation, but so long as a rule is in the books it should be enforced.

THE ELECTRIC RAILWAY SITUATION

A REVIEW OF THE PROBLEMS OF THE YEAR

PROBLEMS CONFRONTING STREET RAILWAYS

BY CHARLES S. SERGEANT, VICE-PRESIDENT, BOSTON ELEVATED RAILWAY

Perhaps the most pressing question at present which is common to street railways in all sections of this country is the one of satisfying the public demands, whether they be for extension of lines, lower fares for longer journeys, new systems of more rapid transit, increased taxation or payments for franchises, reduction of capital to valuation figures, or the many indirect burdens of paving, bridge construction or other highway expenses. The problem of reconciling such demands with a fair wage for employees and a reasonable return to investors may well engage the attention of all managers.

Nearly every one will concede in theory that capital actually invested is entitled to a fair return, but in practice such a right is not always considered by public authorities when new demands are made upon the railways. The most conspicuous example is the tendency to grant only short-term franchises.

The enormous capital outlay required for a first-class city system is absolutely unjustified unless the privilege is to endure sufficiently long to provide for amortizing the major part of the investment by the provision from revenue of suitable sinking funds before the expiration of the franchise.

Most railway men know that this amortization is impossible under ordinary American conditions, and will doubtless agree that investment under short-term franchises is hazardous in the extreme.

There are many causes for a public opinion which is so mistaken as to the conditions of so important an industry, not the least being over-capitalization, and the exaggerated ideas of possible profits which have been so widely disseminated. Street railway investors have come to a realizing sense of the narrow margins of profit afforded by the business, but the general public needs to be enlightened.

To this end some authentic source of information to the public should be supplied, and this can best be done by systematic reports to some public board having jurisdiction. From such reports may be deduced the amounts invested, the costs of the business, the facts as to what constitutes a reasonable fare. Such reports should be of great value to the investor as well as to the public.

One of the great factors in creating erroneous ideas of profits has been the failure in many instances to maintain suitably the property, and in still more instances the failure to provide from revenue for suitable maintenance. When necessity arose provision has too often been made from some reorganization or rehabilitation fund supplied by the issue of additional stock or bonds.

It is probably true that upon the whole the revenue of American street railways has never been charged with sums even approximating the actual costs of maintenance, notwithstanding the fact that due and proper maintenance is as essential to the getting of revenue and to the rendering of a suitable service as it is to the preservation intact of the assets against which securities are issued. Evils of this sort would be disclosed by suitable accounts and authentic reports, and remedies would then be devised and adopted.

REDUCTION OF TAXATION OR INCREASE OF FARE

It is proper to ask what those remedies could be. If the revenue is insufficient to maintain and operate the property when the operation is carried on efficiently, can there be any other remedy than reduction of taxation or increase of fare?

All taxation of a transportation company's *business* (as dis-

tinguished from its real property) reduces its ability to serve the public, for which end alone it presumably exists.

Payments for franchises and divisions of profits with city or State are therefore direct burdens upon the people who ride or ship goods. This is especially true when dividends are restricted by law to ordinary interest rates.

With the ever-increasing waste and expense of government, new sources of taxation are continually sought and under such circumstances relief for street railways by abatement of taxation will be difficult or impossible to obtain.

INCREASE OF RATES OF FARE

Our last remedy lies in the increase of rates of fare. This may be accomplished by reduction of free transfers, by direct reduction of journey lengths through the establishment of new fare limits, or by direct increase of fare.

The almost universal American system of a uniform 5-cent fare was established in the days of the short journey in a light-weight horse car drawn at a slow rate upon a cheap track. The purchasing power of 5 cents was then very much greater than at present, and the service rendered the public in every way very much less.

Still further, the fare was not attenuated by the free transfer—a comparatively modern invention.

The theory upon which a uniform fare rests is that of the postage stamp, a common payment for all, regardless of length of journey. Hence the short-distance rider pays for the losses of carrying the long-distance rider. The company must make from its short journeys the expense of the long journeys, and any and all possible profits. It is obvious, therefore, that any extension of the journey of the short-distance passenger by free transfer or otherwise is absolutely inconsistent with the theory upon which a uniform fare is based. With the growth of cities and extension of lines to more sparsely settled tracts the ride of the long-distance passenger is continually increased, and there is no relief for the transportation company until a sufficient local short-distance traffic can be created by the growth of density in population after a lapse of much time.

This condition must constantly tend to become worse, and is one of the strongest reasons for revision of fares.

The benefits of the uniform low fare undoubtedly have been great from the sociological point of view, and still greater in the development of real estate and taxable property, but all at the expense of the investors in street railways, who would have been well advised had they long since adopted the more logical European system of fare rates proportioned to journey lengths.

In Massachusetts, outside of the metropolitan district, the uniform fare has often been established sentimentally in response to the cry of "one fare in one town," frequently without any regard to the sparseness of population or the length of the journey. In the metropolitan district of Boston and its suburban cities journeys for one fare may be made to include a number of cities.

The fixing and regulation of fares would seem properly to be a function of the owners of the street railways. It is only when business is performed under a public franchise that the owner is deprived of the right to fix the price of his wares, and there would seem to be very good reasons why this should not be the case.

It may be argued that the franchise is a necessary preliminary in the case of public service corporations to securing for the general public the facilities for transportation or lighting or other public services. The object of granting the franchise is not that certain investors may make money, but that the public may have the great benefits of the service to be

provided. Full protection of the public would seem to be secured where the rate of dividend or profit to the investor is fixed by law. That the law should go further than this and undertake to determine the rates to be charged seems an encroachment upon private right, and one which clearly, under the circumstances of legal limitation of dividends, is unnecessary. Under such circumstances the owners of the property will be certain, either to make rates as low as possible in order to secure a large revenue, or to produce with their rates surplus revenue which may be applied to needed improvements in the service. The public is bound to benefit in either case, and it would therefore seem that the public control of rates should be limited only to rates which were unfair or discriminative.

I believe that the question of rates in its broad sense is one of the most pressing and difficult problems to be solved by street railways; that it necessarily involves inquiry and publicity, and therefore I would urge upon the American Street & Interurban Railway Association the importance of a careful and searching inquiry into the costs of doing business under different circumstances and in different localities in order that a true basis for the establishment of fares may be determined.

THE AMERICAN STREET & INTERURBAN RAILWAY ASSOCIATION

BY JAMES F. SHAW, PRESIDENT, BOSTON, MASS.

The prosperity or success of an organization representing an industry can be judged by any one of several standards. The only proper criterion is the benefit which an association renders the industry which it represents. Other standards sometimes taken to measure the standing of an association are its financial condition and the size of its membership. Considered in any of these three aspects, the American Street & Interurban Railway Association has never been in more flourishing condition, and it is entering upon the fifth year of its history in better shape than ever before to serve the electric railways of the country. The success from every standpoint of the Denver convention is now a matter of history, and every one who was in attendance will treasure it in his memory as one of the most pleasant as well as one of the most profitable ever held. It may be of interest to give here the figures of the attendance at that convention and at the previous convention in Atlantic City, which was by far the largest of any previously held by the association or by its predecessor, the American Street Railway Association. The membership of the association is made up very largely of Eastern companies, and the majority of the manufacturers of electric railway apparatus who exhibit at conventions live in the East, so that few people expected that the registration at the Denver convention would be anywhere near so large as that at Atlantic City in 1908. Nevertheless the total number which registered at the convention was 2800 as compared with 3300 at the 1908 convention or a difference of only 500. It may also be of interest to state that since the report of the secretary and treasurer was presented at that convention and up to Dec. 15 there has been a notable increase in the membership, which now consists of 328 active members and 900 associate members.

MIDYEAR MEETING

In accordance with a decision reached at Denver, a mid-year meeting of the association will be held at the headquarters of the American Street & Interurban Railway Association in New York on Jan. 28. This meeting has been called because of the feeling often expressed on the convention floor and elsewhere that it is impossible with but one meeting a year to accomplish all the work of which the association is capable, or even for the member companies to keep in touch with the subjects upon which co-operative effort is desirable.

In one sense this midyear meeting, which will be confined to the American Association or parent body, will be an innovation; in another sense it will not be without precedent even in our

own association because it will correspond to the joint meeting which has been held in New York for several years during the winter by the executive and other committees of the association. These meetings have always proved so mutually helpful and profitable that it is thought even greater benefit will result from the meeting during this January. Arrangements have been made for the presentation to the association at this time of papers by well-known members upon subjects of timely interest and the meeting will be preceded by sessions of various committees of the association.

THE NEW YORK OFFICE

Outside of its committee work and that accomplished at its midwinter and fall conventions, the activities of the association are represented by the work carried on continually throughout the year at its New York office. This office, of course, is also the main office of each of the affiliated associations, and owing to the growing needs of these organizations the demands made upon it are constantly increasing. This is a healthy sign and indicates a condition which we are glad to have. It is now proposed to add still further to the duties of the central office by having it keep closely in touch with the officers of the various State and other local street railway organizations throughout the country. Tentative plans by which these local organizations and our own can be of great assistance to each other have been suggested, but to define a future line of work invitations will be extended to each of these organizations to send a representative or representatives to a meeting to consider the subject to be held in New York on Jan. 27. At this time it is hoped that a plan of close co-operation, which will be mutually beneficial, can be adopted.

THE FUTURE WORK AND POLICY OF THE ASSOCIATION

The assignment by the main association to the various affiliated associations of all subjects of an accounting, engineering, claim, transportation and traffic character, leaves to the main organization, as its chief work, that of the broader aspects of the relations between the railway companies and the public and of the companies with their employees. So far as one can now look ahead, these two subjects afford sufficient scope to occupy the best efforts of the association for many years to come. Under the general subject of public relations can be grouped such important topics as those of national and State regulation in its various forms, franchise requirements, taxes, including the new corporation tax, publicity in its wider aspect, the fare question and the proper issuance and regulation of transfers. In the second division naturally fall questions relating to wages and welfare of employees, pensions, accident insurance, etc. There are also certain other matters of broad policy, such as fire insurance, which will naturally be assumed by the executives of the different companies and so will undoubtedly come within the province of the main association.

THE NEXT ANNUAL CONVENTION

To assist in the solution of these questions it has been proposed that at the next annual meeting of the association half a day or an entire day should be devoted to addresses from men prominently connected with the Federal or State governments, financial institutions of national importance, and members of the bench and bar who have been giving attention to electric railway problems of this kind, but have not in the past attended many of our conventions. Assurances have been received from several of these gentlemen that they will accept invitations of this kind, if extended by the association, and it is believed that if a part of the time of the next annual convention should be devoted to a meeting of this kind it would be exceedingly helpful.

The location of each convention in recent years has been determined in the spring by the executive committee, as the result of a report made by a special committee appointed at the January midwinter meeting. As this course will probably be followed in connection with the 1910 meeting, it is impossible yet to make any announcement of the place to be selected. I might say, however, that invitations have been extended to the association to meet in St. Louis, Saratoga, Niagara Falls,

Atlantic City, Portland, Ore.; Rochester, N. Y., and in one or two other places.

IMPORTANCE OF ATTENDING THE MIDYEAR MEETING

The writer sincerely hopes that the plan of a midwinter meeting will meet the approval of the executives of the member companies and that there will be a large and enthusiastic attendance at the meeting on Jan. 28.

RECENT ELECTRIC RAILWAY PROGRESS

BY A. H. ARMSTRONG, RAILWAY DEPARTMENT, GENERAL ELECTRIC CO.,
SCHENECTADY

While the past year has not been characterized by the large number and magnitude of its electric railway installations, some of those made are of special interest as giving indication of the development of the industry along new and broader lines. To the evidence of actual installations should be added the papers and discussions in the various engineering societies, which, while largely describing apparatus already built and in operation, yet unfold to some extent the designs and plans under way for the present and immediate future. Taken all together, it is conservative to state that the electric railway industry has made most important advances during the year just passed and is now entering into untrodden fields of great extent.

LARGER UNITS AND HIGHER POTENTIALS

One of the controlling reasons for the broader outlook is undoubtedly found in the preparedness of the manufacturing companies to furnish the more powerful machinery required to meet the demand for larger generating and transforming units operating at greater efficiency and still higher potentials. Nowhere is this shown to such an extent as in the construction of electric locomotives capable of replacing the largest and most powerful steam locomotives that 80 years of development has perfected.

The placing on the market of turbo-generator units of 18,000 kw capacity, rotary converters of 3000 kw, transformers of 10,000 kw, operating at practically any line potential asked for, and of switchboard apparatus able to control reliably any aggregation of these units, has resulted only in effecting economies in generating and distributing systems and increasing their radius of usefulness. The development of electric railway rolling stock has, however, continually opened up new fields until now when the limitations of the steam locomotives are being most acutely felt upon our increasingly congested trunk lines, the electric locomotive is so far perfected and proven successful in the daily operation of the electrified divisions of several well-known steam roads, that the most conservative must admit its fitness for certain classes of service.

ELECTRICITY ON MOUNTAIN DIVISIONS

The electrification of steam roads presents a problem of such tremendous importance that interest naturally centers in the progress made in this direction. In this connection attention is drawn to the installation of electric locomotives at Cascade Tunnel on the Great Northern Railway, fully described in the paper by Dr. Hutchinson before the American Institute of Electrical Engineers. This is our first example of large electric locomotives being used on mountain grades, and the immediate reason for their adoption in this case was the desire to eliminate the dangers of steam locomotive operation through an unventilated tunnel over 2 miles long. It is worthy of note, however, that the installation is of such a character that it is readily adapted to extension over the entire Cascade Mountain division of the Great Northern.

It is evident that the Western roads offer a particularly attractive field for the operation of electric locomotives on their mountain divisions. The conditions are none too favorable for steam locomotive operation, and double tracking to avoid congestion is a much more expensive way to gain increased track capacity than electrification. That the present Great Northern installation is but the forerunner of another

of much greater magnitude was indicated by Mr. Sprague in his discussion of Dr. Hutchinson's paper.

LOCOMOTIVE DESIGN

A considerable variety of locomotive construction has been offered. The Great Northern locomotives comprise four three-phase induction motors mounted on two four-wheel bogie trucks articulated. The Detroit River tunnel locomotives are of much the same construction, with, however, 600-volt d. c. motors in place of three-phase induction motors. In both types of locomotives, the motors transmit their torque to the axles through twin gears and the feasibility of this form of construction appears to have been demonstrated.

While side-rod locomotives have been in use for some time in Europe, it was not until this past year that the first experimental unit of this type appeared in Schenectady, followed by the completion of the first Westinghouse locomotive for the Pennsylvania tunnels, also of the side-rod type. In both of these locomotives, the motors are mounted on the side frames, housed in the superstructure and transmit their power to the driving axles through intervening side rods and a counter-shaft. They thus pattern largely after standard steam locomotive construction, the cylinders being replaced by electric motors.

The advantages of side-rod construction appear three-fold, greater motor capacity made possible with the larger space available above the axles, higher center of gravity and all motor construction spring supported on the side frames. For moderate outputs per axle, the axle motor, either geared or gearless depending upon the speed, probably offers a type of construction that is most efficient both in first cost and cost of operation. Together with the steam locomotive boiler, however, the axle motor suffers by reason of the space restrictions imposed by a 4-ft. 8½-in. gage. Mounting motors in the superstructure gives the additional motor space needed for units of large output and at the same time gives a better riding locomotive.

Present developments have not clearly defined the limitations of side-rod construction. The advantages enumerated are obtained at the expense of a considerable increase in weight and cost, together with a decreased efficiency over types of locomotive construction possible with geared and gearless axle motors. Continued developments may, however, result in a more efficient utilization of material, sufficient to eliminate cost of construction as a controlling factor.

Both steam and electric locomotives of recent construction give evidence of the acceptance of the necessity of leading or guiding trucks, preferably a four-wheel guiding truck for locomotives designed for high speeds. While this adds to the weight and cost, it undoubtedly increases the reliability in operation and will probably be seen in future designs of large units.

To add to the perplexity of those endeavoring to solve the single-phase vs. d. c. motor tangle, come the tidings of the complete success of the Great Northern installation. While it is true that this is an a. c. installation, it employs three-phase induction motors and double overhead trolley, and while thus differing from all other installations in this country, it appears from Dr. Hutchinson's paper well fitted to fulfill the service requirements.

There are thus three types of motors which have been given commercial trial in the haulage of trunk line trains, the single-phase and three-phase motors utilizing alternating current and the 600-volt d. c. motor. The two former are particularly adapted for trunk line operation by reason of the high trolley potential that can be used. Indeed, the direct current motor would have been hopelessly distanced in the race for recognition in mountain road electrification had it not been for the continued development of the commutating pole motor with its higher voltage possibilities.

The 1200-volt d. c. motor equipments operating or in construction in this country aggregate 60,000 hp operating over upwards of 400 miles of track. The operation of the equipments already installed indicates the entire success of the higher

voltage system. A brush life reaching 100,000 miles gives ample proof of the absence of commutator troubles and indicates that the limit of high voltage d. c. design has not yet been reached with 1200 volts. Control difficulties at the higher potentials were found to be less than expected, and the entire equipment indicates a life and reliability in service practically as good at 1200 volts as at 600 volts.

The success of the 1200-volt third rail on the Central California Railway gives promise of a still further increase in voltage before reaching the limitations of the high voltage third rail as a means of secondary distribution. Perhaps, after all, the question of d. c. vs. a. c. for mountain road electrification will be decided by the superior qualifications of third rail or overhead trolley. In any case it is becoming recognized that any disagreement of engineers as to details of equipment does not fundamentally effect the fitness of the electric locomotive, as such, for haulage of trunk line trains. Indeed, after all these years of development, there is sharp disagreement as to types and details of steam locomotive construction, and the relative claims of d. c. or a. c. govern the selection of the electric locomotive no more than a decision as to simple or compound determines the superiority of the steam locomotive as the type of motive power for a specified duty.

ELECTRIC OPERATION OF TERMINALS

The electrification of steam road terminals in and about large cities has been given increasing attention. Although a decision has been reached to postpone indefinitely the electrification of the Illinois Central, this does not seem to be a final solution of the terminal problem in Chicago if the continued agitation properly reflects public opinion. In this connection it is disappointing to witness the construction of a large steam terminal station in which no provision has been made to benefit from future electrification.

As to the economic value of establishing a terminal electric zone, no figures have yet been made public other than general assurance that the savings effected are sufficiently great to pay a moderate return on the admittedly large expenditure required. The far-reaching decision to adhere to the 600-volt third rail made in the case of the Pennsylvania Railroad terminal in New York City would indicate its general acceptance as the system possessing the greatest all-round advantages for this class of service. The relations of steam, elevated and subway roads are so close as to call for a uniform secondary distribution system, and the 600-volt direct-current motor possesses qualifications for traction service superior to all others. Hence the recent decision to use this system in and about New York may be looked upon as most sound and one that will not in any way act as an obstacle to the possible future extension of the electric zone.

GASOLINE CARS

Not all of the steam road electrification problem concern locomotive operation and the movement of heavy trains. Many miles of branch lines are now being operated at a loss through a territory that would support an electric line giving a reasonably frequent service. To meet such conditions as do not immediately warrant electrification, the gasoline car has been perfected and has given assurance during the past year of its reliability and economy in operation. Two types of cars are available, the first using a mechanical drive, the second having a generator direct connected to the engine and driving the axles through standard 600-volt direct-current motors. Operating figures so far available indicate that such cars have a wide field of application, perhaps extending to some lines now operated electrically and contending with adverse conditions. The gasoline car appears suited for lines where only infrequent headway is demanded or where the available receipts would not justify the heavier fixed charges of electrification. It is also especially suited for repair cars, inspection cars and to replace the electric car during hours of extremely light traffic, thus permitting shutting down the generating and substations. From present indications, the gasoline-engine car has come to stay and will demand an increasing amount of consideration.

The 1200-volt equipments, with a single exception, have utilized two motors in series rather than motors wound direct for the full potential, in order to save weight and cost. As a single motor may be subjected to practically full line potential if its wheels slip, its rotative speed must be low enough at normal voltage to stand double voltage and double speed without injury. This has given rise to the development of a line of motors, designed to run at considerably lower speeds normally than is considered good practice with standard 600-volt motors. The resulting life of armature bearings and commutator has been greatly increased thereby, and it is an economic question if a corresponding reduction in the speed of standard 600-volt motors in general would not result in a decreased maintenance expense that would amply compensate for their increase in weight and cost.

COMMUTATING POLE MOTORS AND CONTROL

While the introduction of the commutating pole into railway motor design is not strictly new, it has borne fruit during the past year to the extent of relegating commutator troubles to the past. The selection of a railway motor then becomes a matter of finding out if it has sufficient radiating surface to dissipate the internal losses developed in a given service.

In the smaller motors, natural ventilation is still used, but forced ventilation is resorted to where the restricted space limitations are more keenly felt, as in motors designed for the heavier locomotives. The attitude towards forced ventilation in general seems to be that while recognizing its benefits for all motors, it is considered cheaper in the end to pay a little more for a slightly heavier motor and avoid the addition of a motor-driven blower. As the capacity of a commutating pole motor with its perfect commutation is practically limited only by its heating, it is not unreasonable to expect that more general advantage will ultimately be taken of forced ventilation, extending possibly to the smaller motors.

The improvements in control apparatus are mostly of a detail nature. Hand operated type "K" controllers are being provided with auxiliary contactors to make and open the circuit, thus leaving the controller cylinder to effect the various resistance combinations only. Train control for 1200-volt equipments is being made selective, that is, it provides that the proper connections shall be automatically made when the car enters a 600- or 1200-volt section. Air compressor motors are being wound for 1200 volts and thrown directly on full trolley voltage, thus following 600-volt practice.

POWER GENERATION AND DISTRIBUTION

The electric railway field is very broad and embraces generating, transmission and distribution systems. Keen interest is therefore taken in the rapid introduction of the low pressure turbine in those generating stations employing reciprocating engines. The resulting increase in capacity and economy of operation has been most satisfactory.

In transmission line construction there is shown a tendency to adopt a type of flexible pole or tower designed to yield when a line-breaks, thus distributing the strain over several poles. Although the great majority of electric railways are supplied at rather moderate transmission line potentials, a departure is being made in the case of the railways in San Francisco which will soon be run from Stanislaus over a line operating at 110,000 volts.

A recent railway substation installation of interest contains a 60-cycle 600-volt rotary converter of 2000-kw capacity. The steady improvement made in the design of high frequency converters has thus resulted in the successful development of a size of 60-cycle unit that would have been considered impossible a few years ago.

While the year just passed cannot be considered as epoch-making, it has reflected the steady development of electric railway apparatus in general. Marked progress has, however, been made in electric locomotive construction, the perfecting of the gasoline-electric car and the further extensions of the 1200-volt d. c. system. All of these developments have a direct bearing upon the steam road electrification problem, and therefore command widespread attention.

FARES, TAXES AND REGULATION

BY C. L. S. TINGLEY, SECOND VICE-PRESIDENT, AMERICAN RAILWAYS COMPANY

Fares, taxes and regulation; these three questions of great importance confront the electric railroad managers to-day. While they seem separate and distinct questions, they are so closely correlated as to be really one.

In most municipalities the fare is fixed by ordinance, usually that empowering the road to operate by electricity. The rate, namely, 5 cents, was originally determined in the old horse-car days, when the length of ride varied from 2 to 4 miles, usually over a single line, involving no transfers, and if a transfer was issued it was apt to be called an exchange ticket, an additional charge being made therefor. At the time of electrification, however, or in some instances prior thereto, came the era of consolidation and unification. The old, disjointed horse railways were united into systems, chartered routes were departed from, and in order to prevent legal complications transfers were issued without charge, thus enabling the rider to follow the charter route of the several constituent lines without paying an additional fare. Then came electricity, the great solvent which was to make all railway men millionaires, and joyously the companies extended their lines out into the country, giving longer and longer rides for a nickel, enriching the real estate operator, enhancing the value of real estate by leaps and bounds, thereby enriching the municipality by increasing its taxable values, and all the time steadily decreasing the return which was received for the only product which they had to sell—namely, rides—until now in many cases the length of ride obtainable for a single fare is out of all proportion to the fare paid. If it were not for the numerous short riders the companies would be quickly thrown into bankruptcy.

Through stress of competition for franchises many companies in the early days, more particularly in the Middle West, have been foolish enough to issue reduced rate tickets and to agree in their franchises to issue the same, thereby materially curtailing their revenue on the supposition that a man with tickets in his pocket, having already spent his money, will ride more frequently than if he had to pay his fare each time. The nickel has been purchasing more and more year by year in the way of street-car transportation; its power to purchase in other directions has been declining year by year; wages have been steadily advancing, and if the demands made by organized labor and the platforms which they are promulgating are any criterion, the end is not yet. Materials have kept pace with or outrun labor. In a table published in a recent number of the *Railway World* giving the costs of materials used on steam roads, all of which would enter largely into the operation of electric roads, for a 10-year period from 1897 to 1907, the increase ranges from 24.70 per cent on brick to 136.34 per cent on pig iron. It is apparent that something must be done if the electric road is to stay in business and make a return on the capital invested. The most obvious means of meeting this difficulty would seem to be the adoption of the system so prevalent in Europe, commonly known as the zone system, whereby the rate of fare paid by each individual is proportionate to his ride. This is undoubtedly a logical and scientific method; it is, however, open to a number of objections. The American public has been educated to the other system, and the outcry against any change would undoubtedly be great, particularly as it would undoubtedly be supported by philanthropic individuals and associations on the ground that the zone system tends to create congested districts, forcing the workingman into the tenements, producing unsanitary conditions and handicapping his children in their physical, moral growth.

QUESTION OF TAXATION

The question of taxation is a much-vexed one. Few, if any, of the States have made any effort whatever at developing a scientific system of taxation; the result is that most of their schemes of taxation are crude and are laid upon subjects which in the judgment of the lawmakers are the easiest to reach—and obviously the corporation is one of these—rather than appar-

tioned on a basis of equity. Among the illogical features of the burdens imposed upon electric railways, for example, is the care of the highway. This, of course, is a relic of the horse-car days, for in those days wear was imposed upon the paving, dirt was deposited in the street, and there was some show of justice in imposing upon the corporation the duty of making good this wear and removing this dirt. As the case stands to-day, however, the railway imposes no wear upon the pavement, nor does it contribute to the dirt and it should therefore in all justice bear no greater proportion of the expenses of maintaining the pavement or cleaning the street than any other tax-payer.

When we come to the question of taxation upon the property of the corporation it is equally illogical and shows many relics of the past. Undoubtedly the most scientific method of taxing any public service corporation and particularly a street railway is to base the tax on the gross receipts. The tax would then bear some relation to the ability of the property to pay; would be uniform throughout the State and many sources of controversy and litigation would be eliminated. The fair cash value method of taxation is one which brings into the question the individual judgment of the assessor or official making the appraisal, and therefore is apt to give a different basis of valuation for each separate property in each State. This is equally true whether the assessment be made, as is done in Pennsylvania, by the officials of the company, or whether it is done, as it is in some of the States, by the local assessor.

While it is perfectly true that the individuals who furnish the capital to operate electric railways throughout the United States did not go into the business from philanthropic motives and expect a profit upon their investment, it is equally true that the electric railways perform very valuable public service and that many companies now in existence can only justify their existence by the fact that they do perform this public service because they never have earned a dollar for their owners. It would seem to be the part of wisdom and of enlightened policy for the State to recognize the public service performed and instead of heaping upon the electric railways all the burdens possible, to so apportion its taxation that the burdens of the governments, municipal and State, should be borne equitably by all parties at interest, thereby enabling the electric railways to give better service to the traveling public and enabling their officers to devote more time to their proper business of managing the property and caring for the public and less time to watching and combating vicious legislation.

PUBLIC REGULATION

This raises the question of public regulation. Regulation may be a good thing for both the electric railway and traveling public or it may be a very harmful thing for the railway and the community at large. A conservative commission law honestly administered will insure justice, not only to the traveling public, but to the company and the community at large. Such a law and commission may stand as a bulwark of defence against the demands of an unreasonable public or city council. An ill-considered commission law or a dishonest or incompetent commission will lead to many evils and quickly produce intolerable conditions.

The relation between the rate of fare, taxation and other franchise requirements is largely the margin of profit in the operation of the road. If taxation is heavy, franchise requirements burdensome and rates of fare limited, poor service is the inevitable and immediate result, with bankruptcy always a future possibility. If rates of fare are to continue to be limited by law the same law should limit the burdens which can be placed upon the corporation. An ideal situation would be created if all power to impose burdens upon public service corporations was removed from the local authorities and a general State law passed prescribing conditions under which railroads should be operated within the State; prescribing a reasonable tax upon the gross receipts, a portion or all of which should be returned to the municipalities traversed by the road in lieu of local taxation, and the power of the municipal legislature limited simply to saying to the road, "You can or you cannot occupy the streets."

And lastly and most unjust and unreasonable of all taxation comes the corporate income tax amendment to the recent tariff bill. This amendment is a most unwarranted invasion of the rights of the State. To most companies, and particularly most railway companies, the United States Government has no relation; from it they get nothing except what every other citizen gets and for which they pay as every other citizen pays, and to impose upon them an income tax under the guise of excise is unwarranted and unjust. The provisions of the law for ascertaining the net income upon which this tax is to be levied are exceedingly crude and conflict with the accounting requirements of the Interstate Commerce Commission and of the various State bodies having jurisdiction over corporate accounts. They are not based upon sound principles of accounting and were protested against by the American Association of Public Accountants.

POWER STATIONS AND DISTRIBUTION SYSTEMS

BY LOUIS BELL, PH. D.

Progress in power stations and electrical distribution during the past year has been of a gradual and somewhat unsensational character, especially as regards power station practice. Really all that can be said regarding the year's work in power station design is that the big steam turbine units have steadily come into greater favor, the average outputs being each year larger and the turbine itself being upon the whole more and more reliable. It is only within a comparatively short time that the higher economies have been realized from turbines. At the present time it is within bounds to say that they give as high steam economy as any other prime mover used in railway stations, or indeed in electrical stations generally. Whether the turbine can actually meet the highest economies of the triple expansion reciprocating engine at steady load is, from the standpoint of the railway engineer, chiefly of academic importance. The fact is that the railway generating station, so long as it is, as usual, purely an alternating current station, must depend on the steam turbine if high economy is desired, since the more efficient types of reciprocating engines have seldom or never been installed in railway plants. Whether in stations of the larger sizes triple expansion engines can be worked to good advantage is a debatable question. The writer is disposed to think that they can be, and that where any considerable amount of direct current is to be generated from the prime movers that such engines should regularly be used. In making any comparisons between prime movers it must be remembered that high vacuum and high superheating have been introduced with the steam turbines, while they have been scandalously neglected in the case of the reciprocating engines.

Another important recent use of the steam turbine in such plants as are here under consideration is the employment of the exhaust turbine electrically linked to the general generating system. Such turbines, worked of course at high vacuum, furnish a simple, compact and economical means of utilizing the last limits of expansion. They should be considered in the light of apparatus designed to convert the ordinary compound engine into a triple-expansion machine of excellent efficiency in an exceptionally cheap and simple manner. While no results of long operation on such plants of considerable size are now available it is perfectly safe to say that the exhaust steam turbine for heavy service is making good here as it has already made good abroad. The direct current turbo-generator has not as yet come into considerable use and must be regarded so far as a somewhat dubious success, although the writer believes that it is promising better things and deserves more extensive trial than it has yet had, preferably in stations wholly equipped with turbines.

With respect to distribution, the marked present tendency toward higher distributing voltages has not made itself strongly felt in railway practice, although voltages are steadily and gradually rising. Most railway plants have been, and still are, working on very conservative line pressure, from 10,000 or

15,000 up to 25,000 or 30,000 volts. Electrical transmission for railway purposes is peculiar in the amount of public inconvenience that may be caused by relatively slight interruptions of service, and such have been felt in various instances during the past year. The moral is thoroughly plain, that railway distribution lines should be designed and constructed with rather more care than has been customary, as thoroughly indeed as would be a line designed for ordinary transmission purposes.

The tower construction now so frequently used for transmission work does not lend itself very readily to many cases of high-tension distribution for railways on account of the large space required for the towers, scarcely available on the public right-of-way that commonly is utilized for railway distributions. Whenever and wherever the voltage to be utilized is more than 25,000 or 30,000 the use of suspension insulators is worth careful consideration. These insulators have succeeded remarkably well and they constitute in point of fact decidedly the most important advance in power transmission equipment within the last few years. Wherever such construction is undertaken the ordinary wooden pole line becomes somewhat inconvenient, and the use of steel latticed poles with fairly long spans deserves very careful consideration. Such poles have come into extensive use for transmission work in Northern Italy and other places on the Continent, and combine in no small measure the simplicity and cheapness of ordinary pole lines with the mechanical security and durability of the tower line. Used as they customarily are abroad they are designed not to hold up rigidly against the greatest possible strains that a hypothetical load may place upon them, but are deliberately intended to spring, of course within their elastic limit, sufficiently to drop the catenary enough to relieve dangerous strains so that the damage due to a break will be confined to the point at which it occurs. Construction of this character for the feeders of moderate size which are commonly used is a good deal cheaper than tower construction and mechanically quite as sound.

Another matter to which attention should be directed in the interest of economy is simplicity in power station equipment for transmission purposes. Some of the most successful and reliable transmission lines are conspicuous for almost rudimentary simplicity of the generating and switching plants, and, in the opinion of the writer, the point has been reached in the design of not a few recent stations at which the added possibilities of failure on account of intricate apparatus intended to secure safety, is greater than would be the risk of failure with simple equipment.

The one very striking novelty in electric railway service during the year has been the equipment of the Cascade Tunnel of the Great Northern Railway, where for the first time in this country, for heavy service, the three-phase motors have been adopted on a considerable scale. The possibilities of economical distribution to be secured by the use of such motors with their high voltage distribution on the working conductors is notoriously great, and while many engineers still fight shy of double trolleys, foreign experience, as well as that in the Cascade Tunnel shows that this hesitation is not well founded.

The high-voltage direct-current road has also made very gratifying progress of late, but there is nothing to indicate, as yet, that the working pressures can be carried high enough in this way to justify the use of the system on a large scale when the alternating current motors are as thoroughly available as they are at the present time. The convenience of direct-current equipment is too well known to need comment, but when it comes to heavy traction over long distances the success of a direct-current distribution depends on the utilization of voltages which have not yet been reached, at least with constant potential machinery.

The chief difficulty with any distribution for heavy service lies in the yards at the termini. In how far such difficulties can be met by a mere substitution of electric for steam locomotives is one of the questions which the near future must settle. There is at least a strong probability that a change of motive power will entail some radical modifications in operating methods and in terminal equipment.

REGULATION, BUT NOT CONFISCATION

BY R. P. STEVENS, PRESIDENT, LEHIGH VALLEY TRANSIT COMPANY

I have every confidence in the ultimate result which the National and State governments have in view in their efforts to regulate electric and steam railroads, and all other corporations; the people created these corporations, and have the undoubted right to regulate them.

In the past few years, however, there has been passed, in accordance with public demand, much legislation, which, up to this time has hardly been comprehended, and I believe that the best interests of every class will be served well, if, before additional laws affecting corporations are passed, a proper trial be given to those which have recently been placed upon the statute books, and agitation be allowed to rest a bit in order that we may properly digest what has taken place, and calmly consider from the experiences of the past year what is the best course to pursue for the best interests of all.

It would have been very strange, indeed, if, in recruiting the army of 2,000,000 men employed in railway service, a great many bad men should not have been included. In the magnitude of the transactions, and in the rush of construction and reconstruction, it would have been strange indeed if exceedingly grave evils and abuses did not develop. But is it unreasonable to ask that the corporations as a whole be judged by what they have accomplished; by the character of a very great majority of their shareholders, directors, officers and employees, rather than by the comparatively few wrongdoers, and by the abuses and evils which have crept in, but which it is hoped have been to a very great extent eradicated?

It is this very small proportion of wrongdoers, and the popular idea that no matter how great the expense on the part of a corporation in performing a service, a certain fixed price established by custom and by long continuance should be paid for it, that has done much to unsettle business in our country in the past two years.

Our street railway lines must only charge five cents for their passenger fares, whether the cost of conducting their lines has remained the same or increased 100 per cent or 200 per cent over that of former years.

Our railway companies which are struggling to afford facilities for the greatly increased volume of traffic that has been thrust upon them, and which find that prices for everything they have to buy have doubled or trebled their burden of expense, are not only prohibited from charging higher rates for the freight they carry, but must actually lower these, and passenger fares as well.

Meanwhile all other lines of industry are suffered by public sentiment to conduct their business on ordinary lines; that is to say, to adjust the prices of what they have to sell in such a way that their ratio of profit shall not be diminished.

There is a wrong in all this sort of thing that must be remedied before the business relations of the country can ever be soundly established. There must not be one economic law for the steam and electric railways and the like, and another for the farmer and manufacturer; and this brings the thought whether a national prosperity which permanently affects one part of the population at the expense of the other is a prosperity that can be said to be likely to endure.

It should not be assumed that the mixture of private ownership and public regulation in the manner now prevalent will be successful. On the contrary, it is against all rules of political economy and the teachings of history. The public service corporations, starting as a purely private industry, have been appropriated in parts, and other parts are apparently to follow.

Regulation, and not confiscation, will bring success and equity, and ordinary commercial decency requires that the present tendencies of close restriction and supervision should be accompanied by some guarantee of return.

Unless assurance can be had—not of condoning wrongdoing or winking at abuses, but of friendly co-operation, of protection and aid in every fair and legitimate manner against oppres-

sion and injustice; of such guarantee as the Government can give of protection from legislation which will prevent earning a reasonable return on money invested, and of a fair participation in increased values and general prosperity which investments of this kind aid in promoting, it is going to be impossible for public service corporations to obtain the money necessary for the vast improvements and extensions necessary to provide facilities for the immensely increasing volume of business for which they are expected to provide.

Again, I say the masses have assumed, without giving the matter the careful thought and consideration that it deserves, that the present methods will bring the desired result, and have demanded drastic legislation; but careful reflection, and at the most a little more experience, will, I believe, prove the present methods to be of doubtful policy.

Let us have regulation that does not approach confiscation.

AMERICAN STREET & INTERURBAN RAILWAY TRANSPORTATION & TRAFFIC ASSOCIATION

BY R. I. TODD, PRESIDENT, INDIANAPOLIS, IND.

The last annual convention of the American Street & Interurban Railway Transportation & Traffic Association, which was held in Denver, Oct. 4 to 8, was only the second in its history. But the wisdom of the establishment of the association was amply demonstrated by the work accomplished during the year and at the convention. The attendance at the meetings was large, and the enthusiasm in the work of the association was everywhere apparent. Too much cannot be said also of the splendid work accomplished by the committees during the year.

It is very doubtful whether all the members and associate members of the association, even those who attend the annual convention, realize the time and labor spent by the members of a committee upon the preparation of the reports submitted to our association. During the period between the appointment of a committee and the time when its report is due at the main office of the association the members are called upon to attend a number of meetings at considerable sacrifice of time and comfort to themselves. I do not mean that each committee member does not receive benefit from the opportunity afforded at these meetings of broadening his knowledge by contact with others engaged in the same line of work as himself, or that the company with which he is connected does not also profit by the new ideas which he thus acquires. But this in no way detracts from the benefit which the association as a whole receives from the time gratuitously given to its service.

Possibly of the different reports presented at Denver those which attracted the most attention were the reports on city and interurban rules. This is due largely, I believe, to the universal desire toward standardization, which is just as strong in the field of transportation as it is in engineering. The adoption at Denver of these two codes, however, constitutes only a beginning of the work of standardization. The great amount of work done by both committees will be practically futile unless the action of the association at Denver is generally accepted and the rules are incorporated in city and interurban electric railway practice throughout the country. I do not mean that no changes will ever be made in either code, or that slight changes may not be recommended by the committee even during the coming year. Standardization does not mean stagnation, and if after careful thought certain modifications of the present rules seem desirable, they will undoubtedly be carefully considered and adopted by the association. Minor changes will also probably be necessary in individual cases owing to local conditions. But the best interests of the industry as a whole, even those of every individual road, demand the use of a general code which has received the sanction of the national association. Our position before the public and the courts would be greatly strengthened and we could insist upon a higher standard of discipline with our employees if

every one knew that the code used was that which represented the best thought of all electric railway operators.

I have not referred to any of the other work undertaken and being undertaken by the American Street & Interurban Railway Transportation & Traffic Association, because I have been asked to speak particularly of what I consider the most important development of the year in the field covered by this association, but in the other branches of the work nearly or quite as valuable progress is being made. During 1910 all of the important leads for investigation initiated at Denver will be followed up. The future of the Transportation & Traffic Association is bright, and there is plenty of work ahead for all members and associate members.

FARES ON CITY LINES

BY W. H. GLENN, MANAGER OF RAILWAYS, GEORGIA RAILWAY & ELECTRIC COMPANY

The street railway companies of to-day are confronted with more vexing problems than any other line of business. This is largely due to the fact that they are brought into daily contact with millions of people, eager to criticise, and exacting in their demands; and to the additional fact that they are answerable to so many masters. Many a manager is asking himself at this time: "How can I please the public; how can I meet the requirements of city legislation; how can I comply with the demands of the Public Service Commission, and how can I do justice to my stockholders?" It is in the endeavor to find answers to these questions and to reconcile such answers that the problems develop. A thorough discussion of all of the above queries would consume more space than can here be allotted to it. In passing over these questions, however, I feel that they should not be dismissed without saying that the street railway companies would not be looked upon with such suspicion if the public could be brought into close relationship with them and could know their methods and the extent to which they go in order to please the public and to deal justly and fairly with all concerned in their operations. This question of dealing with the public and with the various governing authorities involves the perplexing problems of taxes, paving, types of cars, transfers, rates of fares, and a great many others equally important. But in the limited scope of this discussion I shall confine myself to the matter of fares on city lines.

It has always seemed to me that little logical reasoning is displayed in the attempt to justify the existing rates of fare as charged by the street railway companies. The almost universal unit of fare is 5 cents—the same 10 years ago and doubtless the same 10 years hence. It is the same for 1 mile as it is for 10 miles. Can a man of sound business judgment say that this is right when with the utmost accuracy and precision he figures his expenses on a car-mile basis? Why should not the same skill and ability that is used in regulating expenses so that they will not exceed a certain amount per car-mile be expended in regulating fares in the same way? I concede that in many cases the franchises granted are so hedged about with fare restrictions that no changes can be made. I concede, further, that it is impractical to establish ticket agencies on city lines and charge a mileage rate. But I do think that there are cases in which the city fares can be regulated and controlled, and it is with just such cases that I wish to deal in this article.

There was a time with all street railway companies, perhaps, when the maximum haul was about 2 miles. The fare was 5 cents. With the growth of the cities the lines were extended so that the haul was lengthened to 3 miles, the fare remaining the same. In time another extension was necessary, making the haul perhaps 5 or 6 miles—the fare being still 5 cents. Now the problem confronting the street railway companies to-day is, how much longer can these lines be extended and charge the same fare? Surely the limit must be fixed at some distance, be it 5 miles, 6 miles, or even 7 miles. There is naturally a demand from the public that the fare remain the same regardless of the length of the haul. Conse-

quently the companies must do one of two things. They must refuse to extend their lines beyond a certain limit, or they must charge an additional fare in case the extension is made. I think they have been too lenient in lengthening their hauls, probably due to a desire to yield to public demands. Let us see if there are any good reasons for increasing the fare on a haul which exceeds the limit that may be agreed upon.

Probably no one will deny the assertion that there has been more phenomenal improvement, more rapid strides in transportation facilities, during the past 20 years than in any other line of business. The industry has commanded the ingenuity of the most expert engineers; it has received the attention of the highest order of executive ability, and has been backed at all times by an unlimited amount of capital. The combined resources of these three great factors have been engaged in the accomplishment of one common end: To furnish to the riding public the quickest and most comfortable means of transportation. And the systems of to-day are the results of these successful efforts. It would be unwise to say that they have reached a degree of perfection, for each succeeding day tells the story of a new subterranean or subaqueous tunnel; and not content with this the more daring are now meeting with considerable success in their attempts to master aerial navigation, and who can say but that, in the next decade, this mode of travel will be reduced to a commercial basis.

This rapid process of evolution naturally causes retrospection, and we recall the days of stage coaches and horse cars. Twenty years ago electric cars were unknown and horse cars were the greatest medium of city travel. This method was slow and tedious; the driver was the change maker and the passenger was the collector. The longest ride at that time was not more than 2 miles and the fare was 5 cents, just as it is to-day. The investment in equipment was comparatively small, yet no complaint was made that the fare was too much. On the other hand, oftentimes passengers would drive the car so that the driver might go inside to warm himself, or would willingly assist in putting the car on the track after it had left the rails. Can you imagine passengers doing such things in this day and generation? This fare of 5 cents has been universally adhered to from that day to this, notwithstanding the fact that the facilities offered by the transportation companies to-day are vastly more rapid, more comfortable, more convenient, more safe, more reliable, and the average maximum haul is at least five times as great. If, then, passengers are hauled five times as far to-day as they were 20 years ago; if they are hauled five times as rapidly and five times more comfortably than they were then, by what process of reasoning do we arrive at the conclusion that the charge for this transportation should remain the same?

In reality the fare of to-day is only one-half of that collected 20 years ago, for in that length of time the price of almost everything entering into the cost of street railway transportation has increased 100 per cent. Lumber that was bought then for \$10 per 1000 ft. is now \$28; steel rails that were bought then for \$24 per ton are now \$42, and a ton does not go half so far; copper, once at 12 cents per lb. has lingered around 20 cents for the past few years, and has gone as high as 26 cents. In 1898 day laborers could be employed for 75 cents per day, while in 1907 they received \$1.50 per day and their work was not nearly so satisfactory. Twenty years ago such things as damage claims were almost entirely unknown, while to-day they appear in hordes, consuming from 5 per cent to 15 per cent of the gross revenue of the companies. In like manner all other costs have increased; yet all this time the fare of 5 cents has remained the same, while five times as good service has been given at an increased cost to-day of 100 per cent over what the same service could have been furnished for 20 years ago. If these figures are correct then the horse car companies of that time received 5 cents for what the transportation companies of to-day get one-half a cent. The men, women and children who ride on the cars receive more for their labors or for their wares than they did 10 years ago. Every one of them pays more, not only for the luxuries

of life, but for its necessities, than 10 years ago. When a laborer walks into a butcher shop the buying power of the 5-cent piece in his hand decreases 50 per cent under 10 years ago; yet the instant he steps on a car and tenders it to the conductor in payment for his transportation it immediately increases 500 per cent in buying power.

In the face of these facts can there be any possible justification for lengthening the haul year after year and allowing the fare to remain the same?

It is often said that the cost of carrying long-haul passengers is more than equalled by the revenue derived from the very short hauls. This is true up to a certain point, for if it were not few companies would be doing business to-day. Now it is this certain point that should be located and beyond which no lines should be extended if the existing fare is to obtain. In locating this point it would be manifestly unfair to place it at the end of the average haul, but it should be far enough out to compensate amply for the short hauls.

Not infrequently we hear the argument made that a street railway owes a great debt to the public for the valuable franchises which it enjoys, and should, therefore, give long hauls and comfortable accommodations. I acknowledge the debt but not the method of collection. Aside from the numerous and heavy taxes they pay and the contributions which they make to various public enterprises, I feel safe in saying that the street railways of to-day are the most potent factors in the up-building and development of the country. With a network of steel they traverse the streets of the city and ramify the remotest sections of the country. They enhance the holdings of the millionaire and bring the humble dwelling of the laborer into close contact with his place of daily toil. They annihilate space and have proven themselves to be the greatest time savers in the history of the world. It is in this way that they have liquidated their debt for franchises, and the proposition still stands that in addition they are to-day furnishing transportation facilities to the public, the compensation for which is far from being commensurate with the service rendered.

Again I say that it is high time for the street railway companies to pause and consider well the inevitable results of this indiscriminate extension of city lines without additional compensation therefor.

PROTECTION AGAINST STRIKES

BY G. W. WATTLES, PRESIDENT, OMAHA & COUNCIL BLUFFS STREET RAILWAY

One of the principal problems with which the managers of street railways should prepare to deal is the labor agitator and his destructive weapon, the strike. It has been said that in times of peace we should prepare for war. To wait until a strike is declared before making preparation to meet it is both unwise and expensive. To-day there are two organized forces, one whose business is strike-making, and the other strike-breaking. Regardless of the question of whether or not a street railway company is paying satisfactory wages and maintaining fair conditions, strikes are frequently planned and declared. No street railway company of any importance in the country can insure itself by any reasonable course against a possible strike. When one is declared the only recourse is the strike-breaker, who, with a band of experienced operators, comes quickly to the scene to take charge of the cars. They usually steal the revenues and insult the patrons of the unfortunate company during the time of their stay. The cure is almost as intolerable as the evil.

There is no excuse in this enlightened age for the strike in the first instance, but as long as strikes are used as weapons by unscrupulous labor agitators, street railway companies should be prepared to meet them in an intelligent and effective manner. This could easily be done if the managers of the principal street railway companies of the country would organize among their employees a defensive army that could be called out in such numbers as might be required to take charge

of the operation of any road as soon as a strike was declared. If every street railway in the country having 500 or more employees would agree to furnish its pro rata number of experienced operatives at \$10 per day and expenses, to go to any other city where a strike had been declared against a member of this organization, and, with like drafts of men from other members, furnish a full quota of experienced operatives to carry on the business of the company in the regular manner, accounting for all of the fares and treating the patrons in the same courteous manner as they would at home, the losses of strikes would be much lessened, and the labor agitator would soon learn that his most effective weapon had been destroyed.

RAILS AND SPECIAL WORK

BY VICTOR ANGERER, VICE-PRESIDENT AND GENERAL MANAGER, WM. WHARTON, JR., & COMPANY, INC.

A year seems almost too short a time to assign to its limits the complete development of any improvement in the manufactures pertaining to the railway industry. Such improvements in most cases have to be preceded by experiments and the results must be awaited before an attempted innovation can be classed as a newly developed improvement. In railway track work such developments are necessarily slower than in other branches of the railway industry, where the results and advantages of an improvement are more quickly ascertainable.

In the track work for electric railways, the past year has been most marked by the electric railway track engineer following the lead of the steam railroad track engineer in the demand for open hearth steel rails in place of the Bessemer steel rails. Whether or not the electric railways, in their girder rail tracks, will gain advantages equivalent to those claimed for open hearth steel rails in steam railroad track remains to be seen. Rail failures, which constitute such a serious problem to the steam railroad engineer, owing to the heavy loads and high speeds of the steam railroad equipment, have so far not troubled the electric railway engineer. Better wearing and lasting qualities of the rails under the frequency of electric car traffic is what is looked for only. Whether the higher percentage of carbon which the open hearth steel rails require to give the same wearing qualities as the former Bessemer rails, and the still higher carbon that is necessary to make them likely to wear better, will not in the girder rails bring other troubles, including failures in the thinner parts of the section or when the parts wear thin, is a matter that time only will tell.

In the manufacture of special track work out of the harder and more brittle rails, more difficulties than had been anticipated were encountered in the sawing, bending and other machining of these rails, making the manufacture more costly and bringing to mind the possibility of an increased number of rail failures under service.

Another burning question of the past year was the use of high T-rails in paved streets, instead of girder rails. The writer regrets that he is not qualified to enter into that question, except to say in a general way that while it would seem that the T-rail is desirable from the railway standpoint, where it can be used, the girder rail will for an indefinite period remain by sheer necessity the rail for use in the surface tracks in our largest cities.

Nearly all new girder rail sections designed and rolled in the past year have embodied in their contour the feature to provide for wider wheels by a sloping extension of the back of the head of the rail. In this connection it may be of interest to quote from a discussion about the relation of rails to street paving before the American Society of Civil Engineers in December of the year 1896, where the writer then advocated such a rail, and, in answer to serious objections raised against it, said:

"This beveled extension of the head has been put on not solely for the purpose of allowing the wheels to clean off the dirt towards the outside, but also to provide for a wider tread on the wheel, without having it strike some projecting paving

stone. In the writer's opinion, wider treads on the wheels are quite certain to become one of the requirements of the street railways, owing to the suburban lines, and, further, to lessen the severity of wear of the heavy motor cars on frogs and switches. If the life of the latter could thereby be lengthened and the disturbance of the pavement around them due to their comparatively frequent replacements be minimized, it would be one advantage gained from the paving side of the question."

In special work provision and clearance for wide wheel treads up to 4 in. were quite generally called for during the past year, but in anticipation of the future, rather than for present wheel treads. When wide treads come into general use they will doubtless increase the life of frogs and crossings.

"Manganese steel," no matter what the differences in the products of various manufacturers may be, is now generally regarded as the synonym for the "best-wearing metal for track work." The past year has recorded a more extended use of switches, frogs and crossings cast in one piece, entirely of manganese steel. In tongue switches great improvements have been made during the past several years in the design of the tongue and tongue pivots, and when combined with solid manganese steel bodies the tongue switch need no longer be regarded as the most vulnerable and short-lived part of special work. Hard center work with manganese steel centers, however, still holds its own for frogs and crossings.

The finish and general accuracy of special track work has reached almost an extreme for the class of work. Still, the destructive action on special work of the heavier cars and the ever-increasing frequency of car traffic in our populous cities call for the best, and most exact product, by which the destructive effect may be minimized.

The problem of the rail joints in electric railway track and the problem of that bugbear, rail corrugation, have not as yet been solved, and the past year has not witnessed much progress towards the solution. Let us hope that 1910 may bring us the Archimedes of the electric railway track, who in regard to these two problems can exclaim a triumphant "Eureka!"

WORK OF THE NEW ENGLAND STREET RAILWAY CLUB

BY W. D. WRIGHT, PRESIDENT, PROVIDENCE, R. I.

The New England Street Railway Club has carried on the work of having addresses and papers presented at its monthly meetings that are of interest to street railway men. The club has been very successful during the past few years, and its members take a great interest in its meetings, which are largely attended. Discussions usually follow the presentation of papers.

I believe the club is of great benefit to its members; they have an opportunity to meet each other and discuss various problems, and also to enjoy the addresses and papers from time to time. I believe the street railway industry as a whole is greatly benefited by the existence of organizations like the New England Street Railway Club.

The managements of street railways in New England take great interest in our organization.

I do not know of any program in contemplation for next year that will bring about any special result, further than to continue the active work that has been in vogue since the organization of the club, with splendid results, satisfactory in all ways to every member all of the time.

Outside of the regular monthly meetings, the club does everything possible toward stimulating trolley traffic by the publication of trolley books and maps, and during the summer months conducts a free trolley information bureau, which is visited by thousands of people who are in search of reliable information. The street railways furnish an abundance of booklets, timetables, maps and general printed matter that are eagerly sought by people who are arranging or taking trolley trips. The information bureau is fully appreciated by trolley tourists, and I am sure the companies are considerably benefited by its work.

Our club has nearly 800 members, and its membership is continually increasing; 40 names were added during October.

THE SIGNS OF THE TIMES

BY THOMAS N. M'CARTER, PRESIDENT, PUBLIC SERVICE CORPORATION OF NEW JERSEY

The country has been through a period of five years or more of turmoil. Around those of us engaged in any kind of public-service work the flame has burned savagely—so fiercely, in fact, that many of the great properties of the country have been severely scorched and certain conspicuous systems entirely consumed.

It is perhaps idle to speculate on the cause of all this agitation. Unbridled prosperity for a period of years breeds license, and perhaps a disregard of the public welfare. Insofar as the country has been brought to a realization of real abuses, and has demanded their cessation, it is a gainer, and the business too, in the long run, will be benefited. To the extent, however, that the country in its excitement has impulsively followed and enacted into legislation the captivating but specious reforms urged by political adventurers, neither the country, our business, nor the political adventurer has been benefited; and the reason is easy to understand, for the sound development of the country and the prosperity of the public-service business must go forward in parallel lines, and legislation which militates against the latter over a period of years will retard the former. The adventurer is not benefited, for when his demagoguery is enacted into legislation he has lost his issue and his opportunity to keep himself before the public, until he can frame up something new and more startling.

The indications are that the agitation to which I have been referring has reached its maximum height, and that the wave of radicalism is subsiding. The country seems to want repose and an opportunity for the quiet and energetic prosecution of its business and the development of its resources. Perhaps the best expression of this changing public sentiment is the placid tone of the recent message of President Taft.

If the storm has spent its force, it is perhaps well for those of us who have embarked for our life work upon the public-service vessel to examine into the condition of the old ship after the storm, to investigate what has happened to her, and to see how she is equipped for the balance of the voyage.

Referring first to the more agreeable matters—the fetich of municipal ownership has apparently made no headway in this country. Various small municipal electric plants have singularly failed, and some have been abandoned and sold. The comprehensive investigation made abroad under the auspices of the Civic Federation failed to demonstrate the efficiency of this system, at least as applied to conditions on this side of the Atlantic. The failure of Tom Johnson's plan in Cleveland has been illuminating, and this most un-American doctrine, which three or four years ago was hailed as the panacea for all abuses, real and imaginary, seems to have become possessed of the paralytic microbe in its infancy. It does not follow, however, that the child will not outgrow this first attack and again present itself for serious consideration before the American people, but that it can during our lifetime ever seriously prevail I do not believe, and for this overshadowing reason if for no other: One of the greatest problems threatening the country is municipal extravagance and municipal financing. The expenses of municipal government connected with the absolute essentials thereof, such as water supply, paving, education, the development of parks, etc., are running into such vast sums and in so many cases threatening municipal insolvency, not to speak of confiscatory taxes, that the public will surely hesitate to embark upon new, untried and unnecessary municipal operations at the behest of theoretical doctrinaires.

RATE REGULATION

A more serious condition threatening our business is that of rate regulation, by whatever duly constituted authority the power may be exercised. The existence of this power as a legislative function, provided it is not carried to the limit of confiscation, seems now to be definitely settled, and the Supreme Court of the United States has decided in the Consolidated Gas

Company case that a rate only yielding approximately 6 per cent upon the true value of the property actually used in the business is not so confiscatory as to invalidate the statute prescribing the rate. This has become the established law of the land, and the result is that we must all recognize that this vital power is located in the various legislative bodies to which we respectively owe allegiance, and that the generous exercise of it within the constitutional limits, as laid down in the Consolidated Gas Company and Knoxville Water Company cases, may result disastrously to our business without redress in the courts. Within the limits above referred to, the legislative discretion will be controlling.

Without criticising the legal principles which justify the decision, I am of the opinion that the business principle involved is vital, and if generally put into effect by legislative sanction would retard and stagnate the development of the public-service business throughout the country, and consequently react on the very prosperity of the country itself. It is beyond my comprehension that any investor should put his money into the stock of a new and undeveloped public-service enterprise, bearing with fortitude its early years, with its customary drought of earnings, only to be limited by legislative action when the property has at last become successful to 6 per cent annually on his then investment, regardless of the lean years through which he has passed. Certain it is that if the necessary funds are to be obtained from year to year to properly develop these enterprises and the territory which they serve, it must be upon the confidence of the American public that these properties will not be discriminated against by legislative caprice. But I do not have enduring faith in the ultimate common sense of the American people, and in the resultant attitude of their law-making representatives. I would unhesitatingly recommend allowing one's money to remain in a savings bank, drawing 4 per cent interest, rather than in an investment of the character of which I have spoken.

It is true, and properly so, that the day of exploitation of this class of property is over; that we shall never again see connected with them gross abuses of over-capitalization, resulting in the amassing of large individual fortunes overnight, to the scandal of the community. It is probably true, although I am not entirely sure of its wisdom, that we shall never see any more over-capitalization or water connected with any of our public-service enterprises. To my mind the investor who has the courage to risk his money in a new and untried public-service enterprise which the majority of prudent men would hesitate to embark upon, but which is manifestly to the advantage of the public, is entitled to receive a return upon his investment proportionate to the hazard involved, and I do not see that it makes so very much difference whether it is done by the payment of very moderate dividends upon a capitalization in reasonable excess of the actual cost of the property, or by larger dividends upon its actual cost. By way of illustration, take the case of what is commonly known as the McAdoo tunnel system. I am not familiar with either its cost of construction, nor with its capitalization, but I do know the construction of that system has been one of the greatest boons for the convenience of the public, and especially for the public living in New Jersey, ever created in these parts; and I know, further, that it was a most hazardous undertaking from a financial and engineering standpoint. To say that the gentlemen who had the courage and nerve to push this stupendous enterprise through to completion should only be allowed to receive 6 per cent upon their actual expenditure is, to my mind, a veritable absurdity. Surely the application of this doctrine can never be made general if the country is to develop.

GOVERNMENTAL SUPERVISION

The other remaining serious barnacle that we find upon the hull of our ship as we emerge from the storm is that of government by commission to the extent of administration of public-service corporate property. No one objects to proper governmental supervision over the issuance of securities and the like. My own view is that this can best be accomplished as we have undertaken to do in New Jersey, by strict enactments providing

vigorous penalties for their infringement, rather than by the expensive mechanism of a commission clothed even with moderate powers. These statutes are automatic, and are found in practice to accomplish the desired result. With such statutes in existence I can see neither the alleged protection afforded to the public nor to the companies by the existence of such commissions. This, however, is a subject about which some of us may disagree. The constitution of a commission clothed with full powers of administration, such as is the case under the New York act, presents another and very serious problem. To my mind it is almost as radical and un-American a proposition as is that of municipal ownership. I was bred as a lawyer, and as such I was taught to love and respect the rights of property. When it comes to taking away the management of any corporate property in which I am interested from the authorities duly constituted by the stockholders and placing it in the hands of a politically constituted State commission, I utter my vigorous protest and sound the note of warning. Where this may lead to it is easy to see. Again will appear, and is appearing in New York State, the stagnation of enterprise and absence of investment. Such is the despair of the people over inactivity of investment of this character in New York City that the people of the State have actually approved a constitutional amendment in New York authorizing New York City to further strain its credit by issuing bonds for the construction of so-called "self-sustaining" enterprises.

Again placing my confidence in the deliberate judgment of the American public, I do not believe this particular danger will increase. Supervision by commission may grow, but administration by commission must retrograde. Fortunately in this matter, should legislative discretion forsake us, we still have the courts to fall back on, as evidenced by the recent decision of the Court of Appeals of the State of New York in the Delaware & Hudson case.

FRANCHISES

The so-called short-term franchise, for 20 years or thereabouts, is a snare and a delusion. It is of no benefit to anybody, including the public. In suburban and rural communities a property cannot be financed upon it, and it is doubtful if it can be in urban communities. Moreover, the experience of expiring franchises, notably in Chicago, has demonstrated that for years approaching the end of the period there is involved a deterioration of plant, equipment and service which works to the direct injury of the public, but which must exist as long as human nature exists. Nor do agitations like those which have existed and are existing in Cleveland and Detroit benefit the public. It is probably true, on the other hand, and I am willing to admit perhaps wisely so, that the day of unrestricted perpetual franchises near populous centers is over.

What, then, is the happy medium? Opinions will differ. My own view is in favor of a perpetual or very long term right of operation, providing, however, for certain stipulated periods when the conditions under which operation takes place shall be readjusted by agreement between the municipality and the company if possible, and, if not, settled by arbitration. This has always seemed to me—since the question has arisen—to solve the problem of financing and to offer fair and reasonable protection, both to the municipality and to the corporation. Where urban properties are to be financed solely by the sale of bonds it can probably be done upon a franchise for 50 years' duration, if the mortgage securing the bonds contains an adequate sinking-fund provision.

PROPER METHOD OF TAXATION

The question of the proper method of taxation of public-service franchises is one of great moment, concerning which there has been an infinite variety of experiment. My own experience has led me to believe that, all things considered, the most satisfactory method is the payment of a reasonable fixed percentage of gross receipts, although I appreciate that this method is open to the objection that it may result in taxes being paid for a franchise upon unremunerative property. It is, however, definite and automatic, and the company knows each year just what it has to pay. Certainly up to date the method

adopted in New York State under the so-called Ford franchise law cannot be said to have given satisfaction, either to the State or to the corporations. Millions of dollars of taxes assessed under it are now in litigation, and payment thereof withheld by the corporations. This method, also, in practice is open to the same objection referred to above, namely, of corporations being obliged to pay taxes for unremunerative franchises.

While it is, of course, right and proper that corporations of this character should bear their fair proportion of the public burden, in the long run communities will be better served by public-service corporations and more benefited in their growth and development by imposing fair methods of taxation than by keeping the noses of such corporations down to the grindstone of extortionate exaction.

I abstain from any reference to the governmental tax provided by the Payne tariff bill, other than to record the old-time observation that "misery likes company," and, if the act be valid, to point out to you the figure of the public-service ship, rolling in its waves, surrounded by a myriad of craft of every corporate description.

I have only sketched the surface of the great problems involved in our business. As the responsible executive of one of the largest public-service corporations in the country, I have full confidence that the right will prevail, and that when the still ruffled waters have subsided the great public-service corporations of the country will proceed upon a calmer sea, all doing their proportionate work in the development of our unlimited national resources.

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TERMINAL FACILITIES FOR INTERURBAN ELECTRIC RAILWAYS

BY J. N. SHANNAHAN, VICE-PRESIDENT AND GENERAL MANAGER,
WASHINGTON, BALTIMORE & ANNAPOLIS ELECTRIC RAILWAY

The problem of proper and adequate terminal facilities for interurban electric railways in the large cities in this country is one of vital importance to such properties. In a number of instances properties that were flat failures without adequate terminals, subsequently proved very profitable when such terminals were provided. By adequate and proper facilities are meant not only the building and tracks forming the terminal station, but the tracks by which such station is reached from the private right-of-way. Undoubtedly the ideal arrangement would be a terminal station situated in the center of the retail district, and reached by surface tracks built on private right-of-way. But in this case, as in many others, the ideal arrangement is not often the practicable one, because of physical, financial or legal conditions. The nearest approach to it is probably in having tracks built either on an elevated structure or in a subway. There are, however, several objections to such an arrangement, among others the fixed charges incident to a heavy initial cost, and the loss of advertising due to cars of a distinctive type operating through city streets. The advantages of such an arrangement are, however, great, particularly in enabling "the interurban" to land its passengers in a central terminal in the shortest possible time, as well as the elimination of accidents and delays due to vehicular traffic and pedestrians. If the railway in question connects large cities, the volume of traffic heavy, and the distance from private right-of-way to the terminal station considerable, the advantages will probably be found to outweigh the objections. But undoubtedly, in the great majority of cities in this country, neither an elevated structure nor a subway is practicable, or advisable. Track built on the surface of the street is the natural alternative, and if it be possible for the interurban company to build its own track on streets not already occupied by other lines, then this plan has much to commend it.

But in the writer's judgment, the essential thing for the interurban company's success is to be able to carry its passengers without transfer to the center of the city.

There are two cases which demonstrate the truth of the above statement in one of the largest cities in the Middle West. In the first instance the interurban line connected with and

transferred to, not a slow-running surface line at the outskirts of the city, but with an elevated railroad, which furnished the best of service into and through the heart of the city. Before this transfer was eliminated the financial results were unsatisfactory. An arrangement was made for running the trains of this company through on the elevated structure, and since that time the results obtained have been eminently satisfactory. To the elimination of this objectionable transfer more than to anything else the present success of the property is undoubtedly due. In the second instance in the same city, a high-speed interurban line, built in the most substantial manner, and tapping a territory with a much greater population, is now in the hands of a receiver. The financial embarrassment of this company is due in no small measure to the lack of adequate terminal arrangements.

In another instance which has recently come under the writer's observation, a property had been operating on private right-of-way to a point within 1700 ft. of the public square or business center of a city of 35,000 population. Even under these favorable conditions the passenger receipts were unsatisfactory. The company sought and obtained an entrance over the 1700 ft., thus reaching the public square, or business center, and the immediate improvement in passenger travel was remarkable and is still increasing. In this instance the owners of the property believe the improvement is due in a large measure to the advertising value of having their cars run through the public street and around the square.

The writer has also recently had the opportunity of studying a problem of this character. The conditions in this particular situation may be of interest, and the results eventually obtained will go far toward determining to what extent the success of an interurban property is affected by adequate terminal facilities.

The railway under consideration connects the cities of Baltimore and Washington and is a double-track line built in the most substantial manner. The maximum grade is 2 per cent, the sharpest curve (with one exception) on private right-of-way is 4 deg., the track is laid with 80-lb. A. S. C. E. rail, and practically all grade crossings have been eliminated. Baltimore has a population of approximately 650,000, Washington, 350,000, and the distance between the two cities is 40 miles. In Baltimore the terminal facilities are all that could be desired; a fine station through which the cars pass is located in the heart of the retail district and is reached in a run of ten minutes from the private right-of-way. In Washington, however, the terminal arrangement is not as good; the station at which the interurban cars complete their run is located 2 3/4 miles from the Treasury Building. The transfer between the cars of the city company and those of the interurban company was made as easy and comfortable as possible, entirely under cover. The interurban passenger is provided with a ticket entitling him to transportation on the line of the Washington Railway & Electric Company (the city company) with transfer privileges to any interesting line of that company, reaching thereby practically any point in the city. In other words, the terminal arrangement in the city of Washington was all that could be desired with the single exception that the passenger was compelled to transfer and make a short portion of the trip in the cars of the city company. Although operation has been under such comparatively favorable conditions, and the line has been in full operation about 18 months, yet the passenger traffic has fallen short of the estimates of the projectors of the line and what might have been reasonably expected.

After a careful study of the earnings, and conditions affecting them, the management has been able to reach but one conclusion, namely, that the terminal arrangement in Washington is unfavorable to the best results, and, therefore, a supplementary arrangement has been made with the city company by which the cars of the interurban company will run to Fifteenth Street and New York Avenue, which is directly opposite the United States Treasury Building and within a block of the White House. The principal advantages of the change will be:

In making the cars of the interurban company equally convenient of access in both cities.

In enabling a considerable portion of its passengers to make their entire journey without any transfer whatever.

In benefiting by the advertising value which unquestionably accrues from running a car of distinctive type through one or more of the principal streets. This should prove of much value in Washington, where the transient population is large.

The specific instances hereinabove cited prove, in the writer's opinion, the extreme importance and value to interurban properties of proper and adequate terminal facilities.

NECESSITY OF INCREASE IN REVENUE SUFFICIENT TO MEET INCREASED COSTS

BY CHARLES O. KRUGER, PRESIDENT AND GENERAL MANAGER, PHILADELPHIA RAPID TRANSIT COMPANY

In common with all other street railways, we have felt the necessity of increasing our revenue by an amount at least sufficient to cover the increased cost of operation, maintenance and equipment. How great have been the increases under these headings is, I find, scarcely realized even by many actually engaged in the transportation business. Some of the items of increased expense are startling. For example, when the roads that now compose the Philadelphia Rapid Transit system were consolidated, in 1895, a 90-lb. girder rail was used which cost \$25 a ton; to-day we are using 141-lb. rail for which we pay \$38.20 a ton. Switches used to cost \$122.50; we now pay \$150. Frogs that formerly cost \$83 now cost \$97.50. Ties have gone up from 50 cents to 65 cents. Our standard car costs us exactly 100 per cent more than the standard car of 10 years ago. Coal, another big item, has increased from \$1.72 to \$2.30 per ton. We all remember the time when cast-iron wheels costing about \$4 each were considered satisfactory for street railway purposes; steel wheels at \$18 apiece are now required. These are only a few of the more important examples of the high prices of materials. Wages have also largely increased. The wages of motormen and conductors on this system were raised from 21 cents to 22 cents an hour June 1, adding about \$180,000 to our annual payroll.

Prior to May 1 we issued six tickets for 25 cents and an exchange for 8 cents. On May 4 we withdrew the six-for-a-quarter tickets. The average fare per passenger, which was 3.94 cents in the fiscal year ending June 30, 1909, and 3.56 cents in 1908, almost immediately increased to 4.20 cents, but has since dropped, as shown by the following:

AVERAGE FARE PER PASSENGER

	Cents.		Cents.
June	4.194	September	4.116
July	4.143	October	4.121
August	4.133	November	4.127

The decrease in the average fare per passenger is mainly due to the fact that the sale of exchange tickets has increased. These tickets are largely used by passengers changing from one line to another at points where no transfers are given. Free transfers, which numbered 55,631,765 in the year ending June 30, 1909, are now being used at the rate of 6,370,141 per month.

There was considerable public opposition to the withdrawal of the six-for-a-quarter tickets, but this has almost entirely subsided. The matter was taken into the courts, which have decided twice that the company acted within its rights in withdrawing the tickets, which were held to be not "a rate of fare."

Speaking generally, it seems to me that there is need of a general effort among street railways to educate the public up to a better understanding of street railway problems. The experience of the New England roads shows that fares can be increased, as I believe they must be all over the country, without serious public opposition, if the reasons for the increases are plainly set forth in advance. It should not be difficult to convince the public that the fare unit of 5 cents established in horse-car days is the minimum price at which first-class services can be given, and that when this rate of fare is diminished by free transfers or any other means the operating company's revenue is reduced below a point at which it can give adequate service and provide for the upkeep of the property.

THE AMERICAN STREET & INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION

BY ELLIS C. CARPENTER, PRESIDENT, ANDERSON, IND.

The enthusiasm manifest by the claim agent delegates at Denver was most gratifying. Delegates representing many of the more important properties along the Pacific coast were in attendance for the first time. This infusion of "new blood" acted as a stimulus throughout the entire convention. Enthusiasm, like the measles, is "catching" and we are looking forward to a larger representation from the West and South at our future conventions.

The cordiality of the delegates from every section indicated a bond of friendship, good-will and sympathy reaching from coast to coast. The subjects dealt with were live subjects, and were ably presented in both written and oral discussion. The causes of certain kinds of accidents were dealt with and many remedies suggested. The duty of the claim adjuster is not merely to adjust losses, but also to seek the causes for troubles and suggest remedies therefor, thus preventing the occurrence of trouble, and likewise the adjustment of claims incident thereto.

The policy of the claim department toward the newspapers; the relationship of the medical and claim departments; boarding and alighting accidents; the instruction of employees; the unreported accident, its evil and remedy, as well as other subjects, were all discussed from a practical standpoint.

During the past year, through the office of the secretary of the Claim Agents' Association, much information was asked for, secured and furnished regarding fraudulent claimants. In many cases photographs have been secured and mailed to the various claim departments for identification, and to serve as a warning and protection against such frauds. Two fake claimants were arrested, convicted and are now serving sentences, important evidence in each case being furnished by the Claim Agents' Association.

All companies having knowledge regarding claimants of this character should furnish full information as soon as possible to our secretary so that other companies may have the benefit of it. We all have to contend with the class of claimants that seek the advice of the professional damage lawyer who, when asked by the client as to what he would charge for looking after the case, replied:

"If you furnish the witnesses, \$100; if I furnish the witnesses, \$200.

In dealing with these matters, it has been demonstrated that an index bureau would be very valuable in detecting this kind of claimants and would also furnish valuable data regarding other claimants. By co-operation with accident and life insurance companies and other corporate interests, evidence can be procured that should materially reduce the amount of damages paid claimants directly or after litigation.

The committee appointed to look into the matter of the advisability of taking out a membership for the American Street & Interurban Railway Association in some index bureau, whereby all claim departments of the member companies would be entitled to reports from the index bureau upon application, reported that it had secured a satisfactory proposition from an index bureau and made a favorable report. This will be referred to the executive committee of the parent organization for action.

The subject committee for the 1910 convention is at work and is expected to make its report at the midwinter meeting of the executive committee. In dealing with the subjects for the next convention, the committee will so arrange the subjects as to call for the actual results achieved as well as theories.

Some good missionary work is being done by various delegates and it is expected to have a very large attendance at the 1910 convention. The enthusiastic efforts of the officers, supported by the committees, receiving the hearty co-operation of a large number of willing workers, ought to make the next convention the best ever held.

RELATIONSHIP OF THE ELECTRIC RAILWAY TO THE PUBLIC

BY JNO. BLAIR MACAFEE, PRESIDENT, NORFOLK & PORTSMOUTH TRACTION COMPANY

I have chosen for the topic of this communication the question of relationship of the street railway company, electric light, gas or water company to the public. This is not so broad a question, to the writer's mind, as from its title would appear. It is a confined question. Upon it, nevertheless, depends the other questions which harass the minds of operating officers and stir up public animus.

Questions of fare, transfers and taxation are all related to this one proposition.

A corporation is a creature of the State, created by the laws of the State; its relationship, therefore, to the body politic is that of a child. It should never rise superior to its position.

The difficulties under which corporations labor to-day, due to unbusinesslike supervision, antagonistic legislation and adverse public sentiment, are primarily due to the fact that in the past the officers and directors of such corporations overlooked this relationship. The defiance of the public was flaunted publicly. Even stockholders who were not of the majority or controlling party were denied proper information respecting the conduct of the business of the company. Great public utilities companies came to feel that they were a power and a law unto themselves.

The uprising came. Laws that were thought to be adverse to the interests of such corporations were enacted; corporation commissions were created with supervisory power, taxes were increased, but as yet, save in isolated instances, not to the real detriment of the corporation.

The greatest asset of a public utilities company is good-will. The more patent the attempt of the officers of the corporation to improve its service to the public, the greater the degree of good-will. Officers of all grades are being taught now to feel that they are public servitors. They are taught as the child to respect the parent. Complaints are welcome. They are not thrown in the waste basket, but in well-operated and properly conducted companies are immediately inquired into, with the thought that, though even so large a proportion of them as 90 per cent may be unfounded, yet failure to inquire into all may result in neglect of the 10 per cent that should be properly considered. Once get the public to feel that the utilities companies operating in the community are operated with the thought and desire on the part of their management of pleasing the public, then such a relationship is established as should be. The citizen becomes part of his street railway, his electric light company, his gas or water company. Once this disposition, this degree of good-will, has been established, it is but like a conference of co-partners to discuss with the representatives of the public the necessity of an increase in fare or the abandonment of a transfer.

The American public is not an unreasonable body, but broad-minded, fair and liberal, ready to be convinced by proper argument and presentation of facts that are not distorted. They will uniformly agree to a sound business proposition. In Massachusetts we have seen during the past 18 months various street railways allowed to increase their fare, with the full approval of the Railroad Commission. In other States, where municipal authorities have applied to corporation commissions to raise taxes of the utilities companies and the utilities companies have presented sound arguments, based upon an unperverted statement of facts, such requests of municipal officers have been uniformly refused.

Demonstration to a community that the electric light company is giving the best service at the lowest price commensurate with a reasonable profit has prevented the construction and operation of competing companies. The average taxpayer does not want his city burdened with the ignominy of financial disaster to his utilities companies. His personal interest in the community is such that he hopes to be able to speak with pride of the successful financial operation of the utilities supplying his wants.

Therefore it is that years ago we reached the conclusion that the moving idea in the operation of utilities which damned the public was inherently wrong and calculated to ultimately bring disaster. Nothing so aggravates the general public as to feel that the utilities operating in their particular vicinity are controlled by a political machine. Every honest effort should therefore be taken by the officers in command of the situation to demonstrate to the satisfaction of the public that they are free from political domination. Once convince the voting citizen that such is the case and that the utilities company is operated as a plain, straightforward business proposition, his services, his aid and his vote can ordinarily be commanded for the benefit and the upbuilding of such utilities.

Therefore it is that we say that the fare question, the transfer question and the tax question were relative to the subject of this article. The earnest effort of every operating officer, every executive head and every board of directors should be directed to the encouragement of the proper relationship of his company to the municipal and State governments. Those of the citizens of this country who desire to inordinately and improperly tax and restrict are but few in number comparatively. The average business man is bright enough to realize that his public utilities company should grow with the growth of his city, and that with the utility company and the territory in which he does business advancing perceptibly in the scale of commercial progress, he is bound to be carried along by the tide and reap the resultant benefit.

We appreciate fully the difficulty attendant upon this policy, which difficulty is made greater by the errors of the past. Great obstacles have been raised in the paths of the directing heads of companies by the methods in use not many years ago. It is hard to convince the public of the change of thought, and some will forever doubt the possibility of such a change. Even this disposition will be overcome by continued attention to the wants of the public. When that period has been reached, as it is generally being reached in many of the cities and States of our country, we will hear less of restrictive legislation, less of undue taxation, and will ultimately find that the public will not be led astray by demagogic suggestions of 3-cent fares and 5-cent electric light.

A MONOPOLY OF TRANSPORTATION

BY E. G. BUCKLAND, VICE-PRESIDENT, THE RHODE ISLAND COMPANY

Transportation is a commodity by whatever means it be accomplished. Passengers and freight should be carried by that kind of transportation which can perform the service most efficiently and cheaply. Sometimes that service is by water, sometimes by steam or electricity over a private right-of-way, sometimes by electricity over a highway, and sometimes by a wagon and team of horses. That seller of this commodity—transportation—will be the most successful and efficient who so controls all of it that he can apply each kind where economic laws dictate. For instance, pig iron, ingot copper, cotton, raw wool, hides and similar non-perishable raw materials may well be carried by the cheapest method of transportation, to wit, by water.

On the other hand, the finished product of these raw materials, to wit, cotton cloth, steel, iron and copper products, boots and shoes, woolen cloth and the like can afford and deserve a speedier method of transportation, to wit, steam or electricity operating on a private right-of-way.

Distribution from industrial centers which cannot be accomplished by either of the two foregoing methods should be furnished with transportation over highways by electric street railways or, last of all, by the wagon and horse.

All of these methods are naturally co-operative, and should not be competitive. Being, however, subject to one control that is a monopoly, there must be some check to prevent an abuse of monopolistic powers. That check is properly found by governmental regulation. This regulation may well in the first instance be brought about by an administrative body, but finally

the rights and obligations of a transportation company must not rest with an administrative body subject to political influences, but must be determined by a judicial body which so far as may be is free from such political influences.

I believe in a monopoly of transportation. I believe that such monopoly should be required by law to furnish reasonable facilities at fair prices, and I believe that governmental regulation along the lines suggested is the surest safeguard of transportation properties.

THE SINGLE-PHASE SYSTEM IN THE YEAR 1909

BY N. W. STORER, RAILWAY DEPARTMENT, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, PITTSBURGH

The single-phase system has made very substantial progress during the past year. It is reported that the commission appointed by the Swiss Government has decided in favor of single-phase alternating current for the standard railway system for the State Railways, and several projects are in an advanced state. In France the Midi Railway has adopted single-phase and ordered 30 multiple-unit car equipments and a number of locomotives, the latter to be built by as many companies. The German State Railways have adopted single-phase as standard, and are pushing the development rapidly. In Norway and Sweden substantial progress has been made along the same line. In most of the electrifications under way in Europe high voltage is being used, ranging from 10,000 to 15,000 volts on the trolley. The favorite frequency is 15 cycles. This frequency has been recommended most strongly in Switzerland and Germany, and has been adopted by the Midi Railway in France.

It is probable that the advantages secured for the motors by the use of 15 cycles will be sufficient to influence its adoption in this country for heavy work, except in instances where a large supply of 25-cycle power is available. The advantage for car equipments alone is not sufficient to pay for the introduction of a new frequency.

In this country single-phase has not had as smooth sailing. Equipments for only one new road have been sold this year, and several of the old roads have been changed from single-phase to direct current, with either 600 or 1200 volts on the trolley. Judging from this fact alone, it would appear that the single-phase system has received a setback. However, careful analysis of the reasons for the abandonment of single-phase on the lines that have changed shows that they were not properly single-phase propositions in the first place. On one line, for instance, it was necessary to have direct current at both ends of a road of moderate length, with connections for underground conduit as well as overhead trolley on d.c., resulting in complications which outweighed the advantages gained by the use of single-phase current for the interurban portions of the line. In another case a large part of the mileage made by the equipments was over d.c. lines. While in this case there was not as much complication as in the first instance, it was extremely expensive with the heavier and more expensive single-phase equipments to operate them so large a part of the time on direct current. The entire line might as well be direct current.

In the first years following the introduction of the single-phase system there were undoubtedly extremists who wished to apply single-phase everywhere. This over-enthusiasm has resulted in injury to the system, because of its misapplication. Further, the equipments on a large part of the roads over which they have been operated have been overloaded and overspeeded, performing heavier service than would be possible with direct-current equipments of the same capacity, because of the speed characteristics and the high voltage available at the motors. It is refreshing to see, however, that in spite of the abuses and misapplications of the system, the equipments have operated so well in so many instances. Examples of steam railway electrification, notably the New York, New Haven & Hartford and the Grand Trunk, have been conspicuously successful dur-

ing the past year. The train delays have been greatly reduced over those formerly encountered with steam operation, and very little trouble has been experienced in any way. On the New Haven lines the locomotives are doing far more work than was ever contemplated by their builders. On some of the interurban lines the operation has been thoroughly successful, resulting in a low cost of operation. In others there have been troubles, due, as stated above, to abuse of the equipments, including overloading and overspeeding. In this connection it is significant to note that there has not been a single instance of change from single-phase apparatus to direct current where the equipments were furnished by the largest manufacturer of single-phase apparatus. On the contrary, several of the lines have ordered new equipments for extensions, and further extensions are probable in the near future.

The new railway for which equipments are now being built is the Rock Island & Southern Railway, a road designed primarily for freight traffic, which will also be used for frequent and high-speed passenger service. This line will be operated exclusively from single-phase alternating current, which makes it possible to use inductive rather than conductive compensation for the motors, thus rendering the most vulnerable part of the field winding perfectly safe from injury. The motors will also be operated from a two-coil transformer instead of an auto-transformer, so that the circuits will not be grounded, and thus the liability of breakdown of insulation will be much reduced. These equipments will possess a degree of simplicity which should be attractive to any one who is operating electric railways.

The net results of the experience with single-phase apparatus up to date are that single-phase equipments can unquestionably be built to operate successfully in either interurban service or on heavy railroads. The complication of making equipments operate interchangeably on direct current and alternating current is an undesirable one, but one which need not cause any trouble, provided the equipment is properly cared for.

Preventive leads between the armature winding and the commutator are still advocated as reducing the losses in the motor and making it possible to reduce the size of motors beyond those built for a given output without leads. All that is necessary to make the resistance lead construction satisfactory is to have the leads of sufficient thermal capacity to stand the current for the maximum length of time necessary for the motor to develop its torque at a standstill, and to make the resistances substantial, so that they may not be affected by the mechanical vibration to which all railway motors are subject. It is a well-known fact that the resistance leads of the armatures of the New Haven locomotives have never given the slightest trouble, even though they are subject to the most severe starting conditions, and the motors are required to develop at starting from 100 to 150 per cent overload torque. The worst that can be said of resistance leads is that they furnish an expensive addition to the armature winding; however, the total cost of the motor with resistance leads will not exceed that of the motor built for equal performance without resistance leads, since the number of armature conductors for the motor without leads must be very greatly increased, and frequently the number of poles increased on account of the lower inductions which are necessary.

A discussion of single-phase naturally raises some question as to the natural competitors of that system. These are high voltage d.c. and three-phase. The 1200-volt d.c. system has made considerable progress in the past year for interurban railway service, and while there is apparently not much to be gained in applying this to heavy railway work, it is undoubtedly receiving favor for interurban roads where a large part of the operation must be over standard 600-volt lines. The chief objection to this system is that the voltage is not high enough to meet the requirements for long lines, and it seems certain that if direct current is to be used for heavy work, the voltage must be very considerably increased.

The three-phase system has also made a start in this country in the Great Northern electrification. While apparently

nothing has been demonstrated by this installation, which could not have been foreseen, it indicates a tendency to develop all of the possible systems of electric traction to the fullest extent, so that each problem may receive the most careful consideration as it arises, and the best system for that particular one may be applied. Undoubtedly this attitude will make for the greatest progress in electrification of steam railways. The best part of it is that whichever system is adopted it is certain that it can be made thoroughly successful from an operating standpoint, the main difference between them being questions of first cost and cost of operation.

ADVANTAGES OF SINGLE-PHASE

The reasons for favoring single-phase system are just as strong at the present time as at any period in the past 10 years. The simplicity of the distribution and the possibilities for extremely low first cost make it most desirable from that point of view of any of the three systems. The speed possibilities of the motor make it extremely desirable from that point of view. The handicap is, of course, that the locomotives must in all cases, except where very slow speeds are required, be heavier and more expensive than for either of the other systems. Consequently, the maintenance must be higher. However, this extra cost of maintenance for the locomotives will for lines of any considerable length be more than offset by the decrease in first cost and cost of operation of the distribution system.

The matter resolves itself, as has frequently been said before, into a matter of dollars and cents, to decide which of the three systems will be the proper one to install for any given set of conditions.

Judging from the great interest which is being manifested at the present time in railway electrification, there will be sufficient comparisons made before long, which will determine the particular field that each system is best adapted to serve. At the same time, it is possible that new developments may arise which will very materially change the outlook. At present the outlook for still further extensions of the single-phase system is very good.

PERMANENT FRANCHISES AND REASONABLE RETURNS

BY ARTHUR W. BRADY, PRESIDENT, INDIANA UNION TRACTION COMPANY

The most striking phase of the electric railway situation of to-day is not found in the progress or development of the art of constructing, maintaining and operating electric railways, highly important as this is, but in the growing recognition by street railway interests and public alike of the necessity that electric railway companies be placed on a basis of permanence with respect to franchises and of reasonable compensation and return with respect to fares. Both electric railway interests and the public have been driven to recognize these facts by the pressure of experience, frequently unpleasant, and in some cases disastrous.

The sanguine hopes of the pioneers in electric railway construction and development that the low rates of fare originally adopted for both urban and interurban properties would so stimulate travel as to overcome the apparent inadequacy of return as compared with service have been largely disappointed. The unit of service furnished by urban companies has been greatly expanded through extensions of lines and enlargements of transfer privileges, as well as abuses of those privileges. This increase in the service unit has reduced the financial return to a point dangerously near, and in some cases below, the point of actual compensation. The correctness of the electric railway position in this respect has been publicly demonstrated within the past few years in the case of some of the largest and most important properties in the country through investigations made in connection with franchise negotiations or complaints before public commissions, and through reports of public supervisory boards.

In the case of the interurban companies of the country the

same result has become widely apparent. The extension of the length of the ride paid for by the unit fare is not a disturbing factor in the case of the interurban lines, but it is generally true that the basic rates of fare originally fixed by the interurban companies—in some cases as little as 1 cent per mile—were unduly low. These rates were fixed when lines were first put in operation, and when the amount of travel that would be obtained was purely a matter of conjecture. Furthermore, the heavy expense of renewals and replacements was disregarded, or minimized, when these lines were first constructed, and track, rolling stock and power equipment new. Interurban cars cannot be operated at the speed which the traveling public demands and service cannot be satisfactory in other respects unless these properties are maintained at a high standard. The original rates have, therefore, in many cases, been found non-compensatory, and increased rates established. In a number of instances, notably in Massachusetts, these increased rates have been attacked, but have been almost uniformly upheld by the public tribunal passing upon them. In the course of these attacks exhaustive investigations have been made of the revenues and expenses of the companies in question, and the result has been to demonstrate the fairness, and even the necessity, of most of the increases that have been made. While the notoriety of these attacks has doubtless been highly annoying and unpleasant to the companies immediately affected, the general result has been most helpful to the electric railway interests of the country. The fact that public tribunals, the bias of which would naturally be against rather than in favor of electric railway interests, have found these advances justified has done much to convince the public of the fairness of such fare changes as have been elsewhere made.

The result of the various investigations and reports that have been made touching both urban and interurban companies, as well as of a few very instructive object lessons, is that what before the managements knew, but the public could not be made to accept, the public now knows and believes. The idea encouraged by the rose-colored prospectuses of a few years ago, that an electric railroad is a mine of wealth, constantly enriched by unreasonable profits filched from the public, is largely dissipated. Electric railway interests themselves universally recognize to a greater extent than ever before the necessity of adequate fares and the danger of gradually rendering inadequate fares originally adequate by an enlargement, through extensions and transfers, of the service rendered. At the same time, the public is more than ever disposed to take a reasonable and dispassionate view of conditions, and to recognize the unsoundness of the demands for reductions in fares and enlargement of privileges prevalent a few years ago.

With respect to franchise rights, there can be no doubt that we are in a period of transition, and that the final outcome will be to place these rights on a higher plane of permanence. A few years ago the individual who would contend that an electric railway franchise should be for other than a brief period of years was regarded as corrupted by corporation bias, and an enemy to the community. A remarkable recent development is that the defects and weaknesses of short-term franchises from the standpoint of public welfare are now widely recognized. Among the most revolutionary of the public utility laws recently enacted are those of Wisconsin and New York. Yet the Wisconsin law provides for an indeterminate franchise, and in New York, Commissioner Maltbie, of the Public Service Commission for the First District, has made to that commission a report in which, after discussing the merits and defects of the various forms of franchises, the indeterminate form of franchise is advocated.

There is doubtless serious objection to the indeterminate franchise as defined and limited by the Wisconsin act, and as described and advocated by Commissioner Maltbie, but this is generally true of pioneer work. The important fact is that the Wisconsin act and the New York report alike indicate a realization on the part of the public authorities that under short-term franchises electric railway properties cannot be developed to the point of rendering the greatest possible service to the pub-

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lic, and that, therefore, the public interest demands long-term tenures.

On the whole, the electric railway interests of the country are to be congratulated on the tendencies of the times in reference to the two phases of the electric railway situation above discussed. It is not too much to hope that the next few years will see a settlement of some of the most vexatious of the questions confronting the public and the electric railway companies on a fair and reasonable basis, satisfactory and advantageous to both.

STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK

BY E. F. PECK, PRESIDENT, SCHENECTADY, N. Y.

The three meetings of the Street Railway Association of the State of New York, which were held during 1909, were well attended, and the results were beneficial in the highest degree to the companies represented. Thorough discussion of papers has always been one of the most interesting features of our meetings, and the general participation of the delegates is of great encouragement to all who are concerned in the wise settlement of the various problems which are considered by the association at its meetings.

During the coming year the work of the association may follow to advantage some lines of action which the present tendencies of the times appear to make desirable, although our efforts will not necessarily be confined closely to any subjects which seem advisable now. I can indicate, however, some topics which affect various members of the association, and if they are not taken up at this time they may be made a subject for future consideration.

The question of block signals for interurban railways has been suggested by C. R. Barnes, of the Public Service Commission, Second District, as an appropriate subject for discussion and action by the association, and this topic will probably be placed on the program of one of the meetings of the coming year.

Of the problems facing electric railways at the present time, none is more serious than the transfer situation, and we should endeavor to formulate a system of rules governing the issue of transfers, which will minimize the general public misuse of the privilege. If a system could be devised that could be made the basis of the rules of all companies it might be desirable, but I do not know whether such a system is practicable. It would have to contain rigid conditions designed to prevent abuse of the transfers, and yet be somewhat flexible, in order to meet the requirements of companies operating under different conditions. However, the subject is one which is of deep interest to all our members, and whatever we can do in the direction of solution of the problem will be of value. Systems for the collection of fares may be taken up with profit at the same time.

The interurban companies are especially interested in the subject of operating rules, which will be discussed during the year. At the last quarterly meeting, C. Loomis Allen stated that he would recommend the adoption by this association of the code of rules adopted at the Denver convention of the American Street & Interurban Railway Association, with such modifications as may be needed to meet our local conditions. It is hoped that members of the Street Railway Association of the State of New York will give a careful study to the American Association rules, so that they may be prepared to discuss the subject when it is brought formally before them at an early meeting.

A topic of equal importance is the classification of accounts promulgated by the New York Public Service Commission, Second District. The operating accounts, as prescribed by the commission, have been used by the street railroad corporations for the last six months. Some of the companies have had a full year's experience with the classification as they introduced it, in order to gain experience, before the order of the

commission required them to do so. Many points have arisen in connection with the accounts, which a full discussion will help to make clear.

At our last meeting in Albany, C. Percy Hooker, chairman of the State Highway Commission, suggested that a friendly suit be instituted in court by one of our member companies, with the object of securing a decision to determine the relative rights of the State and interurban companies in connection with the construction of new State highways, and it appears advisable to act on this suggestion.

The question of co-operation with the American Association should receive the earnest consideration of members. It is wise for us to strengthen our own organization in every way, but we should also bear in mind that the National Association is entitled to our support in all questions that work for the betterment of the industry as a whole. A working agreement between the American and the State associations should be advantageous.

TERMS FOR USE OF CITY FACILITIES BY INTERURBAN COMPANIES

BY ALBION E. LANG, PRESIDENT, TOLEDO RAILWAYS & LIGHT COMPANY

Since the advent of the interurban railways, the question of how they should gain entrance into cities and upon what terms and conditions, whether over the tracks of already existing city roads by direct negotiation, or whether with independent franchises, and upon their own tracks over streets not already occupied, has been one of the most troublesome problems we have had to solve. No one will question the wisdom of having interurban roads enter cities over their own tracks, upon independent streets, except when it may be detrimental to the best interests of the city company, but in most cases, owing to physical conditions which preclude any other course, it is an absolute necessity to use a portion of city railway tracks in order to reach the business center; and in only a few known instances are the interurban roads required to transfer their passengers at the city line.

I assume that laws have been passed by most, if not all of the States, governing this subject, but it may be of general interest to say that the laws of Ohio provide that interurban railways may enter cities without consulting city authorities, provided they do so over existing street railways, and also authorize existing street railways to make contracts with interurban railways for such entry. This law has been very beneficial in promoting the construction and operation of interurban railways in Ohio, because the interurban railways have not been delayed in obtaining such contracts upon equitable terms; whereas, had it been necessary to consult city authorities before such rights could be procured, great delay would have resulted, with possibly opposition from the city roads and others whose rights might be adversely effected. The right to enter cities and to make such contracts has undoubtedly influenced many city companies, because of general benefit to the city irrespective of financial return to the city company, to make such terms for the use of its tracks and power as would encourage the building of interurban railroads. I do not know what statistics may show, but I venture the opinion that the construction and development of interurban railways in the State of Ohio have been equal to the record in other States, if not far more rapid, and largely because of the ease with which city terminals could be obtained.

In the city of Columbus the gages of the tracks differ, the interurban being 4 ft. 8½ in., as against the city road's 5 ft. 2 in., and here the interurbans enter by independent tracks in such a manner as to avoid interference with the operation of the city cars. In Cincinnati the same gage of tracks exists as in Columbus, but the interurban roads transfer passengers to a city car especially scheduled to take care of the traffic. In Cleveland the interurban cars are received by the city company and treated as their own, the city company paying to the interurban

companies a given sum per mile for the use of the car. In Toledo, Dayton and some of the smaller cities the interurban companies are required to pay to the city companies something less than maximum fare, and assume all risk of accidents and other minor burdens.

There is a popular impression on the part of city officials and many individuals that city roads derive a large financial return from the interurban railways entering over the tracks, but I believe that a careful analysis of the subject, considering the additional power house investment required to meet extraordinary demands, weight of cars, delay in traffic, etc., will show no benefit to the city roads except indirectly by stimulating the growth of cities and bringing to business houses some new and additional customers.

THE CENTRAL ELECTRIC ACCOUNTING CONFERENCE

WM. H. FORSE, JR., PRESIDENT, ANDERSON, IND.

The Central Electric Accounting Conference is an organization of the accounting officers of electric railways of the Central States, as its name indicates. The constitution of the conference restricts its membership to persons connected with electric railways operating in the States of Ohio, Indiana, Illinois, Michigan, Kentucky and Western Pennsylvania. All of these sections are well represented in the roster of membership.

The conference was formally organized on March 2, 1907. M. W. Glover, who was then auditor of the Ohio Electric Railway, conceived the idea of forming an association of the accounting officers of electric railways of neighboring States, on the plan followed by similar associations of the steam railroads. At the organization meeting Mr. Glover was elected president of the conference, in which capacity he served for two terms.

From its inception the conference was found to be a valuable organization. Its first important work was the formulation of rules governing the interchange of freight and passenger business by electric railways. The growth of this business had been so rapid that much difficulty was experienced by the railways in making proper settlements between themselves. The topography of the country, the density of rural population and the class of communities served by the interurban lines of the Central States were all favorable to the rapid development of traffic. The network of electric railway lines in this territory was made up of a few large interurban systems and many smaller "feeders" and connections. Previous to the organization of the Central Electric Accounting Conference, the interline accounting of these lines was far from uniform and much difficulty was experienced in equitably pro rating the revenue from interline business.

The uniform rules governing the accounting and settlements of interline business were adopted by the conference in 1907, after careful consideration and extended discussion. In brief, these rules may be said to follow the general plan of steam road interline accounting. Certain modifications were made necessary, however, because of the peculiar conditions found in interurban railway operation. Other changes were considered desirable as effecting economies. By taking advantage of the latest saving devices it was found possible to simplify the accounting methods and yet secure greater efficiency than by using certain features of the steam road system of accounting. The steam railroads are hampered by the fact that any change in existing methods would be annoying and expensive, hence they find it better to avoid radical departures from some of the most antiquated methods. The electric railways have not had the misfortune of precedence in this respect, consequently they have been enabled to select the best features of modern accounting methods.

The rules adopted were distributed in printed form to the members of the conference and have since been very generally observed by the electric railways operating in the conference territory.

In March, 1909, a special committee of the conference submitted a set of uniform blanks to be used in the settlement of interline transactions. The conference adopted these blanks, after making some slight alterations, and the railways are now using the uniform printed matter, as well as the methods of settlement. The result has been very gratifying and there is none of the confusion which existed when each railway company used a method of its own in reporting its traffic with connecting lines.

The blanks and rules of the conference were made the basis of a report submitted at the Denver convention in October, 1909, by the committee on interline accounting of the American Street & Interurban Railway Accountants' Association. This report was fully discussed in the convention and was adopted as submitted. In view of the fact that the National Association has adopted the Central Electric Accounting Conference plan of settlement for interline business it is altogether likely that in the future the plan will be generally followed throughout the country.

The conference holds meetings quarterly, in the months of March, June, September and December. The program generally consists of several papers on railway accounting and the resulting discussions are usually interesting and instructive.

One of the valuable features of such an organization as the Central Electric Accounting Conference is its ability to get together upon short notice and take action upon present-day topics. In this respect the neighborly conference has a distinct advantage over the National body whose membership is distributed over an entire continent. The value of the "get together" ability was shown in a convincing manner when the tentative classifications of accounts of the Interstate Commerce Commission were submitted for criticism. At that time the electric railways in several of the Central States met on call of the president of the Central Electric Accounting Conference and thoroughly discussed the tentative classifications. The uniform criticism which was subsequently forwarded by the several electric railways to the Interstate Commerce Commission was received very favorably by the commission, as it bore evidence of a thorough knowledge of actual conditions and contained the suggestions of practical railroad men, un-animously agreed upon every feature of the subject under discussion. In consequence most of the suggested changes were accepted and put into effect by the Interstate Commerce Commission.

The work of the conference in the future will be governed to a considerable extent by the trend of affairs.

At its meeting in Dayton, Ohio, on Dec. 11, 1909, the conference adopted a basic plan for the uniform compilation of statistics relating to car-miles and car-hours. As is well known, the value of statistics of this character is almost nil unless the statistics are used for comparative purposes. The operation of the same property may be compared month by month or year by year. Divisions or lines operated by the same company may be compared with each other. Such statistics are valuable as throwing light upon the internal workings of the railway, but to stop there is to miss the greatest good of the statistical work. Comparison of property with property has always been unsatisfactory and always will be, as long as the interests in control are indifferent to the methods used in compiling statistics. A car-mile, for example, may be a mile run by a little single-truck city car weighing 10 tons with 60-hp motor equipment, or a 62-ft. interurban motor car weighing 50 tons with 600-hp motor equipment. It may be a mile run by a motor and trailer, a single motor car, or a three-car train with multiple-unit control. If these varying conditions can be taken into consideration, and methods adopted that will lead to substantial uniformity in the final results, statistics will be real and valuable instead of misleading and unsatisfactory, as they so often are at present.

If the conference can successfully grapple with such problems as these and others that are bound to arise from time to time, it will continue to uphold its reputation as an organization of real value to its membership.

THE CORPORATION TAX LAW

BY WILLIAM F. HAM, COMPTROLLER, WASHINGTON RAILWAY & ELECTRIC COMPANY

I have followed the controversy with reference to the regulations about the enforcement of the corporation tax law with a great deal of interest, and think we are all indebted to the expert accountants who took a determined stand for an interpretation of the law which would be practical and sound from an accounting standpoint. At the same time, I have never felt alarmed over the possibilities of being compelled to report the income and expenses on a strictly cash basis. Some of my friends had suggested the possibility of hiring expert accountants or of increasing their own office forces to meet the requirements of the law. Nothing of this kind appeared to me to be at all necessary, for I believed that any company which made an honest return in compliance with the spirit of the law would not be the subject of criticism.

The spirit of the law is clearly stated in the first paragraph of Section 28. Boiled down, it reads as follows: "Every corporation * * * shall be subject to pay annually a special excise tax * * * equivalent to 1 per centum upon the entire net income over and above \$5,000 received by it from all sources during such year, exclusive of amounts received by it as dividends upon stock of other corporations * * * subject to the tax hereby imposed."

The law, as above stated, is clear, and is only made confusing by the balance of the act, stating the method of determining the net income, in which it would appear the lawmakers were attempting to combine the methods of accounting used by the corner grocery store and the large corporation, with the natural result.

If some of these instructions were to be interpreted as to reflect only cash transactions, it would become impossible to truly state the net income, and the law does not contemplate that any one should perform an impossibility. An account is a statement of facts. Accounts cannot state facts that do not exist. For example, if a railroad company owes a manufacturing company \$10,000, of which one-half is for current supplies used in maintenance and the other half is for new and additional equipment, and on the last day of the year makes a payment of \$5,000 on account without specially applying it to any portion of the account, it becomes an impossibility to state what portion of the account was settled by that payment, because, in fact, it did not settle anything in particular, but was simply a partial payment on the whole account. True, it would be possible to prepare a statement which would be approximately correct, and if it had been determined that the net income should be prepared on the basis of actual cash receipts and expenses, I believe accounting officers could have prepared a statement which would have been reasonably correct and which would have fulfilled the spirit of the law.

However, the Secretary of the Treasury in the recent interpretation placed upon the act has entirely cleared the atmosphere in the two rulings below quoted:

"It is immaterial whether any item of gross income is evidenced by cash receipts during the year or in such other manner as to entitle it to proper entry on the books of the corporation from Jan. 1 to Dec. 31 for the year in which the return is made."

"It is immaterial whether the deductions are evidenced by actual disbursements in cash or whether evidenced in such other way as to be properly acknowledged by the corporate officers, and so entered on the books as to constitute a liability against the assets of the corporation, stock company, association or insurance company making the return."

These instructions are strictly in accordance with correct accounting and good common sense, and will, I have no doubt, command the approval of all accountants. From an accounting standpoint, there is nothing which now stands in the way to prevent an easy compliance with the law by transportation companies.

COMMENTS ON THE ELECTRIC RAILWAY SITUATION

BY EDWIN S. WEBSTER, OF THE FIRM OF STONE & WEBSTER, BOSTON

The problem of securing an adequate revenue from passenger fares appears to be the most serious issue now confronting the electric railway industry. In the early days of electric transportation the 5-cent fare unit was, on the whole, appropriate to the standards and cost of service rendered. The rolling stock was composed of small, light cars, usually of the single-truck type; the speed of operation was relatively low; the power demands per car were moderate; the cost of labor and materials was far below present figures; comparatively light roadbed, track and line construction met the requirements of the traffic, and the investment per mile of track varied from one-half to one-sixth that of the present, depending upon the size of the community served and other local conditions. Even in the larger cities the transfer facilities were greatly limited, and the average haul per passenger was much shorter than to-day.

The standards and costs of service now rest upon an entirely different plane. The expansion of city systems into suburban territory has raised the average length of haul independently of other causes. The transfer situation has become serious, through its extension beyond reasonable limits. The purchasing power of the nickel from the standpoint of the passenger has greatly increased. From the point of view of the operating company, however, the nickel pays for the conduct of considerably less transportation and for the maintenance of less service and equipment than a few years ago. The cost of power has been reduced to some extent by improved technical administration of generating and distributing equipment, but not enough to offset the enlarged demands of heavier cars operated at increased speeds. The growth in the size and weight of cars has increased the rolling stock investment account and necessitated the expenditure of large sums of money for physical plant, including heavier track and more permanent roadbed construction, multiplied capacities in power stations and lines and enlarged facilities for the economical maintenance of equipment. The advances of the past few years in the cost of labor and material have placed a premium upon new construction work and have narrowed the margin between receipts and expenses. Under the early conditions, average fares of from 1 to 1¼ cents per mile enabled the companies to make progress; to-day these returns are insufficient to provide a reasonable dividend in many properties and maintain the most modern standards of service. The increased length of ride now possible upon a single fare of 5 cents makes it difficult for the larger city properties to earn a reasonable dividend, and only in a less degree does this condition bear upon the companies of smaller size. The relatively great density of traffic in the larger city is sufficient to offset the burdens of the transfer, the extension of lines into outlying districts and the rising cost of operation.

In the larger cities there must be some change in the transfer situation in order to secure a fair return to the companies. Scientific administration of properties is insufficient to meet the rising costs of service rendered to the traveling public. The average haul per fare must be reduced, through the restriction of the transfer privilege or the imposition of some sort of a charge for transfers issued. The policy of selling fares at reduced rates must be closely scrutinized, and in many instances abolished. The fare unit in itself will have to be raised to 6 cents or over in cases where it is clear that a line cannot be operated with reasonable profit on a 5-cent fare basis, or else the fare zones will have to be shortened. Otherwise, a line honestly capitalized will have to reduce its capital to a point below the actual investment in the property. Denial of a reasonable return upon a proper investment and insistence upon the highest standards of service closely approach confiscation. The maintenance of a reasonable return through adequate fares and controlled transfer situations, through economical administration and a liberal executive policy is to the advantage of the

public as well as of the companies, for in the last analysis the cost of an unsuccessful utility operation and the benefits of a profitable public service fall upon the community supplied with facilities. So long as present fare limitations apply, the expansion of existing systems and the development of new enterprises can only be retarded.

THE PROPER TREATMENT OF ELECTRIC RAILWAY PROPERTIES

BY J. M'ILLAN, GENERAL MANAGER, PACIFIC ELECTRIC RAILWAY

It is quite plain to the student of electric railway problems that the most serious mistake that has been made, and is still being made, by both the public generally and many of the people responsible, or who should be responsible, for the proper treatment of electric railway properties, is in thoughtlessly treating and handling them as "cheap John" concerns, when exactly the opposite should be the case.

Every "Tom, Dick and Harry" seems to think it is an easy matter to build, equip and operate an electric, commonly called street, railway, and it is true that a great many undertake such propositions and after expending the money of themselves and friends make failures. So are there a great many failures of steam railway undertakings, and, doubtless, more real "cheap John" or "jerkwater" steam roads, the most of them now being branches of the larger systems of steam railways, than there are of such electric railways; but the idea seems to prevail, almost generally, that, if a neighborhood or village wants a railway, all there is to be done is to organize a company, even though a neighborhood company, sell a few thousand dollars of stock, and a railroad will be the result. The actual results from such undertakings are, as a general proposition, more failures than successes and the construction, or partial construction, of a lot of railroad mileage under misapprehension as to the amount of traffic necessary to support a railway line, even though its mileage be limited. The time for constructing cheap railroads and cheap operation of railroads is fast passing away; in fact, has long since passed in this part of the country.

It seems to be beyond the comprehension of many railway promoters, as well as many railway operating men, that electric railways cost, if well constructed and equipped, more than double the cost of construction and equipping the same mileage of steam railways. In the first place, the rights-of-way, both street or highway, franchises and private rights-of-way, cost more for electric railways and are more restricted and burdensome than for steam railways.

In the State, and in many States, electric (street) railway franchises have by law to be, after being applied for, advertised and sold at auction to the highest bidder. In Los Angeles and many other cities and towns in this State laws have been passed, at the behest of the advocates of municipal and government ownership of public utilities, restricting the life of such franchises to 21, and in some cases only 20 years, which, of course, makes such franchises uninviting, as the railways cannot dispose of securities covering short-lived properties; and, notwithstanding these adverse conditions and the provisions by such franchises for the payment by the railway company of 2 per cent of its gross earnings from lines constructed under them, along comes the United States Government with its new corporation tax law, imposing another percentage tax upon the earnings, which simply means a still further tax, and adding that much more to the already heavy burden of the railway company.

OTHER COSTS

Then, after all the restrictions, the first cost of the right-of-way, franchise or otherwise, is only the beginning.

After rebuilding and paving or repaving streets, frequently to the extent of two-thirds their width, the railways are restricted as to the use of them; are subjected to all manner of assessments, taxes and whatever licenses, in addition to all these, any and every city and town council, or board of super-

visors, generally politicians, sees fit to levy, and from which there does not seem to be any adequate recourse.

With the steam roads the conditions are entirely different. If a steam road wants a franchise for tracks over streets, all it does is to apply for it and for such term of years as may be desired up to 50 years. Such applications are passed upon by the councils and boards of trustees, or supervisors, and granted or declined, generally granted, without any advertising or bidding. In fact, the State charters of the steam roads generally give them the right to build upon and occupy with tracks public highways not under the jurisdiction of city or town municipal bodies.

The burden of crossings with steam roads, cost and maintenance is, as a general rule, upon the electric road, whether the crossings be in the streets under franchise rights or otherwise. This crossing and special work expense is one of the largest items of the cost, both construction and maintenance, of anything like an extensive system of electric railway lines.

The first cost of the most of the interurban passenger cars of the Pacific Electric Railway Company, equipped and ready for service, several hundred in number, averages about \$10,000 per car.

How many steam railway coaches in the country cost anything approximating such figures?

The cost of constructing up-to-date electric railways, through localities able to support such transportation facilities, is, mile for mile, about three times that of a steam railway.

The cost of operation, due to the enormously large number of employees necessary for conducting suitable and anything like satisfactory transportation, is, for the same mileage, more than twice, if not three times, that of steam roads. As an example of this: The Pacific Electric Railway, with a distance mileage of roadway of approximately 325 miles, carries upon its operating pay-rolls a monthly average of more than 3500 employees, of whom approximately 1000 are trainmen, motormen and conductors; shopmen 600 to 800, and correspondingly large numbers in all other departments. How many passenger cars, costing a less price per car, and how many employees are required by the steam roads for operating the same mileage? One-half? No; not one-third!

Still the prevailing impression seems to be that electric railways and their service are cheap and should be cheaper; and, strange to say, the most electric railway owners and managers have tried, and are still trying, to conform to this view of the matter in handling the properties under their management, thus encouraging and fostering the general belief that it costs next to nothing to build, equip and operate electric railways.

PUBLIC DEMANDS MORE AND MORE

As a whole the owners and promoters of electric railway properties, men of means, who should also be men of experience, are responsible for the failures of their properties to meet their operating expenses and fixed charges, due to insistence upon "getting along with the public" without friction and lawsuits, without considering and realizing the dear public, like Oliver Twist, continues to demand more; yes, more and more.

Every manager knows that the general demand is for improved service as well as improved and more expensive equipment and facilities generally. The public demands that the employees be better paid in support of the demands of the employees themselves, but let the electric railway company make a move toward increasing its rates a half cent or a cent per passenger or per trip, or toward effecting any economy in the direction of readjusting its service by cutting out a few light and losing trips, or correcting abuses of the transfer privileges and limiting the use of transfers and commuters' tickets to strictly their legitimate purposes, and a howl goes up all along the line and turns loose upon the company every demagogue and "citizen fixit" who can get the newspapers to print his views and his name.

Electric railway taxes, licenses and like fixed charges are almost constantly being increased arbitrarily by political as-

sensors and municipal bodies, principally for the purpose of showing their constituents they are doing something to earn the salaries they are drawing from the public, and because the public service corporations are "easy marks" for them. The Pacific Electric's taxes have been practically doubled over what they were only two years ago, with very little additional mileage and equipment.

The price of almost everything used in the construction and operation of electric railways, as well as wages, is constantly advancing, and we are expected to meet these conditions without increasing passengers' fares and rates one iota.

Does the ordinary person or electric railway manager stop to think how the 5-cent street carfare originated, and that half a generation ago it was considered cheap for an uncomfortable ride in an uncomfortable horse or mule-car, and that such rides were limited to a few miles, at most, and transfers were unheard of and unexpected? Why is it the public does not object to paying largely increased hotel rates, or higher prices generally for the necessities for living, without protest or raising a fuss about the increased cost of living, and at the same time raises such a row over the refusal of a transfer or the increase of a passenger fare by a cent or such matter, due to the efforts of the railway company to meet its increased expenses while constantly improving its facilities and service? If a citizen is charged \$1 for a steak he has been in the habit of buying for 75 cents or 80 cents, or 25 cents for a cigar he has been getting for 15 cents or 20 cents, does he raise a row about it and run to the newspapers, city councils or legislative bodies complaining of the "robbery?" No! Why? Because upon being told the cost of the article has increased, he says he believes in the policy of "live and let live" and lets it go at that. But let the street railway, or any other railway company, attempt to meet its fast increasing expenses and public demands in the same manner, and note the "tempest in a teapot" that is raised.

The costs of constructing and operating electric railways in an up-to-date manner have increased correspondingly with the cost of operating first-class hotels and other enterprises of a public or semi-public nature and with the general increase in the cost of living.

INCREASED COSTS AND INCREASED RATES

Then why cannot the electric railway companies increase their prices by an amount corresponding to the increased cost of their service?

The electric railway managements themselves have a large share in the responsibility for such adverse conditions and general beliefs and lack of understanding on the part of the public of the actual necessities for fair and living revenues for their railways.

They have themselves cheapened their properties and their service by voluntarily, if not upon noisy demands by agitators, reducing fares or extension of transfer limits, etc.

In many, many cases where city lines have been extended beyond city limits, as they existed when franchises were secured, and even where interurban lines have been built between nearby towns and cities, no notice has been taken of the increased mileage and consequent increased operating and maintenance expenses, and the city 5-cent fare has been allowed to apply almost indefinitely. In many cases where city lines have been extended to outlying districts, Government posts, smelters, parks, etc., with little or no local traffic between terminals, the 5-cent fare, like the Constitution following the flag, has followed to the ends of the rails of the electric roads; and not only is this too often the case, but the transfer habit has been allowed to follow to the same extent. One of the best known firms of street and electric railway promoters and owners in the United States has done more damage to the electric interurban railway interest in this respect than can well be reckoned, and is found, sooner or later, to suffer severely for its carelessness or recklessness in the respect indicated, which seems to indicate either incompetent management, or misinformation and misguided judgment. Incompetence on the part of the owners as well as on

the part of managers, because the owners employ the managers.

As one example of many of the public's view of the electric railways operating cost: A shipper of cement in large quantities recently offered the Pacific Electric a shipment of several thousand tons of cement from a port to a point to which the rate is 80 cents per ton, a very low rate for the haul. The shipper's condition upon which he would route the business via the electric road was that it should cut the rate below the published tariff. Upon being told that this electric road's freight rates are the same as the steam roads and its service quite superior, which latter fact he conceded, he "cussed" the office out, saying he could not see any use for electric roads unless they were to cut the rates. He routed his shipments via the steam road. He was and still is under the general impression that it doesn't cost anything to own and operate electric railways. Why this impression? Because of incompetent or inexperienced managements of electric railways.

As a general thing where electric railways have entered into the package, express, or freight carrying business, they have done so at ridiculously low and unremunerative rates and resorted to irregular methods of securing and handling the same.

EXPRESS SERVICE AT LESS THAN FREIGHT RATES

I am told that in many parts of the country the interurban electric roads take boxes of freight, boots and shoes, hats, clothing, etc., from the trade or jobbing centers into the country along their lines on the platforms of passenger cars at rates very much less than those of the old established steam roads, thus giving very superior express service at less than fair and living freight rate, while, as a matter of fact, the service of the electric roads, being superior to that of the steam roads, the electric roads should, if any difference in rates is to be made, get higher rates, particularly on their freight and express service, on the general rules that the "servant is worthy of his hire"—in other words, the buyer paying the value for what he gets. The question is how long can they last at it, and do they realize how much such practices are losing for their companies?

How many men doing this for their companies know what the service is costing and look ahead far enough to realize what the result of this kind of thing will be?

In looking over the rates of one interurban road, which was, and is still, doing a package and freight business, I found rates provided as follows: "Meat, little pieces 5 cents; big pieces 10 cents; baby carriages, without baby 10 cents, with baby 25 cents," and so on throughout the list; the conductors being provided with the sheets, and using their own discretion as to what is a little or big piece of meat.

Is it any wonder that the established steam roads refuse to join the electric roads in the application and prorating of joint through rates? Can they be blamed for refusing to do so as long as such practices by the electric roads prevail?

Every traffic man of experience must know that the steam roads, having been in the business for so long a time, have the carrying business down to an exact science, and that competition in transportation long since brought all rates down to figures as low as the roads can well exist on and keep apace with the demands of the times for improved service at increased operating expenses, and that it is no longer a question of competition in rates but in service.

It is very easy for anyone to reduce rates and give more for the money. Any incompetent man can do that, but, oh! how hard it is to increase rates and fares correspondingly with increased operating expenses and get a fair price for the service given. It takes an able and competent man to do so, and nine times out of ten he sacrifices his position and his reputation making the effort and becomes the most unpopular manager in the company, both with the public and the company for which he is working.

The general impression seems to be that street and electric railways are "mints" when it comes to making money, and it is quite true that some of them have made a little money from

operation, but how many? The number is extremely small as compared to the number of companies and the amount of capital invested in the business.

Many companies, or the owners thereof, may have made money out of electric railways by selling their stocks and bonds and "unloading" them, leaving the properties in fit condition for the hands of the courts and receivers. But how many electric roads have really made their fixed charges, taxes, licenses, street and road assessments, etc., and paid any dividends upon their legitimate stock, and at the same time performed good service and maintained their properties, roadway, equipment and facilities in first-class shape as they should be from their transportation revenues?

As already stated, they are the exception and are very few and far between in the electric railway world, and unless the owners and managers of such properties awaken to a realization of the situation that is now confronting them and unite in getting the governing powers, National, State and municipal, to allow them fair returns for their service and upon the capital invested in them, they are, before many years more elapse, going to be fewer.

AMERICAN STREET & INTERURBAN RAILWAY ENGINEERING ASSOCIATION

BY F. H. LINCOLN, PRESIDENT, PHILADELPHIA, PA.

This year, as last, a meeting of the executive committee of the American Street & Interurban Railway Engineering Association was held as soon as possible after the annual convention, so as to plan the work of the coming year, select the committees and allow the maximum time for committee work. There were five standing committees last year. Each presented a report at the Denver convention and it is a matter worthy of note that every one of these reports was ready for distribution and was sent out with the first package of papers issued from the secretary's office.

It is unnecessary to review for the readers of the *ELECTRIC RAILWAY JOURNAL* any portion of the work accomplished at Denver. The convention was all that could have been desired and the reports submitted by the committees were concise and complete and the discussions were well maintained. The visit to Denver was also particularly instructive to the members of the Engineering Association, because of the novel type of cars and track in use in that city. If any criticism of the sessions of the association could be made, it is that there was an attempt to cover too much ground. It is undoubtedly true that the time at the disposal of the association did not permit it to devote as much time to all of the reports as might have been desired and which they deserved. It should be remembered, however, that one advantage of committee work is that the entire range of investigation required in any topic does not have to be done on the floor of the hall. A great deal of the preliminary study of any subject can best be undertaken in the committee meetings so that the association has to consider only the carefully selected and final product. Again, the committee reports presented this year so many interesting topics that it would have been impossible to have exhausted their possibilities of debate if the convention had been extended continuously over a week. Both of these conditions form arguments, consequently, not against association work, but in its favor, and as many of the subjects taken up in the reports presented at Denver will be continued by committees during the year, there will be ample opportunity for their further consideration.

Among the topics which will form part of the program of the Engineering Association during the coming year will be those connected with mechanical and electrical problems of heavy electric railroads. This branch of electrical engineering seems to fall particularly within the province of the Engineering Association. Most of the questions relating to this class of engineering are similar in kind, though perhaps not in degree, to those confronting street and interurban railway companies and are even more closely approximated on the subway and elevated railroads

of the country. The question of standards for the heavier class of electric transportation has become serious and calls for immediate attention. Some work along these lines had already been undertaken, especially by the equipment committee of this association, but under the direction of our special committee on heavy electric traction, which has just been appointed, progress can be made much more rapidly and systematically.

The greatest need of the association this year is more members and the hearty support of all member companies. Our committees for 1910 will soon begin work on the preparation of their reports and many of them may ask for information by mail on data sheets. Every effort will be made to select and frame the questions so as to minimize the work of replying to them, but it is very important for the committees to have the hearty co-operation of the managements in securing data in regard to practice in different parts of the country. With this information available the Engineering Association can be of even greater value to the industry than ever before.

HELP THE PUBLIC IN CORRECT THINKING

BY JOHN A. BEELER, VICE-PRESIDENT AND GENERAL MANAGER,
DENVER CITY TRAMWAY

While it is true, as you say, that "a large part of the problems which affect one property affect all in some degree," yet there is so great a difference in the degree by which they are affected that almost all questions not purely technical are in a way local.

We, in the growing cities of the West, have to make our business to a considerable extent, while you in New York devise the best means of carrying the people that are clamoring for transportation. Your patrons are waiting for you while we are, in a measure, waiting for them and are always building in advance of present needs. This difference affects all consideration of questions of taxation, franchises, fares and transfers, and an argument from our point of view may not be at all pertinent in large and older cities where from the very beginning of the industry the business was there for the taking. The most difficult problem for us is to keep up with the reasonable demands of the public and get a living while doing it.

In a city covering so much ground as Denver, the increasing length of the 5-cent ride, even though confined to the city limits, is a problem of constantly growing anxiety. We know that a part of our business is done at a loss, but we feel that, having the whole city, it is our duty to do this losing business because we have the good lines to support it. There is, however, a limit to it and we find difficulty often in deciding where to draw the line and in keeping a proper balance between the good and the bad ends of the business.

These thoughts, of course, apply with equal force to transfers which are only an artificial method of lengthening the 5-cent ride. We have avoided, of course, transferring so as to allow a round trip, but, much more to the point, we have avoided and intend to avoid the deadly transfer on a transfer which has done such an injury to lines in larger cities. Our idea of a transfer is not to allow a passenger to get from anywhere to anywhere for 5 cents, but to give a transfer good on one specified line to be used within a reasonable time for one fare. So far and no further we consider the interests of the public and our own to be identical.

In connection with these matters, while we pay franchise taxes in addition to taxes on property, we fully believe, from the standpoint of the public interest alone, that franchise and all other taxes not paid by everyone are indefensible and we are constantly trying to show the public that a special tax of any kind is, so far as it goes, a limit upon the service and a wrong to the poorer part of the community. We hold and we preach the quantity and quality of service are by far the best contribution that street car companies can make to the "common good."

And in this same line of thought we think that long-term and even perpetual franchises properly guarded, are for the best interest of the public. This heresy, too, we preach at every

opportunity at the risk of being charged with false pleading, selfish interest and with forgetfulness of the rights of the people to the streets. But all of these unfashionable heresies which I have expressed are true, and if hammered into the people, will stick soon with some and finally with all. All franchises being revocable if the public good required under eminent domain should be in the true interest of the public perpetual. There is no use, in a street railway journal, in setting forth the public injuries that result from limited franchises. Recent history is too full of them.

You will perhaps think that what I have written is fitter for an audience at a town meeting than for one of street railway managers, but I really think that we should take high ground in these matters and, so far as we can, help the public in the direction of straight thinking about their and our affairs.

AMERICAN STREET & INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION

BY H. S. SWIFT, PRESIDENT, TOLEDO, OHIO

During the past year the Accountants' Association, through its classification committee, has taken up with the Interstate Commerce Commission many questions in reference to the application of the new system of accounts under certain conditions, and has obtained rulings which have been distributed by the commission in pamphlet form. Many of these questions were important, and the decisions show a logical interpretation of the theory of accounting.

A joint committee was appointed by the Engineering Association and by our association to bring about a more uniform cost system for shop and power station work. A large amount of data has been secured from member companies, and progress made toward compiling the information. Both committees were continued for the coming year and no doubt the report will be presented in good time so that the recommendations can be discussed and acted upon at the next convention of the association.

Another question, that of statistics for interurban electric lines, was brought before the last convention. A large number of the members of our association operate interurban lines which have been developed by extensions and consolidations into large systems that have already become an important element in the transportation field. With their development has arisen the necessity for more uniform and more serviceable statistics, and this subject is of such interest that it should be given more attention during the coming year.

There is also a demand for data as to the prevailing practice in many branches of our work, such as methods of paying employees, computing mileage, handling invoices, stores, etc., not with the expectation or intention of bringing about any uniformity, because the varying local conditions will make this impossible, but that the experience of others may be available as a guide.

Reviewing the work of the association, it seems that up to the present time its members have given much of their time and attention to their duties to the executive officers of their companies. This is unquestionably of most importance, but the educational work of the association must soon broaden along other lines, and at this time especially accounting officers may well consider their duties and responsibilities to stockholders, to investors and to the public. One kind of statistics furnished for years, the cost of carrying passengers, is a subject of great interest, and no doubt many accountants have theories about some items of cost in addition to operation and maintenance which should be added to their reports to give the correct answer. A number of years ago there was no experience to guide them in solving some questions, but for some time electric lines have been operating under conditions as nearly uniform as can be expected in the future, and accounting officers should work out this important problem and be prepared to defend their analyses, for at the present time in many localities the

public is greatly interested in this question, and executive officers and directors, too, are giving this basic item of cost and the other problems which grow out of it more serious attention.

THE FUTURE OF STREET RAILWAY SERVICE IN LARGE CITIES

BY WILLISON FISH, ASSISTANT TO THE PRESIDENT, CHICAGO RAILWAYS COMPANY

Street railways as a thing by themselves have a history of 50 or 60 years—a large part of it being a blank; but street railway service is a branch of transportation in general which is as old as almost anything else. The old street car was, of course, a horse car. It began as a slightly transformed coach or stage, with the driver sitting up in front, drawing \$1 per day, and with passengers mounting on a step at the rear. Except for the two tracks that it ran upon it was very little different from any other omnibus. No doubt all the old rules for omnibuses were applied to the new vehicle. It would be interesting to inquire how long a time elapsed before the people made an ordinance requiring that these tracks were not to be continuously held by other vehicles. I will venture the guess that it was some considerable time, and that the owners and drivers of other vehicles feigned to believe that their own rights in the street were grievously infringed. But here was one change made from the older times; here was the beginning of the specialization of the track.

I do not know what the old custom was, but I have no doubt that at one time omnibuses stopped wherever a passenger signaled them. Of course, they stopped at the curb. Here, then, when passengers went out onto the street to get a car and when the car itself stopped only at the street intersections was another considerable change from the old time. In fact, this limitation of stops at the street intersections was so great a change and so sudden an innovation that the world has not become entirely accustomed to it yet, and in many cities will still be found ordinances requiring street cars to stop in the middle of long blocks.

Now, when the above changes had been instituted, the street car of former days was fairly well provided for. It was drawn by horses or mules, and there was no particular harm, if the slower traffic teams could occasionally be induced to leave the track, in allowing the street car teams and the other teams to move along together. The cars, too, were light, and the speed was slow, so there was no great loss of time in making these one-block stops. Moreover, the cities in the old days were much smaller, and what there was of them was more congested, so that the trips were short even with the slow speed and the frequent stops.

The circumstances of street railway service are now, of course, vastly different. Here in Chicago, instead of a service extending $3\frac{1}{2}$ miles to the "Limits" on the north, or 3 miles to Western Avenue or 4 miles to Thirty-ninth Street, we have true street car service extending to the north end of Evanston, about 15 miles; to the west line of Maywood, $11\frac{1}{2}$ miles; to Jefferson, $9\frac{1}{2}$ miles; to Lyons, 9 miles; to the south limits of the city, 17 miles. The distances are now three times what they were in 1875 and twice what they were in 1885.

At the same time the cars have increased in size and weight. They were formerly mere stages on car wheels, weighing, perhaps, 2 tons. They are now like the cars on steam roads, and weigh 25 tons. The motive power is no longer the horse, with its limited speed, but electricity. In 1875 here in Chicago we had about 400,000 people; now we have 2,500,000. Moreover, the 400,000 lived close together and did not need to ride on the street cars; the 2,500,000 live with great distances to traverse, and depend on the street cars.

The people of Chicago have for a considerable time felt a strong need of radical improvements in the street railway service. Many of the necessary improvements have been made.

Since 1906 about \$40,000,000 has been spent in Chicago largely in the physical rehabilitation of cars and tracks, but with all this outlay of money on the physical parts of the system the method of operation remains practically the same as in the simple old horse-car days. The cars still divide the right-of-way with the teams, and they still stop at each street intersection and "in the middle of long blocks where signs are placed."

I believe that easily practicable changes in the system of operation would add as much or more to the comfort and efficiency of street railway service as has the expenditure of this large sum of money. I see in the history of transportation in the past, and in evolution of all kinds, assurance that presently the large cities will ask for and demand a street car service unimpeded by other traffic, and with stopping points for the cars at intervals corresponding to the length of the routes traversed. I understand that the first railroad charter in the United States provided that the rails should be so designated and laid as to allow wagons to use them, but when the steam cars attained a high speed the road of the steam car was made special to itself. In the early history of steam railroading, too, all the passenger trains stopped at every station, but now this is changed, to the vast improvement of the service.

While cities have been multiplying their population and still more rapidly extending their limits, there are yet some things that remain as they were, and to which, if possible, all other things must be made to fit. Thus, the people now who live 6 or 8 miles from the center of the city have still only 24 hours a day in which to live and do their work; they have no more time to devote to riding on street cars than they had when the trips were half as long. Whatever the maximum speed of a car, trips from the center of the city to the residence district will take more time than people can afford to use if the cars are to be obliged to work their way like a wedge through the other traffic. And again, if there were no other traffic upon the tracks, and the cars still followed the old horse-car rule of stopping every block (not forgetting to stop in the middle of long blocks where signs are placed), the average trip would still consume altogether too much time.

I thoroughly believe that, to as great an extent as possible, the right-of-way of street cars should be reserved for street car use, and that it should not, except when necessary, be used at all by other traffic. I know that a very great saving would be made in time, and a vast addition made to the satisfaction of the public if the number of stops were to be greatly curtailed.

I think that the public authorities and the street railway men should study this problem with their minds entirely free from old methods, which are to a great extent merely an unmeaning heritage from the old days of stages and omnibuses. I think that the kinds and amounts of traffic upon streets should be ascertained and that then rules should be made governing this traffic, according to its kind and amount. For instance, I know that about one and a half million people who pay cash fares ride on the surface roads of Chicago every day of the year, and that this traffic is one of enormous importance. It would not be difficult to determine what the team traffic amounts to: we know that in Chicago there are about 2800 miles of streets and 1400 miles of alleys, and that less than 450 miles of Chicago streets are occupied by street car tracks. On a street that has a double track 16 ft. is taken up by the tracks, and outside of this width about 22 ft. remains. Now, it seems to me very likely that a little figuring would show that this 16 ft. on the 450 miles of streets could well be devoted almost exclusively to the use and accommodation of these 1,500,000 daily travelers, and that when the 22 ft. remaining on these 450 miles of streets, together with the entire roadway on the other 2350 miles of streets not occupied by tracks, are left to the exclusive use of team traffic, the latter has all that it needs, and certainly all that its comparative importance would justify. The paved streets in Chicago amount to 1618 miles.

I am absolutely satisfied that a large proportion of the

stopping places should be eliminated. Unless boulevards or steam or railroad crossings interfere, or unless the blocks are of unusual length, street cars in the large cities should have established stopping places at every fourth block.

I have made a great many observations, and find in brief that on the lines of the Chicago Railways this rule as to establishment of stopping places would eliminate 64 per cent of the stopping points; out of 199,000 actual stops counted 53,000 were unnecessary, or 26 per cent. I find that of all passengers carried on the trips observed 68 per cent already made use of the main stopping points, and I found that only 16 per cent of the passengers would be at all inconvenienced by the establishment of these stopping points.

Between Monroe and Dearborn Streets and Devon Avenue there are now 125 points at which cars will stop for passengers. Of course, the cars do not, in fact, stop every block, but in the rush hours the percentage of stops becomes very large. There should be but 46 stopping points on this line, instead of 125. On Lincoln Avenue the 71 present stopping points should be reduced to 23; on Ogden Avenue the present 108 should be reduced to 40, and on Madison Street the present 84 should be reduced to 30. These figures assume that in the downtown district the cars will stop once at each intersection.

I believe that both of the changes which I suggest here are practically bound to be brought about. The rapidly growing population of the cities and the more rapidly growing area of the cities demand these changes. The benefits from these changes will be many. They will not only greatly shorten the time, but they will make the schedule far more certain. They will do away, too, with some of the extreme vexations and irritations of street car travel. Every one now who has definite hours to keep must allow from 15 minutes to half an hour every day for possible and even probable delays beyond the time required by the actual schedule.

With the best of cars, the best of roadbeds, with abundant power and with the energy of the people and their keenness in getting at the reason and logic of things, it seems to me that it will not be very long before the old haphazard horse-car methods will be abandoned and street-car service be made rapid and certain.

SOME PRESENT TENDENCIES IN CAR CONSTRUCTION

BY S. M. CURWEN, VICE-PRESIDENT AND GENERAL MANAGER, THE J. G. BRILL COMPANY, PHILADELPHIA

For some time the question of lighter city cars has been most carefully considered by railway managers and car builders. After the discontinuance of short single-truck cars, which were superseded on most of the larger roads by cars having double-trucks and greater capacity, the trend of practice was toward the use of still larger and heavier cars. This tendency continued until in many places the cost of operation, from the increased weight, became such a factor that railway managers began to turn their attention to the possibilities of using a car which would be much lighter but would have a slightly decreased carrying capacity. A number of experiments have been made and show that for most types of service and under ordinary conditions it is easily possible to build a car varying in length of body between 28 ft. and 32 ft. and fitted with pay-as-you-enter platforms, which seem now to be almost universally used, light enough to enable the car to be operated by two motors and mounted on single-motor trucks. At the same time the electrical manufacturing companies have developed for such a service a light motor of increased capacity, which, in proportion to its output, makes a two-motor equipment weigh much less than a four-motor equipment.

The best construction to obtain lightness and strength is governed by so many conditions that it is almost impossible to give any fixed rule for obtaining these results. In some instances lightness may best be obtained by the use of steel underframes strengthened by steel plates reaching to the windows.

In other instances it is better to build cars almost entirely of wood with strengthening steel members in the underframes and platforms. I believe, however, that more intelligent effort is being directed now toward the economic utilization of every pound of weight in a car body than at almost any previous period.

In the case of interurban equipment, managers do not appear to consider the question of lightness as important as other features which affect the operation of their roads. The tendency has been rather to use a large and proportionately heavier car with a view of competing with cars of steam railways.

The American Street & Interurban Railway Association standardization committee has been doing excellent work in endeavoring to standardize a number of wearing parts on car trucks, notably wheels and brake shoes. Its efforts are being appreciated by the different roads and its specifications are being used largely in orders for new equipment. This principle of standardization can be, and no doubt will be, extended gradually with benefit to the industry.

TENDENCY OF DIMINISHING PROFITS AT 5-CENT FARE

BY FRANK R. FORD, OF FORD, BACON & DAVIS

The most important problem to the street railway industry to-day, in my opinion, is: How long can the nickel remain the flat rate of fare for unlimited street transportation within large cities?

The tendency of diminishing profits at the 5-cent fare is shown from the following brief consideration of the income account:

A. Gross Receipts.

It is believed that, due to the recent experiences in Cleveland, Philadelphia, New York City and elsewhere, the tendency will be away from a further imposition of decreased fares with unlimited transfers, such as six tickets for a quarter, 4 cents cash; seven tickets for a quarter and 3 cents cash. The charge made for transfers in Cleveland indicates this tendency.

In large cities there is a greatly increased investment obligation with increased gross earnings; as the city expands the transportation interests must keep pace, providing, first, surface lines; second, elevated railroads, and third, subways. The investment per mile of street quadruples approximately at each of these steps.

The larger the city the longer the ride and the slower the speed on the surface: real estate and operations become more expensive. The largest cities sometimes demand the underground trolley for surface railways.

Street railway rates should be determined as scientifically as are those for steam railroads, electric light, etc. All other transportation rates, such as steam railroads, steamboats, stage coaches, cabs, etc., are based on a charge per weight-mile and, as the passenger will average about 150 lb., in passenger transportation, this unit is usually the passenger-mile.

The 5-cent nickel is a convenient fare piece and its use as a flat rate has been advocated largely because street railways owners and managers have thought it would produce more than a reasonable return. In large cities with unlimited transfers it is questionable to-day whether this provides as much as a reasonable rate.

B. Operating Expenses.

The tendency of increased cost of operation is shown for the period 1902 to 1907 by an increase of the operating ratio for the street railways of the United States from 57.5 per cent to 60.2 per cent of gross earnings, due largely to

1. Increase of service per 5-cent passenger, caused by increased length of ride, from:

1. Increase of populated area. This has resulted in a decrease of passenger receipts per mile of track of the larger street railways during recent years.
2. Increased use of transfers. The per cent of transfer to fare passengers for the entire United States has in-

creased from 22.3 per cent to 26.8 per cent during the same period.

2. Increased cost of labor, due to increased cost of living, high tariff, gold production, etc., is shown as follows:

	1902.	1907.
1. Wages per employee.....	\$605	\$658
2. Wages per car-mile, cents.....	7.1	8.5
3. Wages per cent of gross earnings.....	32.7	33.0

The increased rate of wages is offset partly by more wholesale business and by use of labor-saving devices.

3. Increased cost of materials and supplies. The average wholesale prices of railroad materials and supplies, as reported by the United States Bureau of Labor, show large increases from 1897 to 1907. For the period from 1902 to 1907 the cost of materials and supplies of street railways of the United States, as evidenced by operating expenses, less wages and salaries, increased from approximately 4.7 cents to 6.2 cents per car-mile, or from approximately 21.9 per cent to 24. per cent of gross earnings.

4. Increase due to heavier weight of cars per seat. The weight of 650 lb. per passenger seat of the single-track car of 1900 compares with over 1300 lb. for the double-track four-motor pay-as-you-enter car of 1909. The cost of transporting this increased weight has been estimated at from 6 cents to 10 cents per pound per year. This accounts largely for the increased power consumption per car-mile of recent years.

5. Increased cost of maintenance due to higher standards required by:

1. More scientific management.
2. Public opinion as expressed generally and through authorities.
3. Heavier rolling stock and increased cost of labor and materials, as stated above.
4. Renewals due to wear charged to operating expenses, where formerly capitalized.

The total cost of maintenance charged to operating expenses for the larger street railways has increased considerably during recent years, both per car-mile and in percentage of gross earnings.

6. Increased cost of fuel. From records of United States Geological Survey average cost of bituminous coal at mine increased from 81 cents per ton in 1897 to \$1.14 in 1907. For street railways the fuel cost per car-mile has increased, but due to power-house economies the cost of fuel and the entire cost of power in percentage of gross earnings have not changed materially.

7. Increased cost of damages. During recent years damages and legal expenses in connection have increased considerably in percentage of gross earnings.

8. Increased cost of general officers and clerks due to:

1. Necessity for more scientific management.
2. Cost of statistics for security holders and public authorities.
3. Increased salaries.

The increase from 1902 to 1907 of the average salary of general officers and clerks was from \$1,040 to \$1,100 per man, or from 3 per cent to 3.1 per cent of gross earnings.

9. Small decreased cost of operation of cars. During recent years the cost of operation of cars, the remaining large operating expense, has continued practically stationary in percentage of gross earnings, although this is usually the item to which economies are directed.

C. Fixed Charges.

The tendency to increase fixed charges is shown as follows:

1. Taxes. While taxes paid directly in cash have not increased during recent years in percentage of gross earnings other tax items have increased largely, such as:

1. Paving renewals (formerly capitalized).
2. Paving maintenance.
3. Change of grade or relocation of track due to street improvements (formerly capitalized).
4. Street sprinkling.

5. Snow removal from streets.
6. Cleaning streets.
7. Bridge tolls.
8. Free passes for government employees.
9. Free lighting and use by municipality of poles and conduits.
2. Division with municipalities of net income, such as:
 1. In Chicago the city receives 55 per cent of net income.
 2. In Cleveland the city will receive all net income above 5 per cent on bonds and 6 per cent on stock, representing a low valuation of actual investment.
 3. In Philadelphia the city will receive 50 per cent of net income above 6 per cent on capital stock.
3. Reserve funds for:
 1. Depreciation. This is required by such State commissions as the Public Service Commissions of New York and Wisconsin and provisionally by the Interstate Commerce Commission. Some of these commissions go so far as to require this fund to provide not only for present renewals, but also for both past and current depreciation due to wear, "obsolescence," "supersession" and "inadequacy."
 2. Unliquidated damages for previous and current years. This is required by the Chicago traction settlement ordinance, and is provided for by many other companies.
 3. Amortization of tangible capital:
 1. Due to mortgage requirements, such as sinking funds.
 2. Due to franchise requirements by which city obtains physical property at end of franchise without payment, such as New York subway.
 4. Amortization of intangible capital:
 1. Bond discount.
 3. Cost of organization.
 3. Interest and taxes during construction.
 4. Franchise cost and additional franchise value, including promotion profits.

Most of these reserves are recommended or required by the commissions mentioned.

4. Interest.
 1. The average rate of interest on bonds has remained practically the same from 1902 to 1907, being 4.39 per cent and 4.25 per cent, respectively.
 2. The proportion of total capital allowed to be issued in bonds has decreased, thus increasing the cost of financing the remainder.
5. Return on capitalization.
 1. Dividends and surplus decreased from 1902 to 1907 from 12.2 per cent to 9.4 per cent of gross income.
 2. Compare total return on capitalization with other industries of the United States.

The return per \$1,000 of capitalization for 1905 is given by Logan G. McPherson, in the *Railway World*, as follows:

Industry.	Gross.	Net.	
1. Manufactures	\$1,216	\$151	(15.1%)
2. Agriculture	191	98	(9.8%)
3. Steam railroads.....	150	44	(4.4%)
Compare street railways for 1907.....	\$127	\$46	(4.6%)

Where the period from 1902 to 1907 is given above reference is made to the preliminary report of the United States Census and to all street railways of the United States.

The Ft. Wayne & Wabash Valley Traction Company has equipped one of its large interurban cars with tungsten lamps as an experiment. The new lamps are said to give a better light when the trolley voltage is low than can be obtained with ordinary carbon filament lamps.

Every street car in Rotterdam carries a small package of first-aid-to-the-injured supplies. It is placed in a case beside the fare register, and contains bandages, adhesive plaster, antiseptics and other supplies useful in case of injury.

TRAFFIC PROBLEM IN CHICAGO

BY THOMAS E. MITTEN, PRESIDENT, CHICAGO CITY RAILWAY

The chief problem which the new year will press upon Chicago traction is traffic and the scientific operation of the rehabilitated properties. Unification and co-ordination of the various street railway lines of the city is the obvious first step in its solution. A beginning has been made in this direction in the consolidation of the lines operated in the southern division of Chicago.

Congestion of traffic in the downtown or intra-loop district is steadily increasing, and is adding not only to the hazards of operation, but to the difficulty of maintaining schedules and up-to-date service. The situation is crucial in many respects, and there is little room for ill-considered experimentation or blundering. Mistakes made at this time would prove costly, both to the public and to investors in street railway securities. Personally, I am confirmed in the opinion that Chicago can obtain relief only by extending the limits of the present central business district and by reducing to a minimum interruptions to traffic in the heart of the city. This, in my judgment, can be accomplished only by straight-line operation and by use of the zone system. At present the elevated and surface lines are being operated at cross purposes with the actual demands of the traffic. In short, what we need most is system based upon the traction needs, present and future, of the entire city. To work out in theory and practice such a system is the task and opportunity of traction management in Chicago.

The Chicago City Railway has practically completed its work of "immediate rehabilitation" as required by its franchise ordinance, and is well equipped to meet the greater problem of operation which confronts it. Our relations with employees and public during the past year have been most gratifying, and the prospects for increased prosperity are likewise encouraging.

CONVENTION SOUVENIR NUMBER OF GERMAN STREET RAILWAY PAPER.

Under date of Sept. 11, 1909, the *Deutsche Strassenbahn und Kleinbahn Zeitung* published a special number in connection with the Hamburg convention of the Vereins Deutscher Strassenbahn und Kleinbahn Verwaltungen (German Street & Interurban Railway Association). This is said to be the first convention issue ever published by a German railway paper. The introductory feature is a very interesting description of Hamburg, accompanied by a frontispiece illustration of the colossal Bismarck monument and numerous views of other noteworthy places in the famous Hanseatic city. This is followed by a brief statement showing the size and track conditions of the Hamburg street railway system. About 18 miles of track in Hamburg are thermit-welded. Mr. Stahl, of the Dusseldorf tramways, contributes an article describing several special cars developed on his system for cleaning grooved rails, sprinkling car using compressed air and a vehicle for the transportation of invalids. G. A. A. Culin, of Hamburg, writes on the mystery of corrugation, and F. Melau, of Berlin, on the oxy-acetylene process as applied to rail cutting and rail welding. Dr. Dietrich, manager of the Berlin municipal lines, describes an automobile tower wagon. Another striking feature of this convention number is the number and length of the articles written by several of the most important manufacturers of electric railway equipment to describe their shops and general facilities.

The first electric railway in Bolivia was opened in July, 1909, at La Paz, by the Bolivian Rubber & General Enterprise Company, which is a corporation with headquarters in London, England. The company will furnish free electric lighting to the city and the latter is to grant subsidies as the railway system is extended.

ELECTRIC RAILWAY ROLLING STOCK ORDERED IN 1909

The orders placed by electric railways for rolling stock in 1909 are shown in detail in the accompanying table. The total of all cars, locomotives and miscellaneous rolling stock ordered was 4957, an increase of 53 per cent over 1908. As in previous years the table has been compiled from our own records kept from week to week, from returns received from the railway companies known to have placed orders and from reports obtained from the car-building companies. It is therefore exceptionally complete and accurate in the details given.

The orders classified according to the service in which the cars are used are given below :

Table with 3 columns: Service, 1907, 1908, 1909. Rows include Passenger cars, city; Passenger cars, interurban; Freight and miscellaneous cars.

The cars shown in the table marked with an asterisk (*) are of the prepayment type. A total of 1096 out of 2537 city cars ordered were of this type.

The prospects for large orders of cars to be placed in 1910 are indicated by partial returns which show that 101 roads expect to purchase more than 2600 cars next year.

ROLLING STOCK EQUIPMENT ORDERED IN 1909.

Main table listing rolling stock equipment ordered in 1909. Columns: Purchaser, No., Class, Length, Serv., Truck, Builder. Includes entries for Albia Int. Ry., Amarilla St. Ry., Aroostook Valley R. R., Asheville & E. Tenn. R. R., Ashland Lt., Pwr. & St. Ry., etc.

Main table listing rolling stock equipment ordered in 1909 (continued). Columns: Purchaser, No., Class, Length, Serv., Truck, Builder. Includes entries for Chicago & Oak Park El. R.R., Chicago & Southern Trac. Co., Chicago, Aurora & DeK. R.R., etc.

Purchaser	No.	Class	Length	Serv.	Truck	Builder
Ft. Wayne & Wabash Val. Tr.	1	Elec. Loco.	.....	Freight	S. T.	Westngh.
	1	Pass.	.....	Int.	D. T.	Co. Shops
	20	Semiconv.	32-1	City	S. T.	Cincinnati
	4	Comb.	55-0	Int.	D. T.	Cincinnati
	4	Exp. Trail.	40-0	Int.	D. T.	Cincinnati
	2	Exp.	60-0	Int.	D. T.	Cincinnati
	10	Gondola	40-0	.....	D. T.	Haskell-Bar.
	1	Sprinkler	.....	City	S. T.	McGuire-C.
	1	Steel Tr.	.....	City	D. T.	McGuire-C.
Fresno Traction Co.	10	Calif. type	37-2	City	D. T.	American
Galesburg Ry. & Lt. Co.	1	Sweeper	.....	City	S. T.	McGuire-C.
Gallatin Val. Elec. Ry.	1	Semiconv.	51-2	Int.	D. T.	Brill
	1	Elec. Loco.	.....	.....	.....	Baldwin
	1	Comb.	.....	Int.	.....	A. C. & F.
Galveston Electric Co.	10	Open	28-8	City	S. T.	American
	5	Narragan.	36-0	City	D. T.	American
	3	Closed	20-0	City	S. T.	Kuhlman
	4	Pass.	.....	.....	D. T.	McGuire-C.
Gary & Interurban Ry.						
Geneva, Waterloo, Seneca Falls & Cayuga Lake Trac. Co.	13	Closed	47-0	Int.	D. T.	Wason
	3	Closed	28-0	City	S. T.	Wason
	6	Closed	39-0	City	D. T.	Co. Shops
	12	Closed	30-0	City	S. T.	Co. Shops
Georgia Railway & Elec. Co.						
	1	Pass.	.....	.....	S. T.	McGuire-C.
	3	Semiconv.	30-8	City	S. T.	American
Grand Rapids Railway	12	Pass.	43-6	City	D. T.	American
	2	Closed	42-0	Int.	D. T.	American
	2	Trailer, C.	42-0	Int.	D. T.	American
	2	Closed	20-0	City	S. T.	American
Great Falls Street Railway	2	Semiconv.	.....	City	S. T.	Brill
Gulfport & Miss. Coast Tr. Co.	1	Comb.	42-0	Int.	D. T.	Cincinnati
Hagerstown Railway	2	Closed	30-0	City	S. T.	Ottawa
Halifax Electric Tramway	2	Closed	.....	City	S. T.	Cincinnati
Helena Lt. & Ry. Co.	2	Closed	.....	Int.	D. T.	McKeen
The Hocking-Sun. Crk. Tr. Co.	1	Gas-M.	57-0	Int.	D. T.	Cincinnati
Houston Electric Co.	25	Pass. S.E.*	31-0	.....	S. T.	Cincinnati
	5	D. E.*	31-0	.....	S. T.	Cincinnati
	5	Closed	28-0	City	S. T.	Cincinnati
	5	Closed	48-0	Int.	D. T.	Pressed St.
Hudson & Manhattan R. R.	90	Bag & Ex.	50-7	.....	D. T.	Brill
	2	Closed	30-0	C.&Int.	S. T.	Ottawa
Hull Electric Co.	1	Snow Plow	32-0	C.&Int.	D. T.	Ottawa
	1	Snow Plow	45-0	C.&Int.	S. T.	Russell
	1	Sweeper	28-0	C.&Int.	S. T.	Ottawa
Huntington Railroad	1	Snow Plow	17-0	Int.	S. T.	Russell
Illinois Central Electric Ry.	2	Closed	44-0	Int.	D. T.	McGuire-C.
	1	Comb.	49-1	Int.	D. T.	McGuire-C.
	1	Work	43-0	.....	D. T.	McGuire-C.
Illinois Central Traction Co.	2	Trailer, C.	44-0	.....	D. T.	McGuire-C.
	1	Gas. Mot.	54-0	.....	D. T.	McGuire-C.
Illinois Traction System	7	Trailer	52-6	Int.	D. T.	Danville
	4	Comb.	52-6	Int.	D. T.	McGuire-C.
	2	Sleepers	.....	.....	.....	A. C. & F.
	1	Trailer	52-6	Private	D. T.	Danville
	4	Exp. Mo.	52-6	Int.	D. T.	McGuire-C.
	32	Ex. Trail.	41-5	Int.	D. T.	McGuire-C.
	40	Frt., Box	40-0	Int.	D. T.	A. C. & F.
	50	Gondola	40-0	Int.	D. T.	A. C. & F.
	4	Cabooses	.....	.....	D. T.	Hicks
Indiana Union Traction Co.	6	Gondolas	34-0	.....	D. T.	Hicks
Ind'lis, New Castle & Tol. Ry.	6	Pass.	60-0	Int.	D. T.	Jewett
	2	Express	58-0	Int.	D. T.	Jewett
Ind'lis Traction & Term'l Co.	10	Open	42-2	City	D. T.	Cincinnati
	44	Closed	46-8	City	D. T.	Cincinnati
Interborough Rap. Tran. Co.	40	Closed, M.	47-0	Elev.	D. T.	Barney & S.
	20	Closed, M.	47-0	Sub.	D. T.	Jewett
	110	Closed, M.	51-0	Sub.	D. T.	A. C. & F.
	40	Closed, M.	51-0	Sub.	D. T.	Standard
	100	Closed, M.	51-0	Sub.	D. T.	Pressed
	20	Trailer, C.	47-0	Elev.	D. T.	St. Louis
	20	Trailer, C.	47-0	Elev.	D. T.	Waston
	20	Work	33-0	S. & E.	S. T.	Walston
Ithaca Street Railway Co.	2	Closed	43-0	City	D. T.	Cincinnati
Jacksonville Electric Co.	5	Pass.*	31-0	City	S. T.	Danville
Jacksonville Ry. & Lt. Co.	2	Pass.	32-0	City	S. T.	McGuire-C.
Kansas City Ry. & Lt. Co.	25	Trailer, C.	26-0	.....	D. T.	A. C. & F.
Lack. & Wyo. Val. R.R. Co.	1	Frt., Box	36-0	.....	D. T.	Hicks
	5	Gondola	36-0	.....	D. T.	Haskell
Lake Shore Electric Co.	10	Gondola	36-0	Coal	S. T.	St. Louis
Lawrence Ry. & Lt. Co.	7	Open	.....	City	S. T.	St. Louis
	12	Semiconv.	21-0	City	S. T.	Brill
Lehigh Valley Traction Co.	4	Closed	29-5	.....	D. T.	Brill
	1	Bag & Ex.	.....	.....	S. T.	Brill
Lehigh Valley Transit Co.	2	Snow Plow	.....	C.&Int.	S. T.	Russell
	2	Snow Plow	.....	City	D. T.	Russell
Lewiston & Youngstown Frontier Ry. Co.	6	Trailer, C.	.....	.....	.....	Co. Shops
Lew'n, Aug. & W'ville St. Ry.	2	Frt., Box	36-0	Int.	D. T.	Co. Shops
	3	Flat	36-0	Int.	D. T.	Co. Shops
	1	Snow Plow	.....	C.&Int.	S. T.	Russell
	1	Sprinkler	.....	City	S. T.	Co. Shops
Lexington & Interurban Rys.	3	Pass.	31-0	City	S. T.	Kuhlman
	3	Freight	45-0	Int.	D. T.	Co. Shops
Lincoln Traction Co.	3	Express	41-0	Sub.	D. T.	Co. Shops
Linwood Street Railway	1	Closed	42-0	Int.	D. T.	Stephenson
Long Island Railroad	100	Closed	62-0	Tunnel	D. T.	A. C. & F.
	15	Comb.	62-0	Tunnel	D. T.	Standard
	15	Exp. Comb.	62-0	Tunnel	D. T.	A. C. & F.
Los Angeles & Redondo Ry.	10	Pass.	47-0	Int.	D. T.	Co. Shops
	1	Elec. Loco.	30-0	Int.	D. T.	A. C. & F.
Louisville & Eastern R. R.	5	Closed	.....	City	D. T.	Cincinnati
Louisville Railway	33	Pass.*	45-0	City	D. T.	Wason
Lowell & Fitchburg St. Ry.	2	Pass.	41-0	Int.	D. T.	Wason
Mah'g & Shen'go Ry. & Lt. Co.	6	Closed	51-0	Int.	D. T.	Niles
	12	Closed	40-0	City	D. T.	Niles
	2	Express	45-0	Int.	D. T.	Niles
	2	Freight	.....	.....	.....	Niles
Manor Valley Ry.	2	Semiconv.	28-0	City	S. T.	Kuhlman
	1	Semiconv.	20-8	City	S. T.	Kuhlman
	1	Express	28-0	City	D. T.	Kuhlman
Maryland Electric Railways	3	Passenger	56-9	Int.	D. T.	Jewett
Mason City & Clear Lake Ry.	2	Passenger	57-3	Int.	D. T.	American
Memphis Street Railway	1	Express	.....	.....	.....	Co. Shops
	1	Flat	.....	.....	.....	Co. Shops
Metropolitan St. Ry. Co.	6	Passenger	36-0	City	D. T.	Jewett
	50	Passenger	47-0	City	D. T.	Jewett
	25	Trailer, C.	.....	.....	S. T.	McGuire-C.
Michigan United Railways	5	Passenger	40-0	City	D. T.	St. Louis
	2	Express	50-0	Int.	D. T.	St. Louis
Milford & Uxbridge St. Ry. Co	1	Sprinkler	17-0	City	.....	Brill
Milwaukee Elec. Ry. & Lt. Co.	100	Passenger	50-0	City	D. T.	St. Louis
	10	Closed	53-5	Int.	D. T.	Kuhlman
	1	Work	.....	.....	.....	Hicks
	20	Flat	.....	.....	D. T.	Hicks
	15	Dump	.....	.....	.....	Hicks
Milwaukee Northern Ry.	2	Comb.	50-4	Int.	D. T.	Niles
Missouri & Kan. Int. Ry. Co.	2	Closed	43-10	Int.	D. T.	American
Montreal & So. Counties Ry.	8	Closed	49-8	Int.	D. T.	Ottawa
	1	Snow Plow	.....	.....	.....	Ottawa
	1	Swp. r. D.	32-0	C.&Int.	S. T.	Ottawa
	2	Closed*	45-0	City	D. T.	Ottawa
Montreal Street Railway	25	Closed*	.....	City	D. T.	Russell
	1	Snow Plow	.....	Size 3 Int.	.....	Brill
	1	Snow Spr.	27-8	.....	S. T.	Brill
	2	Closed	34-0	C.&Sub.	.....	Barber
Morris County Traction Co.	2	Gas-Motor	.....	.....	S. T.	Fairbanks
Mt. Pleasant & Red Spg. Ry.	2	Passenger	52-0	City	D. T.	Kuhlman
Municipal Traction Co.	25	Passenger	21-0	City	S. T.	Danville
Muskogee Elec. Trac. Co.	6	Semiconv.*	33-10	.....	S. T.	Brill
Mutual Lt. & Wtr. Co.	4	Closed*	.....	.....	.....	Danville
Nashville Interurban Ry.	1	Semiconv.	33-4	Int.	.....	Danville
	1	Express	.....	.....	.....	American
Nebraska Trac. & Pwr. Co.	1	Pass. & B.	41-4	C.&Int.	D. T.	American
New Paltz, H'ld & Poug. Ry.	3	Open	20-0	City	S. T.	Wason
N. Y. & No. Sho. Trac. Co.	3	Passenger	34-4	.....	.....	Brill
	4	Semiconv.	34-4	.....	D. T.	Kuhlman
	4	Semiconv.	35-0	.....	D. T.	Brill
N. Y., Auburn & Lansing R.R.	10	Closed	50-0	Int.	D. T.	Jewett
N. Y., N. H. & H. R. R.	2	Elec. Loco.	.....	Freight	.....	Westingh'se
New York State Railways	4	Passenger	.....	.....	D. T.	Kuhlman
	25	Pass.*	30-11	City	D. T.	Kuhlman
	2	Snow Spr.	.....	.....	S. T.	McGuire-C.
Niagara, St. Cath. & Tor. Ry.	2	Closed	55-0	Int.	D. T.	Brill
	1	S. P.&B.C.	41-0	C.&Int.	D. T.	Russell
Nipissing Central Ry.	4	Open	45-0	Int.	D. T.	Preston
North Alabama Traction Co.	1	Semiconv.	.....	.....	D. T.	Kuhlman
Northern Ohio Tr. & Lt. Co.	6	Closed	51-6	Int.	D. T.	Kuhlman
	4	Closed	22-6	City	S. T.	Kuhlman
	6	Convert.	35-6	City	D. T.	Kuhlman
	1	Private	52-0	Int.	D. T.	Niles
Northern Texas Trac. Co.	12	Closed	28-0	City	D. T.	Cincinnati
	1	Cl. ed	21-0	City	S. T.	Cincinnati
	4	Closed	51-6	Int.	D. T.	Kuhlman
	6	Closed	30-0	Int.	D. T.	Jewett
North Jersey Rapid Tran. Co.	6	Passenger*	34-0	Int.	D. T.	St. Louis
Ocean Electric Railway	6	Semiconv.	41-0	City	D. T.	Cincinnati
Ogden Rapid Transit Co.	5	Semiconv.	.....	.....	S. T.	McGuire-C.
Ogden Street Railway Co.	1	Sweeper	.....	.....	S. T.	McGuire-C.
Ogden & Southern Railway Co.	1	Elec. Loco.	.....	City	D. T.	McGuire-C.
Ohio River Ry.	1	Closed	20-0	City	S. T.	Kuhlman
Ohio Electric Company	6	Closed	61-6	Int.	D. T.	Cincinnati
	6	Express	50-0	Int.	D. T.	Cincinnati
	8	Freight	38-6	Int.	D. T.	Cincinnati
Oklahoma Railway	3	Passenger	54-0	Int.	D. T.	Niles
	6	Open Pass.	45-0	Int.	D. T.	Niles
	6	Closed	20-0	City	S. T.	American
	10	Closed	30-0	City	S. T.	American
	4	Semiconv.	30-0	City	D. T.	American
	2	Work, Lo.	34-0	.....	D. T.	Co. Shops
Old Colony Street Railway	12	Semiconv.	39-6	Both	D. T.	Laconia
	3	Express	39-6	.....	D. T.	Laconia
Omaha & Council Bluffs	10	Closed*	40-4	City	D. T.	American
Orange County Traction Co.	1	Snow Spr.	.....	.....	S. T.	McGuire-C.
Ottawa Electric Railway Co.	12	Semiconv.	30-0	City	S. T.	Ottawa
	18	Semiconv.*	40-0	City	D. T.	Ottawa
Pacific Electric Railway	30	Passenger	39-1	City	D. T.	St. Louis
	25	Open	41-2	Int.	D. T.	St. Louis
	5	Passenger	34-10	City	D. T.	.....
	52	Frt., Box	36-8	Int.	D. T.	Mt. Vernon
	60	Flat	41-11	Int.	D. T.	Pressed Stl.
	15	Gondola	3			

Table with columns: Purchaser, No., Class, Length, Serv., Truck, Builder. Lists various railway projects and their specifications across multiple columns.

NEW ELECTRIC RAILWAY TRACK CONSTRUCTION IN 1909

The accompanying table shows in detail the new electric railway track mileage built and opened for operation during the year 1909 in the United States, Canada and Mexico. The table has been compiled from answers received from the railway companies whose names appear, and the mileage given in each instance is therefore correct. Unfortunately, replies were not received from all the railway companies to which a request for information was sent, and hence there are probably some omissions. The only mileage represented in the table is track which was completed and placed in operation during the year. A number of long lines made substantial progress in track construction during the year, but were not opened for operation up to the time the returns were sent in. This mileage does not appear in the table. In a few instances mileage will be found in the table this year which also appeared in the table compiled last year. This duplication arises from the fact that, through a misunderstanding in sending in the returns, track which was built but not opened for operation in 1908 was given and included in the table published at the beginning of 1909. The total new mileage represented this year is 887.16, as

against 1258.51 miles built in 1908. The new construction in 1908 was much less than the unofficial figures compiled for 1907, and the mileage of 1909 represents another large decrease over 1908. This is due in a large measure to the after effects of the period of financial depression in 1908, with the uncertainty of securing the necessary funds for the completion of electric railway projects which had been under consideration for two or three years. The falling off in 1908 was not so great as in 1909 because those projects that were nearly completed were finished and placed in operation, while few, if any, of the new projects on which work was started in 1909 were finished by the end of the year. Much new work has been going on during the past 12 months, however, and the results will no doubt appear as a large increase in 1910. According to reports received, much new work will be started early in 1910, with good promise of rapid completion.

In the classification of the mileage by States, New York again heads the list, with 129.08 miles, as against 183.76 miles of single track built last year. The largest mileage built by any one company in New York State was that of the Rochester, Syracuse & Eastern Railroad, which completed 44 miles between Port Byron and Syracuse. The extension of the electric zone of the Long Island Railroad and the construction by that

company of a number of double-track cut-off lines accounts for another 20 miles in the State of New York, and if to this be added the 15 miles of the Huntington Railroad which is owned and operated by the Long Island Railroad, the construction work of the latter would total 35 miles of single track. Ohio again appears second in the list of States, with 77.13 miles. This is largely made up of two long interurban extensions, that of the Cleveland, Southwestern & Columbus Railway from Ashland to Leroy, 30 miles, and that of the Ohio Electric Railway from Lima to Defiance, 42 miles. The latter road is a steam railroad which has been rehabilitated and equipped for electric operation.

Reports from railway companies up to the time of going to press indicate that at least 1800 miles of new electric railway track will be built in 1910.

ALABAMA.	
	Miles.
Birmingham Railway, Light & Power Co.	1.00
Mobile Light & R. R. Co.	1.13
Montgomery Traction Co.—Oak Park, Chisom and Pickett Springs	4.00
North Alabama Traction Co.	0.50
Sheffield Co.	0.05
Total	6.68
ARIZONA.	
Phoenix Railway Co.	1.75
Total	1.75
CALIFORNIA.	
Bakersfield & Ventura R. R.—Oxnard	2.00
East Shore & Suburban Ry.	2.00
Glendale & Eagle Rock Ry.—Between Glendale and Eagle Rock	2.25
Los Angeles Ry.	5.80
Los Angeles & Redondo Ry.	2.61
Pacific Electric Ry.—Between Wilmington, San Pedro and Long Beach; between Santa Ana and Huntington Beach	25.86
Peninsular Ry.—Los Altos, Mayfield, Palo Alto	4.00
Sacramento Electric, Gas & Railway Co.	1.00
San Diego Electric Ry.	2.00
South San Francisco Railroad & Power Co.	.50
United Railroads of San Francisco	5.13
Total	53.15
COLORADO.	
Colorado Springs & Interurban Ry.	1.50
Denver City Tramway Co.	10.00
Denver & Interurban R. R.—In Fort Collins	1.00
Grand Junction & Grand River Valley Ry.	4.00
Total	16.50
CONNECTICUT.	
New York, New Haven & Hartford, R. R.—East of Glenbrook	1.13
Total	1.13
DISTRICT OF COLUMBIA.	
Capitol Traction Co.	10.00
Total	10.00
FLORIDA.	
Pensacola Electric Co.	1.63
Total	1.63
GEORGIA.	
Columbus R. R.—Spur track into Base Ball Park	0.23
Georgia Railway & Electric Co.	10.50
Rome Railway & Light Co.	1.50
Total	12.23
IDAHO.	
Boise & Interurban Ry. Co., Ltd.	1.50
Total	1.50
ILLINOIS.	
Bloomington, Pontiac & Joliet Electric Ry.—Pontiac to Chenoa	10.00
Calumet & South Chicago Ry.	5.15
Chicago City Ry.	0.12
Chicago Railways Co.	8.08
Chicago & Southern Traction Co.—In Chicago Heights	1.00
Dixon, Rock Falls & Southwestern Electric Ry.—Tampico, Yorktown and Hoopole	10.00
Illinois Central Electric Ry.—Breereton and Norris	5.00
Murphysboro Electric Railway, Light, Heat & Power Co.—Murphysboro and Carbondale	2.50
Total	41.85
INDIANA.	
Bluffton, Geneva & Celina Traction Co.—Bluffton, Vera Cruz, Linn Grove and Geneva	18.50
Chicago, Lake Shore & South Bend Ry. (Kensington & Eastern R. R.)—Hammond, Ind., to Kensington, Ill.	7.33
Indianapolis, Newcastle & Toledo Electric Ry.—Indianapolis to Newcastle	20.00
Winona Interurban Ry.—Warsaw and Mentone	11.00
Total	56.83
IOWA.	
Centerville Light & Traction Co.—Centerville to Mystic	7.00
Colfax Springs Ry.	1.00

Fort Dodge, Des Moines & Southern R. R.—Ogden, Ogden Mines and Fraser	6.00
Mason City & Clear Lake Ry.	1.02
Sloux City Service Co.	5.00
Tri-City Ry.	2.00
Waterloo, Cedar Falls & Northern Ry.	10.00
Total	32.02
KANSAS.	
Kansas City-Western Ry.—Marshall Creek	1.50
Lawrence Railway & Light Co.	9.00
Manhattan City & Interurban Ry.	2.00
Southwestern Interurban Ry.—Arkansas City and Winfield	14.00
Wichita Railroad & Light Co.	7.00
Total	33.50
KENTUCKY.	
Central Kentucky Traction Co.—Lexington to Nicholasville	12.00
Total	12.00
LOUISIANA.	
Alexandria Electric Railways Co.	1.75
Lake Charles Railway, Light & Water Works Co.	1.25
Total	3.00
MAINE.	
Bangor Railway & Electric Co.	0.25
Rockland, South Thomaston & St. George Ry.	0.27
Total	0.52
MARYLAND.	
Maryland Electric Railways	1.52
Total	1.52
MASSACHUSETTS.	
Boston Elevated Ry.	15.00
Boston & Northern Street Ry.	1.10
Dartmouth & Westport Street Ry.	.83
Lowell, Acton & Maynard Street Ry.—South Acton to West Acton	1.60
Middlesex & Boston Street Ry.	1.00
Old Colony St. Ry.	.60
Total	20.13
MICHIGAN.	
Benton Harbor-St. Joe Railway & Light Co.—Benton Harbor to Coloma	10.68
Michigan United Railways Co.—Jackson, Lester, Mason and Lansing	37.00
Saginaw & Flint Ry.—Flint, Mt. Morris, Clio, County Line, Birch Run and Frankenmuth Junction	24.00
Saginaw Valley Traction Co.	.64
Twin City General Electric Co.	1.00
Total	73.32
MINNESOTA.	
Duluth Street Ry.	2.46
Twin City Rapid Transit Co.	2.41
Total	4.87
MISSISSIPPI.	
Columbus Railway, Light & Power Co.	1.25
Municipal Street Ry—Yazoo City	1.00
Total	2.25
MISSOURI.	
Cape Girardeau-Jackson Interurban Ry.	1.00
Kansas City, Lawrence & Topeka Electric R. R.—Shawnee to Montevia	1.00
St. Louis, Lakewood & Grant Park Ry.	3.00
Springfield Traction Co.	1.00
Total	6.00
MONTANA.	
Butte Electric Ry.	2.00
Gallatin Valley Electric Ry.	18.00
Total	20.00
NEVADA.	
Reno Traction Co.	0.50
Total	0.50
NEW YORK.	
Binghamton Ry.—Extension of Downsville division to Stella	0.68
Brooklyn Rapid Transit Co.	2.34
Buffalo & Lake Erie Traction Co.	9.00
Buffalo Southern Ry.—Buffalo City Line through Ebenezer to East Seneca	5.40
Elmira, Corning & Waverly R. R.—Wellsburg to Elmira	6.00
Elmira Water, Light & Railroad Co.	0.40
Hudson & Manhattan R. R.—Between Jersey City and New York	6.80
Huntington R. R.—Huntington, Farmingdale and Amityville	15.00
Long Island R. R.	20.00
New York City Interborough Ry.	4.50
New York & North Shore Traction Co.—Flushing and Whitestone; Roslyn and Manhasset	8.00
New York State Railways—Rochester Lines	1.75
Onelda Railway Co.—Sherrill to Kenwood	1.70
Rochester, Syracuse & Eastern R. R.—Port Byron, Weedsport, Jordan, Memphis, Warners, Amboy, Belle Isle and Syracuse	44.00
Syracuse Rapid Transit Ry. Co.	1.79
Utica & Mohawk Valley Ry.	1.72
Total	129.08
NORTH CAROLINA.	
Charlotte Electric Railway, Light & Power Co.	1.00
Durham Traction Co.	0.75
Weaverville Electric Co.	4.80
Total	6.55

OHIO.	
Cleveland, Southwestern & Columbus Ry.—Ashland, West Salem, Lodi and Leroy.....	30.00
Dayton, Springfield & Xenia Southern Ry.—In Spring Valley; in Dayton.....	1.50
Hocking-Sunday Creek Traction Co.....	3.00
Northern Ohio Traction & Light Co.—Between Canton and Massillon.....	0.63
Ohio Electric Ry. (Columbus & Lake Michigan R. R.)—Lima to Defiance.....	42.00
Total	77.13
OKLAHOMA.	
Oklahoma City & Suburban Ry.....	5.00
Oklahoma Ry.—Oklahoma City to Putnam City.....	8.00
Oklahoma Union Traction Co.—Tulsa to Orcutt Lake.....	2.50
Total	15.50
OREGON.	
Oregon Electric Ry.—From West Woodburn to Woodburn..	2.50
Portland Railway, Light & Power Co.....	3.00
Total	5.50
PENNSYLVANIA.	
Allegheny Valley Street Ry.....	3.00
Central Pennsylvania Traction Co.....	1.05
Chambersburg, Greencastle & Waynesboro Street Ry.—Through Chambersburg.....	2.50
Conestoga Traction Co.—Connects Christiana and Parkesburg.....	5.00
Mahoning & Shenango Railway & Light Co.....	2.20
Pittsburg Railways Co.....	10.00
Scranton Ry.....	3.00
South Bethlehem & Saucon Street Ry.—Friedensville and Centre Valley.....	3.40
Southern Cambria Ry.—Johnston, Conemaugh, Echo, Mineral Point and South Fork.....	11.00
Stroudsburg & Water Gap Street Ry.....	0.50
Wilkes-Barre & Wyoming Valley Traction Co.—Wilkes-Barre to Hudson, Parsons, and Miners Mills.....	6.00
Total	47.65
RHODE ISLAND.	
Rhode Island Co.....	1.38
Sea View R. R.....	0.10
Total	1.48
SOUTH DAKOTA.	
Sioux Falls Traction System.....	1.50
Total	1.50
TENNESSEE.	
Memphis Street Ry.....	0.75
Total	0.75
TEXAS.	
Corpus Christi Street & Interurban Ry.....	5.50
Houston Electric Co.....	0.93
Mt. Pleasant & Red Springs Street Ry.....	1.13
Northern Texas Traction Co.....	1.00
Port Arthur Traction Co.....	7.00
San Antonio Traction Co.....	6.43
Uvalde Street Ry.—Sansom to Uvalde.....	4.00
Wichita Falls Traction Co.—In Wichita Falls; to Lake Wichita.....	8.00
Total	33.99
VIRGINIA.	
Norfolk City & Suburban Ry.....	1.00
Roanoke Railway & Electric Co.....	1.50
Total	2.50
WASHINGTON.	
Everett Railway, Light & Water Co.....	0.08
Great Northern Ry.....	6.25
Seattle Electric Co.....	25.00
Seattle-Everett Interurban Ry.—Seattle and Everett.....	8.00
Seattle, Renton & Southern Ry.....	3.00
Spokane & Inland Empire R. R.....	17.00
Whatcom County Railway & Light Co.....	4.50
Yakima Valley Transportation Co.....	13.00
Total	76.83
WEST VIRGINIA.	
Morgantown & Dunkard Valley R. R.—West Morgantown, Riverside, Granville and Randall.....	3.00
Total	3.00
WISCONSIN.	
Ashland Light, Power & Street Railway Co.....	0.75
Chippewa Valley Railway, Light & Power Co.....	0.64
Eastern Wisconsin Railway & Light Co.....	2.00
Grand Rapids Street R. R.—Grand Rapids, Centralia, Port Edwards and Nekoosa.....	8.00
Milwaukee Northern Ry.....	2.00
Wausau Street Ry.—Weston.....	1.00
Total	14.39
CANADA.	
British Columbia Electric Railway Co., Ltd.....	12.35
Calgary Street Ry.....	16.00
Hull Electric Co.....	2.25
International Transit Co.....	0.31
Montreal & Southern Counties Ry.....	6.00
Niagara, St. Catharines & Toronto Ry.—Welland, Humberstone and Port Colborne.....	9.00
Nipissing Central Ry.—Cobalt, Port Cobalt and Haileybury.....	5.00
Port Arthur & Fort William Electric Ry.....	3.00
Sandwich, Windsor & Amherstburg Ry.....	0.25
Sarnia Street Ry. Co., Ltd.....	0.38
Total	54.54
MEXICO.	
Compania Electrica y de Ferrocarriles de Chihuahua.....	3.89
Total	3.89

HEAVY ELECTRIC TRACTION PROJECTS IN 1909

A large amount of work was done in 1909 on the construction and extension of heavy electric traction projects in the United States. New York City was the center of activity with the Pennsylvania cross-town tunnels nearing completion and important extensions of their terminal electric zones being made by the New York Central & Hudson River, New York, New Haven & Hartford and the Long Island railroads. In the Middle West the Michigan Central's tunnels and approaches under the Detroit River, which are to be operated by electric locomotives, will be opened early in 1910, good progress having been made on the construction and equipment. The Great Northern three-phase division over the Cascade Mountains was put in operation during July, 1909. No new track to be operated electrically was built during the year by the Baltimore & Ohio in Baltimore or by the St. Clair Tunnel Company at Sarnia.

In the following paragraphs the progress of the year on each of the projects on which active work was done is briefly summarized.

PENNSYLVANIA TUNNEL & TERMINAL RAILROAD

The Pennsylvania Railroad is building its new entrance into New York City under the name of the Pennsylvania Tunnel & Terminal Railroad. The extension begins at Harrison, just east of Newark, and crosses the Hackensack Meadows to the west portal of the tunnels under Bergen Hill on the west side of the Hudson River. The tunnels extend under the Hudson River, the Island of Manhattan and the East River, emerging in Long Island City and connecting with the Sunnyside yard. The extension connects with the Long Island Railroad near Woodside Avenue, Borough of Queens. The total length of the extension is 14.9 miles, of which 9.83 miles is on the surface, 2.29 miles under the two rivers and 2.78 miles under ground. Exclusive of the switching tracks in the Harrison transfer and Sunnyside yards, the total length of track in the extension will be 49.75 miles, all electrically operated. The Harrison and Sunnyside yards contain nearly 80 miles of track, not all of which will be electrically operated.

During the year 1909 the work has progressed actively on the extension, including the Harrison and Sunnyside yards. All the tunnels have been completed and main tracks have been laid in the tunnels and approaches from Harrison to Winfield, east of the Sunnyside yard. Ballasting is in progress and will be completed early in the spring of 1910. Yard tracks have been laid at Harrison for the interchange yard, and practically all the tracks in the Sunnyside yard have also been laid. Work is progressing actively on the interlocking and signaling throughout. Yard buildings at Sunnyside yard are under construction and will be finished early in the spring. The main station, facing Seventh Avenue between Thirty-first and Thirty-third Streets, has been completed on the exterior, and the work of finishing the interior is well advanced. It is anticipated that it will be practically completed early in the coming spring.

The installation of electric power cables, third-rail, power plant and substations is well advanced and will be completed in the spring of 1910. It is believed that early in the spring partial service of the Long Island Railroad into the station will be inaugurated, and in the early summer a partial service of the Pennsylvania Railroad will be in operation.

The initial order for electric locomotives to haul through trains in the tunnels included 24 double units of 4000 hp. Two of these locomotives have been delivered. They were described in the ELECTRIC RAILWAY JOURNAL of Nov. 6, page 982. The proposed initial daily service to be handled in the terminal station is 400 trains of the Pennsylvania Railroad and 600 trains of the Long Island Railroad.

LONG ISLAND RAILROAD

The Long Island Railroad completed the equipment for electric operation of 40 miles of track on which work was commenced in 1909, thus increasing its electric trackage to 140 miles. The most important pieces of work completed, or well

advanced during the year, were the construction of two additional running tracks, reduction of grades and elimination of grade crossings between Winfield and Jamaica, thus providing four tracks from the portal of the Manhattan tunnels to Jamaica, and the construction of the Glendale cut-off from Glendale to Woodhaven Junction to furnish a double-track connection from the Far Rockaway and Rockaway Beach divisions. Work has been begun on the double tracking and electric equipment of the North Shore division from Winfield to Port Washington. This will be finished by the end of next summer.

On Feb. 1, 1910, the company hopes to begin through electric operation from Jamaica to the Manhattan terminal and by June 1 to run all trains into Manhattan.

Contracts were placed during the year for 130 new steel cars for suburban service which will be delivered before May 1. This will give the company 400 steel motor and trail cars for the service on the electric lines between Manhattan and the present Brooklyn terminal at Flatbush Avenue. The through service to Manhattan will effect a saving in running time on all trains of 25 minutes each way as compared with the present ferry and crosstown street car trip required to reach the station site in New York.

NEW YORK CENTRAL & HUDSON RIVER RAILROAD

During the year 1909 the extension of the New York Central electric traction system has progressed a distance of 12 miles, between Wakefield and North White Plains, and it is contemplated that on or about Feb. 1 all passenger trains on the Harlem division will be operated electrically between Grand Central Station and North White Plains, thus eliminating the temporary terminal at Wakefield.

The extension includes the erection of two new substations, one known as No. 8, located at Tuckahoe, and the other as No. 9, at White Plains. Each station contains three 1000-kw rotary converters, with the necessary step-down transformers and switching equipment. The general arrangement of the two new substations is the same as those already in service on this system, with the exception that electric storage batteries, with their boosters, regulators, etc., have been omitted. The electric signal equipment, which at the other stations is in a detached building, in the two new stations has been installed under the same roof.

The aerial transmission lines have been extended a distance of about 13 miles to the end of the North White Plains yard. The construction is identical with that previously adopted, except that it has been necessary in several instances to use temporary wooden poles where a change in track alignment or the elimination of grade crossings prevented the permanent poles being located.

The third-rail work includes about 27 miles of new third-rail on main track and in yards. The type of construction is the same as that formerly adopted, with the exception that since the first installation it has been possible to obtain rolled steel offset side inclines in place of cast iron. This is a decided improvement, both in conductivity of the rail and from a construction standpoint.

There will be six new circuit-breaker houses containing the remote controlled circuit breakers through which the third-rails will be fed, the arrangement conforming to the existing practice on this road.

All passenger and freight stations on the division will be lighted electrically and the current will be taken from the 2200-volt signal circuits, which are carried on the high-tension transmission line poles. A 2200-volt signal circuit from substation No. 9 will feed a small light and power station which is located in the North White Plains engine house, and will replace the present steam-driven generators.

The temporary inspection sheds and repair shops for electric equipment located at Wakefield will be abandoned, the plant dismantled and the forces transferred to the permanent electric inspection shed and repair shop at North White Plains. The temporary steam locomotive house, turntable, water supply, etc., will be no longer required.

During the past year the electrical work has kept abreast of the civil engineering developments at the Grand Central Station terminal, and as existing tracks were dismantled the third-rail and feeders were taken down and returned to stock, while the new tracks were equipped with third-rail and permanent feeders, so that they were ready for electric operation as soon as the construction work permitted them to be turned over to the operating department.

For light and power purposes in the Grand Central Station terminal a 1500-kw lighting rotary has been temporarily installed in the Fiftieth Street substation. The primary current is obtained from the main generating station at Port Morris. This rotary, with an auxiliary connection to the Edison service, will be used for temporarily lighting the Grand Central Station terminal pending the construction of the terminal plant.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD

The New York, New Haven & Hartford Railroad made no extensions of its electric zone between Woodlawn, N. Y., and Stamford Conn., during 1909, but in the Stamford yard and east of Stamford it erected a number of experimental catenary sections. The most important of these was a section about 6000 ft. long erected east of Glenbrook, the object being to study the best type of catenary construction to be adopted for future four-track and six-track electric operation. The partially electrified Stamford yard was completely equipped with a new form of catenary construction.

As the company made no extension of its suburban electric passenger service during the year, it did not order any additional passenger locomotives. In May, 1909, however, an order was placed with the Westinghouse Electric & Manufacturing Company for two electric freight locomotives, one of which has been received and the other rapidly nearing completion. These locomotives will be capable of hauling the heaviest freight trains on the New Haven road at an average schedule speed much higher than that now obtained with steam locomotives. In 1908 the company ordered four steel motor cars and six steel trail cars to be equipped for multiple-unit operation. These cars have been received and after thorough tests have been made they will be placed in suburban service early in the year. The activities of the New York, New Haven & Hartford in 1909 were concentrated chiefly on a study of the cost involved in the contemplated extension of its electric zone from Stamford to New Haven, within which it is proposed to operate both freight and passenger trains by electric locomotives.

GREAT NORTHERN RAILWAY

On July 10, 1909, electric operation was begun on the Cascade tunnel section of the Great Northern Railway in the State of Washington. This is the first mountain section of a steam railroad to be equipped and operated by electric locomotives. Its distinguishing feature is the use of the three-phase alternating current system taking current at 6600 volts from two overhead trolley wires. The total length of track which has been equipped for electric operation is 6.25 miles, which includes 13,873 ft. of tunnel, the remainder being in the yards at each end. The tunnel has a rising grade of 1.7 per cent eastbound and at the present time all eastbound freight and passenger trains are hauled through it by electric locomotives, but passenger trains only are hauled by electric locomotives westbound. The electric rolling stock consists of four locomotives each equipped with four three-phase motors having a one-hour rating of 475 hp or 1900 hp for each locomotive.

As previously stated, electric operation was begun on July 10, 1909, and was continued until Aug. 11, when the hydroelectric generating station was shut down on account of failure of both water wheels. The service was resumed on Sept. 9 and has been continued regularly since.

DETROIT RIVER TUNNEL OF THE MICHIGAN CENTRAL

The Michigan Central Railroad is building a double track tunnel under the Detroit River connecting Detroit, Mich., and Windsor, Ont. It will be operated electrically by direct-current locomotives, which were described in the *ELECTRIC RAILWAY JOURNAL* of June 19, 1909, page 1125. Six of these locomo-

tives of 1200 hp each will be delivered by March 1, 1910. The tunnel and approaches will contain about 6.25 miles of single track equipped for electric operation. The progress made in the construction and equipment of the tunnel and approaches may be summarized as follows:

With the exception of rodding the ducts and cleaning up, the construction of the approach tunnels is completed. The last section of the subaqueous tunnel was sunk Sept. 14, and on Oct. 15 an opening for passage from portal to portal was made. The work of placing the 20-in. ring of reinforced concrete inside the forms is progressing rapidly, and if the present rate of progress continues the tunnel construction will be finished early in March.

The electrical equipment is being installed as fast as conditions permit. The substation is nearing completion and the duct system follows closely the completion of the tunnel and yard work. Track bonding and the installation of the third-rail work are going forward on the Canadian side of the river and will be completed during the winter months. The placing of special ties in concrete in the approach tunnels has been started.

The entire reconstruction and enlargement of the Detroit yards and the separation of the grades between Fifteenth and Twenty-fourth Streets is going forward rapidly, and such tracks as are needed for the handling of trains through the tunnel will be ready when needed. It is expected that the tunnel will be ready for regular operation by electric locomotives early in the spring.

SWISS ELECTRIC RAILWAY STATISTICS AT THE END OF 1907

The Swiss Government has just issued its railway statistics for the year ending 1907. There were then 36 street railways in operation with a total length of 402 km (249 miles), of which 31 meter-gage lines having a combined length of 261 km (162 miles) were served by electric apparatus only. The only 4 ft. 8½-in. gage street railway reported in Switzerland is a 2.9 km (1.8 mile) line in Lucerne. The street railways carried 97,367,553 passengers and 181,561 metric tons of freight over 23,072,029 train-km (14,304,664 train-miles). Their total gross income was 12,313,430 Fr. (\$2,376,492) and the total operating expenses were 9,455,353 Fr. (\$1,824,874). These results were obtained with 28,48 employees, eight steam or electric locomotives, 109 freight cars and 859 passenger coaches, of which 661 were motor cars.

There were in service 42 interurban narrow-gage railways, of which 21 roads with a total length of 416.6 km (258.3 miles) were operated exclusively with electricity, while three others with a total length of 24.7 km (15.3 miles) used a mixed service with steam locomotives. All of the electric and mixed lines were of meter (39.37 in.) gage. The total length of the steam narrow-gage lines was 514 km (318.7 miles). The combined railways carried 11,317,588 passengers and 787,616 metric tons of freight over 5,586,722 train-km (3,463,768 train-miles). Their total gross income was 13,402,307 Fr. (\$2,616,645) and the operating expenses were \$8,527,102 Fr. (\$1,645,731).

The rack and pinion railways numbered 12 and totaled 97 km (60 miles) in length. Only three lines having a combined length of 16.9 km (10.5 miles) were all-electric and three more totaling 26.1 km (16.44 miles) were mixed steam and electric. The 12 roads carried 1,031,006 passengers and 69,989 metric tons over 302,538 train-km (187,573 train-miles). Their total gross income was 3,793,781 Fr. (\$732,200) and the operating expenses were 2,026,505 Fr. (\$391,115).

The cable railways numbered 36 and had a total length of 31.66 km (19.63 miles), mostly of meter gage. Of these lines, 24 having a total length of 21.32 km (13.22 miles) were operated electrically. They carried 6,060,926 passengers and 163,698 metric tons of freight over 570,716 train km (353,833 train-miles). Their total gross income was 1,879,714 Fr. (\$362,785) and the operating expenses were 1,049,889 Fr. (\$202,628).

RECENT WORK OF THE GERMAN STREET & INTER-URBAN RAILWAY ASSOCIATION

BY A GERMAN ENGINEER

The plan originally followed by the German Street & Interurban Railway Association to secure technical papers for its meetings was to assign the subjects which required investigation to temporary committees. Later on, the association appointed four permanent committees, among which all topics were divided. This method proved unsatisfactory because the number of committees was too small to permit thorough work, but a remedy was found in the appointment of subcommittees. The men selected for the subcommittee work are always those who have had considerable experience in the matters assigned to them, but before a subcommittee report goes before the association it must be examined and approved by the parent committee. This method has proved very satisfactory, because it insures a thoroughgoing report by specialists, and the recommendations can be moderated if necessary by the broader point of view of a second body. The subcommittee system has also created considerable enthusiasm for association work, because it gave a larger number of members a chance to participate actively. Still another good feature of the plan is that the subcommittee reports attract more attention and are apt to be more valuable when signed by individuals than if the work of a committee. It was originally believed that the report of a single person would not be as unbiased as that of several men. This in a sense is true, but when a report has to be signed by several men with different ideas there is danger of its being a colorless compromise which provokes little debate. The committee method had also the great disadvantage in the German association of keeping out men of strong convictions who did not wish to see their personalities lost, or merged with the inferior work of others.

The standing committees of the association now are:

Committee "A," on organization and legal matters.

Committee "B," on construction and operation.

Committee "C," on electrical matters.

Committee "D," on steam interurban railways.

Committee "E," on miscellaneous city railway topics.

The following statements summarize the work accomplished during the last two years of committees "B" and "C," which are those in charge of technical subjects connected with electric railway matters:

WORK OF THE COMMITTEE ON CONSTRUCTION AND OPERATION

An idea of the importance of this committee may be gained from the fact that it discussed 15 topics, as follows: Rail specifications, standardization of rail sections, preparation and modification of the contract with the selling agency of the associated lamp manufacturers, rail corrugation, revision of the present ordinances relative to permissible braking distances, value of snow plows, co-operative buying of rails and other materials, rolling stock serviceable for both track and trackless operation, switches with cleansing and drainage means, manganese rails and ties, tire shrinkage for car wheels, projecting fenders, noiseless paving such as wood and asphalt, sprinklers.

RAIL SPECIFICATIONS AND STANDARDS

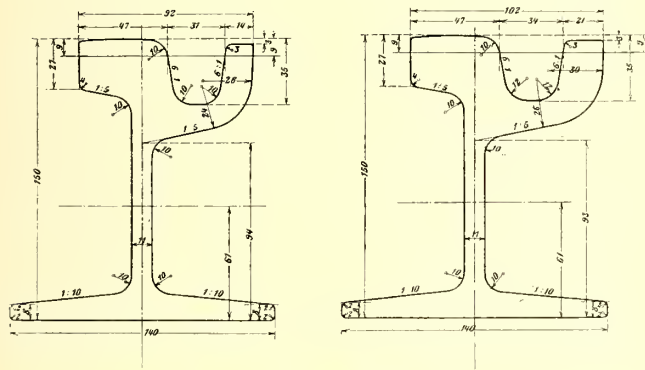
The rail specifications were prepared particularly for railways which are too small to employ engineers competent for that purpose. Up to the time of its adoption such lines were obliged either to buy what the rolling mills offered or to imitate without reason the practice of large railways with heavier traffic conditions. Conditions in Germany in regard to rail standards before this committee commenced its work were even worse than in the United States, for the "Phoenix" mills alone have been obliged to roll 129 different types of grooved rails to satisfy their customers. To terminate this condition the German association undertook a comparison of about 200 rail sections which had been used in Germany under various traffic conditions for the past 10 years, and, as a result, has recom-

mended just four sections of straight track and four companion sections for curves. The lightest section is shown in the accompanying illustration. The others are of the same general form, and the data concerning them appear in the following table. The suffix "a" refers to curved rails.

TABLE OF APPROVED RAIL STANDARDS.

	Sec. 1.	Sec. 1a.	Sec. 2.	Sec. 2a.	Sec. 3.	Sec. 3a.	Sec. 4.	Sec. 4a.
Weight in kg. per m.....	42.8	45.7	49.2	52.4	56.0	59.8	57.8	61.0
Height in mm.....	150	150	160	160	160	160	180	180
Base in mm.....	140	140	150	150	180	180	180	180
Thickness of web in mm..	11	11	12	12	12	12	12	12
Width of groove in mm..	31	34	31	34	31	34	31	34
Depth of groove in mm..	35	35	40	40	40	40	40	40
Width of head in mm....	47	47	51	51	56	56	56	56
Width of lip in mm.....	14	21	15	24	16	26	16	26
Moment of resistance in cm ²	208	215	251	259	299	307	342	356

It will be observed that the lightest rail recommended weighs 42.8 kg per m (about 85.6 lb. per yd.), although it has been customary for many roads to use rails weighing only 32 kg per m (64 lb. per yd.). A heavier minimum was adopted because experience had shown that the slight saving in metal was more than balanced by the increased cost of maintenance. Furthermore, the committee rejected rails higher than 180 mm (7.1 in.), although some of the larger systems had been experimenting with rails 200 mm (7.8 in.) high. On this point the committee was of the opinion that the lower rail was ample for ordinary stone paving and that from the standpoint of maintenance the higher rail had not proved so superior when set in concrete foundations as had been expected. In high rail



Typical German Standard Rail Sections for Straight and Curved Track

work with asphalt foundations it had been found that the cost of the extra concrete and the heavier expense involved in removing it at the time of renewals amounted to more than the reduction in the repairs of loose rails.

Many roads in Germany have in the past followed the practice of using for the outside rail on a curve a rail with a shallow groove (8 mm or 0.31 in.) so that the outer wheel runs on its flange instead of its tread. This reduces the wheel slippage as it increases the effective diameter of the outside wheels and has been employed successfully for 10 years by such large systems as that of Hamburg, where not a single derailment has occurred from this cause. The original groove depth in Hamburg was 8 mm (.31 in.), but the standardization committee has recommended that users of this method employ a depth of 10 mm (.39 in.) to be on the safe side. In future the railways will build up their curves either of two similar standard wide-groove rails or of a wide-groove rail for the inner side and a flat-groove rail for the outer side. It may be mentioned here that the committee also recommended four standards for the Haarman or two-part girder rail, which are quite popular in Germany.

MISCELLANEOUS TOPICS

The committee on structures and operation broadened its contract with the associated lamp manufacturers to include the new metallic filament lamps. Under this agreement a rebate of 25 per cent is made to all railways which buy their total annual supply through the common sales agency. Following the

method pursued in the purchase of rails, specifications were drawn up for buying copper wire, but the committee complains that the wire syndicate refuses to accept the minimum requirements laid down.

Corrugation, of course, has been a prominent subject with this committee. It has now entered into an agreement with the International Street & Interurban Railway Association and German rolling mill interests whereby all concerned will share the expense of determining whether corrugation is due to the composition or the rolling of the rail. It is agreed that the rail makers will conduct mill and laboratory tests; that the German and the International railway associations will pay the greater part of the market price for the rails tested, and that the expenses of installation will be borne by the companies operating over test tracks. Arrangements have been made to conduct the roadway trials in Berlin, Hamburg, Cologne, Dresden, Düsseldorf, Essen, Munich, Nurnberg, Leipsic and Frankfort.

The proposal to use manganese rails owed its origin to the belief that corrugation was caused by hard wheel-tires running over the softer rail. On conferring with the rail manufacturers, the committee learned that even a trifling percentage of manganese would involve great difficulties in rolling. Hence this subject has been closed for the present.

The subject of snow plows has received little attention as snowstorms in Germany rarely are as severe as in Canada and the northern part of the United States.

During the past eight years several German railways have been interested in the development of a vehicle capable of operating over railway tracks as well as the highway. The Hanover company, for example, desires such a vehicle to bring produce into the city without reloading. No satisfactory method has yet been devised for this purpose, but the committee is trying to persuade car and wagon makers to study the problem, owing to the large field there would be for the sale of a successful type.

The necessity for finding a standard tire shrinkage was brought about through disagreements between the wheel makers and wheel users. The committee found that the most common shrinkage allowance to avoid loose tires was 1 mm (.039 in.) for wheels of 600 mm to 800 mm (23.6 in. to 31.4 in.) diameter, but several companies have gone up to 1.5 mm (.058 in.) without serious results.

The fender question was revived by the Hamburg-Altona Railway, which presented for wider adoption a fender devised on its own lines. The committee investigated this device and concluded that it presented no novelties or unusual efficiency.

The committee was pleased to receive from several municipal railways data confirming the complaints made by privately owned lines against the expense of asphalt paving. It is hoped that this evidence from unprejudiced sources will help the companies in their campaign against asphalt. Wood paving blocks have not yet been used in Germany.

REPORT OF THE COMMITTEE ON ELECTRICAL EQUIPMENT

The committee on electrical equipment confined itself to the discussion of interpole motors, main circuit fuses and oxydized aluminum wire. The study of electrolysis was also continued by this committee in co-operation with the German Electro-technical Society and the German Gas & Water Association. Measurements have been made in Braunschweig, Cassel, Nurnberg, Bentzen, Düsseldorf and Warsaw (Russian Poland). When the experiments are completed, the test commission will prepare a specification covering the installation of return current circuits.

GROWTH OF THE ASSOCIATION

The German Street & Interurban Railway Association was founded in 1806 at Munich with 38 member companies. The membership now numbers 128 out of 172 street railways and 64 out of 137 interurban railways in Germany. During the first eight years the administrative work of the association was in the hands of the Hamburg Street Railway Company after which it was turned over to the Great Berlin Street Railway Company. The latter company is still in charge.

INTERURBAN PROGRESS IN THE CENTRAL STATES

WITH ACCOMPANYING MAP

Electric railway construction in the Central Western States has not been at a standstill in 1909. Some work of importance has been carried out in each State within the territory shown on the accompanying map. The new mileage in several instances was composed of connections of more than passing interest. Groups of electric railways have been united, and to-day, as compared with a year ago, it not only is possible to make longer trips over unbroken electric routes, but it also is easier to travel "the electric way," because of the excellence of the "through limited" cars now operated. Ambitious plans have been announced for new fast through lines and some existing systems have greatly improved their roadbeds with a view to shortening the schedule time over existing routes. This development of through long-distance service becomes more important with each added line in the already vast network of electric railways which covers the Central States.

How far-reaching the electric railways are and how thoroughly they have linked the population centers can best be appreciated by a study of the map of interurban roads in the Central States which accompanies this issue. The original drawing from which the engraving for this map was made is owned by The Arnold Company, Chicago, Ill.

This year, as in the past, the new lines and those under construction or recently proposed are shown on the map. The information added has been checked with the track and roadway items as published from week to week in the news department of the *ELECTRIC RAILWAY JOURNAL*. Special care has been taken in revising the map, but on account of the wide scope of the territory there may be some errors of location; and if such are observed this paper will greatly appreciate any advice that may assist in making more complete its records of new construction.

One who studies the trend of interurban growth from year to year will note that in Ohio and Indiana the existing large mileage so well fulfills the needs of the territory that the annual additions to that mileage are mostly extensions and connections, rather than new construction of independent roads. Several projects in Illinois, in addition to the Illinois Traction System, are striking out across country and promise to become extensive lines similar to their forerunners in Ohio and Indiana. In the States between the Mississippi and Missouri Rivers the interurban railway systems are few in number, but the program for 1910 announces the construction of several long lines extending from the larger population centers into new territory.

Referring particularly to the projects in the several States it is found that in Ohio the Cleveland, Southwestern & Columbus Railway, during the last week of February, 1909, inaugurated service on its important Seville-Ashland-Mansfield extension. This line, 42 miles in length, joins the interurban network near Cleveland with the lines radiating from Columbus and offers a new through route from Cleveland to Columbus by way of the Cleveland, Southwestern & Columbus from Cleveland to Mansfield; the Ohio Central Traction Company from Mansfield to Bucyrus, and the Columbus, Delaware & Marion from Bucyrus to Columbus. The roadway construction of the Mansfield-Seville division follows the latest design. One feature of particular interest is the type of substation construction, employing metal lath and concrete for structural materials in buildings 70 ft. long by 16 ft. 8 in. wide.

Service recently has been inaugurated over the lines of the Cleveland, Southwestern & Columbus Railway between Cleveland, Mansfield and Bucyrus. The route is 116 miles long and three limited trains daily now cover the distance in 4 hours and 30 minutes. These trains connect at Bucyrus with those of the Columbus, Marion & Bucyrus Railway operating to Columbus. The railway companies owning this through route are said to be planning a fast limited service for the 170-mile run between Cleveland and Columbus.

The Ohio Electric Railway opened its electric service between Lima and Defiance late in December. This line formerly was operated by steam, but it has recently been reballasted, and with the completion of new concrete culverts, steel bridge spans and the erection of overhead lines, regular interurban service on a three-hour headway was inaugurated. One year ago the Ohio Electric Railway had completed its 72-mile Lima-Toledo division, but had not entered the city of Toledo. An excellent roadbed has been built on private right-of-way to a new terminal station within a few blocks of the hotel district in Toledo, and through passenger and express service is now operated to and from this terminal.

Early in the year the Youngstown & Ohio River Railway Company completed its line from Leetonia to East Liverpool and traffic arrangements were made jointly with the Youngstown & Southern Railway for the operation of through cars from Youngstown to East Liverpool. Some of the longer routes of electric travel in Ohio now available are from Cincinnati through Dayton, Springfield and Lima to Toledo over the Ohio Electric Railway; from Dayton through Lima and Findlay to Toledo over the Western Ohio route, and from Columbus to Cleveland by way of Marion, Bucyrus, Mansfield and either Norwalk or Seville, as earlier mentioned. In addition to these there is an unbroken electric service over the older high-speed lines of the Lake Shore Electric Railway from Toledo to Cleveland, and over the Cleveland, Painsville & Eastern to Ashtabula, thence over the Pennsylvania & Ohio to Conneaut, and over connecting lines in Pennsylvania and New York to Buffalo and the larger cities along the route of the New York Central & Hudson River Railroad. A passenger may also travel from Cleveland to Wheeling, W. Va., or Pittsburgh, Pa., by electric lines.

In Michigan two important connections have been made during the past year. The Saginaw & Flint Railway on Feb. 22 opened service on its line from Saginaw to Flint where connection is made with the through service of the Detroit United Railway to Detroit. The connection of the Detroit United system from Detroit to Flint with the Saginaw & Flint line, and the existing Saginaw & Bay City line, makes possible through electric travel northwest from Detroit 125 miles to Bay City. The Michigan United Railways Company recently completed an important line connecting its Kalamazoo-Battle Creek-Jackson division with its Lansing-St. Johns division. The new line is 37 miles long and was constructed closely in accord with the standards which were followed in building the Jackson-Battle Creek line. Current is distributed to the cars through a 60-lb. third rail supported on vitrified insulator blocks. Limited cars will make the run between Lansing and Jackson in one hour and there connect with the limited trains of the Detroit United Railway, which give service between Jackson and Detroit. The running time between Detroit and Lansing will be 3 hours and 45 minutes for the 113 miles.

Considered broadly, the most important electric project in Michigan is that of the Detroit River tunnel of the Michigan Central Railroad, which is referred to in the summary of heavy electric traction projects on page 37 of this issue of the *ELECTRIC RAILWAY JOURNAL*.

In Indiana the one break in the otherwise continuous chain of electric railways between Wisconsin and Central New York is rapidly being closed. This break is found in the line of the Winona Interurban Railway between the towns of Mentone and Akron, in the north central part of the State. A recent item in the *ELECTRIC RAILWAY JOURNAL* stated that cars were operating over a 10-mile section at the southern end and a 12-mile section at the northern end of the 44-mile section which intervened a year ago. On the remaining 22 miles the grading is largely completed and rails are being laid. It is expected that through cars will be in operation by Feb. 1. This link will make possible through electric travel between Indianapolis and Chicago and will complete the electric route from Wisconsin into the State of New York.

Arrangements have been completed for opening the first section of the Indianapolis, Newcastle & Toledo Railway and the



Map Showing Electric Interurban Railways in Operation, in Construction or Proposed in the Central States

larger part of the construction work between Indianapolis and Newcastle has been finished. This section is about 45 miles long and as originally promoted was intended as part of a through route between Indianapolis and Toledo, running northeast from Newcastle. During the early part of the year the connection between the western end of the Chicago, Lake Shore & South Bend Railway in Indiana and Pullman on the Illinois Central Railroad in Illinois was completed. For some months through fast service has been operated by this road between Chicago and South Bend, the electric cars connecting with the Illinois Central suburban express trains at Pullman. A passenger from Chicago to South Bend taking a suburban express train on the Illinois Central road to Pullman, 14 miles, and there changing to a limited car of the "South Shore Route" running east to South Bend, 76 miles, may make the 90-mile trip in 2 hours and 57 minutes. The running time for the first 14 miles on the Illinois Central Railroad is 36 minutes and for the 76 miles to South Bend on the electric line is 2 hours and 17 minutes.

In Illinois the most important electric railway project which has been under construction during the past year is the St. Louis terminal of the Illinois Traction System. This company is spending \$6,500,000 in building an entrance into St. Louis, Mo. The project includes the construction of a bridge over the Mississippi River, which, with its approaches, will be about 2 miles long. On the Illinois side a double-track line connects the eastern approach to the bridge with the main line of the Illinois Traction System. On the Missouri side a double-track route 2.5 miles long, partly through the streets of St. Louis and partly on private right-of-way, connects the western approach to the bridge with the large terminal station property located within one block of the commercial center of the city. This double-track entrance into St. Louis has been completed and awaits the erection of two more spans of the Mississippi River bridge before service can be inaugurated. Other important work carried out by the Illinois Traction System during the past year has included the construction of high-speed belt railways from 3 to 5 miles long around the cities of Edwardsville, Springfield and Decatur. With the completion of these belt lines it will be necessary to haul long freight trains over the city streets, and the through passenger schedules may be shortened.

A year ago the plans for the northern extension of the Illinois Traction System toward Chicago had not been announced. During the past 12 months construction work has been completed on one section of the through line which the Illinois Traction System eventually will operate between St. Louis and Joliet or Chicago. It has been announced that the northern extension of the through line now operating from St. Louis through Springfield and Lincoln to Mackinaw, 157 miles north, will soon be extended through Eureka to Streator, about 35 miles.

A recently completed section from Streator north to Ottawa will connect the new line with the east and west line of the Chicago, Ottawa & Peoria Railway, which is being built to Morris, 20 miles distant from Joliet. The latter line is under the same management as the Illinois Traction System. From Joliet Chicago may be reached over three existing electric routes. Announcement recently has been made that the interests which control the Joliet & Southern Traction Company will build a high-speed electric line from Joliet to connect with the Metropolitan West Side Elevated Railway, which will furnish an entrance into Chicago for the interurban cars of the new line.

The Rock Island Southern Railway has just completed track laying for its 40-mile line between Rock Island and Monmouth, Ill. This new road does not parallel any steam railway for more than a short distance and will give transportation facilities to rich coal fields not yet fully developed. The road has been designed for handling heavy traffic and it is expected that electric passenger car operation will be begun early in 1910, while freight trains will be handled for a limited time by steam locomotives.

A new third-rail line has been built from Wheaton 11 miles directly west to Geneva, Ill. This road connects at the eastern end with the Elgin-Chicago division of the Aurora, Elgin & Chicago Railway, and at Geneva with the Fox River division of the same road. The construction standards of the Aurora, Elgin & Chicago third-rail line were followed and that company is operating the train service.

The Aurora, Rockford & DeKalb Electric Traction Company until recently has operated its 30-mile line between Aurora and DeKalb with gasoline motor cars. Trolley wire is now being strung along the route and two substations are under construction. These substations will receive power from the Batavia generating station of the Aurora, Elgin & Chicago Railway and electric service will shortly be inaugurated between Aurora and DeKalb.

RECEIVERSHIPS AND FORECLOSURE SALES

During 1909 a total of 22 electric railway properties went into the hands of receivers. They involved 558 miles of track and a total outstanding capitalization of \$52,287,200, of which \$22,325,000 was in bonds and \$29,962,200 in capital stock. The Illinois Tunnel Company was omitted from the list for the reason that this subway road, although operated electrically, carries no passengers. A list of the receiverships follows:

RECEIVERSHIPS.			
Company.	Miles of track.	Outstanding bonds.	Outstanding stock.
Albany & Hudson R. R.	47	\$1,850,000	\$1,750,000
Angelo Power & Traction Co.	2	.....	.....
Beaumont Traction Co.	12	500,000	600,000
Buffalo, Lockport & Rochester Ry.	60	3,685,000	4,000,000
Burlington County Ry.	15	475,000	484,000
Chicago & North Shore Street Ry.	..	675,000	650,000
Columbus, Delaware & Marion Ry.	58	915,000	3,000,000
Columbus, Marion & Bucyrus R. R.	20	500,000	500,000
Consolidated Railway & Power Co.	4	.....	60,000
Holmesburg, Tacony & Frank'd Elec. Ry.	17	400,000	750,000
Indianapolis, Crawfordsville & Western Traction Co.	45	1,500,000	1,500,000
Manistee Light & Traction Co.	10	600,000	1,000,000
Meadville & Conneaut Lake Traction Co.	29	1,100,000	1,000,000
Montgomery County Rapd Transit Co.	8	400,000	300,000
North Shore Street Ry.	..	.....	.....
Norwich & Westerly Ry.	24	750,000	668,200
Ocean Shore Ry.	53	2,800,000	5,000,000
Philadelphia, Bristol & Trenton St. Ry.	21	650,000	1,000,000
St. Francois County Ry.	14	125,000	300,000
Southern Colorado Power & Ry.	21	1,000,000	1,000,000
Southwestern Street Ry.	16	400,000	400,000
Washington, Baltimore & Annapolis Electric Ry.	82	4,000,000	6,000,000
Totals	558	\$22,325,000	\$29,962,200

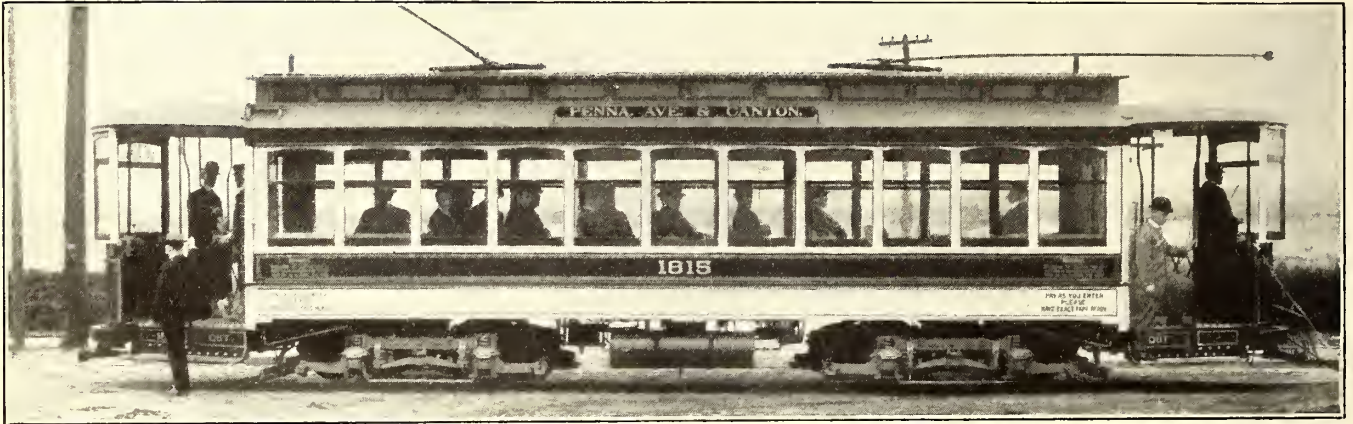
The foreclosure sales during 1909 involved 21 properties operating 488 miles of track. The outstanding securities on these properties aggregated \$43,439,700, of which \$21,174,000 represented bonded debt and \$22,265,700 capital stock. The Norfolk & Southern Railway was not included in the returns, as it is primarily a steam property, although operating 48 miles of track by electricity. Some properties which have been in financial difficulties were reorganized without foreclosure proceedings. The foreclosure sales were as follows:

FORECLOSURE SALES.			
Company.	Miles of track.	Outstanding bonds.	Outstanding stock.
Albany & Hudson R. R.	47	\$1,850,000	\$1,750,000
Anderson Traction Co.	18	.....	163,000
Angelo Power & Traction Co.	2	.....	.....
Auburn & Turner R. R.	13	125,000	100,000
Conneaut & Erie Traction Co.	30	1,087,500	800,000
Danbury & Harlem Traction Co.	16	319,500	320,000
Dayton & Xenia Traction Co.	51	800,000	800,000
Denton Interurban Railway & Power Plant Co.	3	.....	.....
Erie, Cambridge, Union & Corry Ry.	42	1,000,000	1,000,000
Gainesville Electric Ry.	8	250,000	300,000
Gettysburg Transit Co.	9	100,000	100,000
Las Vegas Railway & Power Co.	5	300,000	200,000
Meadville & Cambridge Springs St. Ry.	16	300,000	300,000
Miami Electric Co.	3	90,000	25,000
Mineral Wells Electric System.	6	.....	.....
Missouri Water, Light & Traction Co.	5	.....	100,000
Philadelphia, Bristol & Trenton St. Ry.	21	650,000	1,000,000
Port Jervis Electric Light, Power, Gas & R. R. Co.	4	95,000	150,000
Tarrytown, White Plains & Mamaroneck Ry.	24	300,000	300,000
Toledo Urban & Interurban Ry.	71	810,000	761,700
Virginia Passenger & Power Co.	94	13,007,000	14,096,000
Totals	488	\$21,174,000	\$22,265,700

PAY-AS-YOU-ENTER CARS FOR BALTIMORE

Beginning with the first day of the new year, the United Railways & Electric Company, Baltimore, Md., is instituting a pay-as-you-enter service, with its Pennsylvania Avenue line as the pioneer. The company has provided for this purpose 32 Brill semi-convertible cars with 30-ft. 8-in. bodies, which have been altered under license of the Pay-As-You-Enter Car Corporation by A. T. Clark, superintendent of shops. Previous to the actual operation of the cars the Baltimore company has been conducting a vigorous advertising campaign

weakened. On the contrary, the results would justify one in saying that the cars were materially strengthened. When the cars were brought to the shops they were stripped of controllers, circuit breakers and other electrical parts; also of the side panels, hoods, vestibules, dashers, brake shafts, platforms, outside platform knees and supporting angle iron for knees, double sliding doors, together with the inside end wall finish and longitudinal seats on the motorman's left-hand side. The first alteration consisted in replacing the outside platform knees with longer ones, the angle-iron supports formerly used being put back. The center platform knees were spliced



Baltimore Pay-As-You-Enter Cars—Side View

under the direction of W. A. House, president, and T. A. Cross, general manager. The Baltimore newspapers have also lent their news columns for the same object. In one interview Mr. House is quoted as strongly indorsing the prepayment cars because of the greater comfort and safety which they will afford to the riding public. The Baltimore cars embody several special features, as will appear from the fol-

lowing description of the alterations and from the accompanying cuts. The former crown-pieces were put back and the flooring was laid and stripped. The dasher, dasher post and dasher rails were all used again, but the steps were lengthened to suit the altered platforms. The original malleable iron step hangers were retained, and a new wooden tread, with Universal safety treads, was substituted. The hoods were used again by splicing in a neat and substantial manner 7½ in. to



Baltimore Pay-As-You-Enter Cars—Rear Platform



Baltimore Pay-As-You-Enter Cars—Door Arrangement in End Bulkheads

lowing description of the alterations and from the accompanying cuts.

Briefly, the alterations consist of lengthening the platforms from 5 ft. to 5 ft. 9½ in. and arranging the end walls of the cars with a pair of narrow sliding doors and a single swinging door. The cars lent themselves extremely well to these alterations, as none of the vital parts of the construction was

each end of the hood bow, and the hood boards lengthened accordingly. When completed it is almost impossible to tell where the hood has been altered, and, in fact, its appearance is identical with that of the original hood in all except length. The brake shafts were moved 1 in. closer to the dasher.

The platform was divided into two parts by vertical and horizontal railings, the horizontal railings being arranged as a

barrier to keep the entering and leaving passengers from coming into conflict and to make a suitable location for the conductor and the fare box. The box can be removed from the rail by unlocking the padlock and carrying to the other end of the car. On the motorman's platform the horizontal railing is raised out of the way by sliding it upward close to the hood. The company's standard lazy tongue gates are installed on both platforms as illustrated. It will be observed that passengers alighting from the motorman's platform leave on the near side of the vertical step rail, the other half of the platform being kept closed by a gate. This feature tends to prevent the motorman from being jostled by departing passengers.

The alterations to the end wall of the cars were entirely upon the motorman's left-hand side of the car. The head-piece and end sill were mortised to receive the posts forming the narrow center bulkhead between the double sliding doors and the swinging door. The narrow end lining was attached to this bulkhead, and both were braced by using a 1½-in. x 2¼-in. x 5/16-in. angle iron, which also forms a pocket for the sliding door. The narrow bulkhead has a narrow sash with double thick glass, and the inside lining also has the same kind of sash, arranged to swing. The swinging door,

fare ready" occurs on the outside panels, upon each side of the car in the lower corner. The glass in the upper vestibule sash on the motorman's right-hand side has the wording "Pay as you enter" in black letters on ground glass. The cars were equipped with special Brill fare-boxes. The registration device is not contained in the fare-box, but is cared for by International registers. One register rod passes through the car from end to end, with an outside connection to enable the conductor to operate from the rear platform the register in the front of the car. As the cars are equipped for double-end operation, this arrangement is duplicated at the other end of the car.

The cars are mounted upon Brill 27 GE-1 trucks, have four Westinghouse No. 101-B motors, and are equipped with Westinghouse Traction Brake Company's S. M. E. brake equipments. Each car has 14 transverse rattan seats of Hale & Kilborn manufacture, besides the corner seats. The cars are also equipped with Hunter illuminated signs. The total weight of a car with its equipment is 54,500 lb.

RESULTS ON ENGLISH ELECTRIFIED STEAM ROADS

At a meeting of the Institution of Civic Engineers held in London, Nov. 9, papers were presented on three of the electrically equipped steam roads in England. The titles of these papers were: "The Single-Phase Electrification of the Haysham, Morecambe and Lancaster Branch of the Midland Railway," by J. Dalziel and J. Sayers; "The Equipment and Working Results of the Mersey Railway Under Steam and Under Electric Traction," by J. Shaw, M. Inst. C. E., and "The Effect of Electrical Operation on the Permanent-Way Maintenance of Railways, as Illustrated on the Tynemouth Branches of the North-Eastern Railway," by C. A. Harrison, D. Sc., M. Inst. C. E.

An article on the road described in the first paper was published in the *ELECTRIC RAILWAY JOURNAL* for July 4, 1908. The authors of the paper state that the choice of this particular section of the line for a more or less experimental electrification was partly due to the fact that it could be worked from an existing power-station at Haysham. Though the traffic is light it is long-hour throughout the year, and, consequently, is expensive to work by steam, so that there was scope for saving in working expenses; the summer traffic is heavy and liable to congestion, two of the stations being terminals, and there is a considerable local traffic between Morecombe and the third station, Lancaster, which tends to congest the main-line trains. The operation with electric cars is very similar to that with locomotives. The motor cars haul daily trains having a total weight of 190 tons, which is 125 per cent over the load originally specified to the contractors. The paper reviews the points in which single-phase apparatus is sometimes alleged to be unsuitable, namely, high-speed schedule, frequent stops, suburban and interurban traffic with high acceleration, etc., and then states that the apparatus is equally as capable for such service as direct-current apparatus, that the weight of the single-phase train is only a very small percentage greater than that of corresponding direct-current trains, and that the energy consumption is appreciably less. The paper concludes by giving details of the results in service of the equipments, an indication of the probable cost per train-mile of such service, detailed notes of the mileages accomplished and lost by defects, a note as to the development, cause, results and steps taken to remedy and obviate such defects, and detailed figures as to the amount of cleaning, repair and attention required; also, where possible, the mileage life of the various wearing parts, including bows, commutators, brushes, bearings, contactor contacts, wheel-tires, etc.

The Mersey Railway runs under the Mersey River and joins Liverpool with Birkenhead. It was described in the *STREET RAILWAY JOURNAL* for April 4, 1903. The electric service was inaugurated in May, 1903. The traffic conditions call for train service of 19½ hours per day, with a peak-load for a few hours in the morning to Liverpool, and another peak-load for a few



Baltimore Pay-As-You-Enter Cars—Front Platform

which is arranged to swing inward from the corner post, to prevent passengers from falling into the street, was made by using the former sliding doors, but placing wider stiles upon them. For the double sliding doors new, narrow doors are made. As the swinging door was located in the corner of the car, the longitudinal seat on this side was cut on a line with the first side post, and that section of the car between the corner post and the first side post was furnished with a seat arranged to drop when this end of the car is at the rear. This change required special treatment of the cable, cable box and sand box. The last item is beneath the car, and is filled from an opening in the car floor. The location of the swinging door in the corner necessitated the removal of the semi-convertible feature between the corner post and the first side posts on this side. The whole appearance of the interior was made to conform to its original lines, so that the cars as completed present a finished appearance and do not show to the average eye where the alterations have been made. The cables and circuit-breaker heads were spliced out to suit the longer platforms, but otherwise there was no change to any of the car wiring.

The cars were carefully overhauled and painted, and the brass trimmings and other fittings were polished and lacquered. The painting, striping and lettering were made to accord with the railway company's standards.

The wording "Pay as you enter" and "Please have exact

hours in the evening in the reverse direction. During steam working the peak was met by increasing the number of trains in service, and, under electric working, the peaks are met by increasing the number of cars per train, keeping the interval between the trains constant throughout the day. The road is operated by direct current with four-car or five-car trains with a motor car at each end during heavy traffic and with trains of one motor car and one trailer in light traffic. The electro-pneumatic system of control is used. Electricity is also employed for elevators, pumping and ventilation. The authors give some interesting statistics in regard to cost of operation. With electric traction 1 lb. of fuel, costing 8s. 9d. (\$2.10) per ton, moves 1 ton of load 2.29 miles at an average speed of 22¼ m.p.h.; whereas, with steam, the same weight of fuel, costing 16s. (\$3.84) per ton, moved the same load 2.21 miles at an average speed of 17¾ m.p.h. As regards the life of rails under the two systems, the average rolling load over the track before the rails require renewal has been increased from 32,000,000 tons to 47,500,000 tons. The average speed, including stops, has been increased from 15.6 to 19.9 m.p.h., and the number of ton-miles per annum from 43,000,000 to 67,000,000, while the total expenses per ton-mile, after allowing for the interest on the additional capital for electrical equipment, have been reduced from 0.344d. (0.688 cent) to 0.292d. (0.586 cent). In the half year ending June 30, 1908, the number of passengers carried was more than twice as many as in the last half-year of steam working (ending Dec. 31, 1902) and more than 2½ times as many season tickets were issued; the seat-miles run per passenger showed a decrease of 30 per cent, and the passenger receipts per seat-mile an increase of 26.5 per cent, while the ratio of expenses to receipts decreased from 95.3 per cent to 69.8 per cent. The following financial statistics were also given:

	Electric.		Steam.	
	Pence.	Cents.	Pence.	Cents.
Locomotives and carriage departments per ton-mile	0.089	0.178	0.117	0.234
Maintenance of track	0.0089	0.0198	0.0208	0.0416
Costs of hydraulic lifts per lift-mile..	30.1	60.2	85.2	170.4
Total cost operation and maintenance.	0.152	0.134	0.238	0.476
Total cost of operation including general expenses, but exclusive of interest on additional capital for electrification	0.24	0.48	0.344	0.688

The third paper relates to the equipment of certain branches of the Northeastern line which were put in service July 1, 1904. The total length of electrified line, including sidings, is 75 miles, and the average distance between the station stops is 1¼ miles. A third rail, at 600 volts, and a fourth rail for the return are used. The paper says that the wear on track, although greater under electric traction on frogs and crossings, is only slightly increased on tangents. The capacity of the passenger station at Newcastle has been greatly increased as the time for dispatching and reloading the train has been reduced to 2 minutes. With steam trains four platforms and eight signal operations were required, but with the electric trains only two platforms and four signal operations are needed. The running time has also been reduced. The paper gives an estimate of the annual cost of renewals, with a table, and concludes by stating that it would have been impossible to carry by the old steam service the number of passengers that are now being conveyed on the Tynemouth lines with the electric service.

At the September, 1909, convention of the German Street & Interurban Railway Association, Arthur Busse, chief engineer of way and structures, Grosse Berliner Strassenbahn, presented some figures on the costs of the proposed corrugation study. He estimated the total cost at \$6,250, of which \$1,250 to \$1,500 will cover special steels; a like amount will cover extra expenses at the foundries, and the balance will be required for the chemical and physical analyses to be made by Dr. Puppe, who has been selected by the railway and rolling mill interests. The railway using the test rails will buy them at the regular prices. The test expenses will be borne as follows: \$1,250 from the German Street & Interurban Railway Association; \$1,500 from the foundries and rolling mill interests; \$4,250 from several electric railways. The International Street & Interurban Railway Association will be asked to contribute \$1,250.

HEARINGS ON OPERATION OF SIDE-DOOR CARS IN SUBWAY AND ON LIGHTING

Two hearings were held before John E. Eustis, of the Public Service Commission of the First District of New York, on Dec. 24, 1909, to consider the subjects of the operation of side-door cars in the subway and the lighting of the stations and track. Frank Hedley, vice-president and general manager of the Interborough Rapid Transit Company, and Theodore L. Vaughn, of counsel, represented the Interborough Rapid Transit Company. E. G. Connette, chief of the transportation bureau of the commission, and several engineers of the commission were called as witnesses for the commission. G. H. Backus represented the commission as counsel at the hearing on the operation of the side-door cars, and H. H. Whitman represented the commission as counsel at the hearing on lighting.

The hearing on the side-door trains and cars was held first. Mr. Connette, who was called as the first witness, said that 15 trains, each composed of eight side-door cars, were being operated by the company, and that 27 side-door trail cars were used to complete the equipment of the other express trains. The side doors of the trail cars of the mixed trains were not operated, however. Approximately half of the side-door trains were withdrawn from service during the middle of the day so as to start them on their runs together to handle the evening rush. Mr. Connette thought it unnecessary to withdraw the trains from service for more than an hour or two, and was of the opinion that the side-door trains should be alternated with others. He had found the average saving in time of stops at stations to be 12 seconds with the side-door trains.

Mr. Hedley said that fewer trains could be run past a given point during the half-hour rush when the side-door trains had been alternated with the others. The company was opposed to operating the side doors in the trains composed of side-door trail cars and end-door motor cars because it would increase the accident hazard. The expense of installing on the mixed trains the automatic signal system in use on the trains with all side doors would not be justified. The company had expected long before now to have the full complement of side-door cars in operation, but it had been unable to secure the equipment from the builders. Beginning about Feb. 1, 1910, the company expected to receive side-door motor cars at the rate of two a day, and by April 15 all the nondescript trail cars would be absorbed. The company should not be required to operate the side doors on the elevated portion of the line in the outlying sections where traffic is light. The hearing was then closed.

At the hearing on the lighting of the stations and track an expert witness was introduced who testified to the illumination of the Brooklyn Bridge station. Two members of the engineering staff of the commission testified that the roadway was lighted sufficiently well to make it possible to walk the track without danger, but that inspections could not well be made with the present lights.

Mr. Hedley suggested that a commission of three disinterested laymen be secured to consider the station lighting from the standpoint of the public and make recommendations in regard to specific stations which they deemed to be insufficiently lighted. Lamps of 10 cp each are spaced about 30 ft. apart along the track, and are so shaded with reflectors as to prevent the light from affecting the vision of the trainmen. The subject of lighting the roadway had been very carefully considered by Mr. Hedley and W. Barclay Parsons, engineer to the Rapid Transit Commission, and the present system was adopted as best fitted to the requirements. Any increase in the lighting would make it more difficult for motormen to distinguish signals and tail lights, and would thus decrease the efficiency of these safeguards. A bank or banks of lamps could be easily installed for making repairs and for inspections.

Mr. Connette agreed with Mr. Hedley about the lighting of the roadway, and said that nothing should be done that would in any way tend to decrease the efficiency of the signals and tail lights.

THE BRILL PRIZES FOR SENIOR THESES

The J. G. Brill Company has announced that it will repeat this year the offer of prizes for essays on car design. These prizes are offered to the senior students of the colleges, universities and technical schools of the United States, who will be graduated in 1910, and the subject selected this year is "The Design of an Electric Railway Car for City Service." The following is taken from the announcement of the company:

"The authors of the three theses which in the estimation of a jury shall be considered most meritorious of those submitted shall receive respectively in order of merit for their work: (1) The sum of \$250 and the John A. Brill gold medal; (2) the sum of \$150; (3) the sum of \$100.

"Each thesis will be judged: (1) On its technical merit; (2) on the manner in which the subject is presented.

"A jury of three, consisting of a member of the American Street & Interurban Railway Association, the editor of the *ELECTRIC RAILWAY JOURNAL* and the vice-president of The J. G. Brill Company, will decide the relative merits of the theses.

"Three copies of each thesis must be submitted in order to be considered. Each copy shall be typewritten or printed on standard size, 8½ in. x 11-in. sheets. All accompanying tracings, black and white prints or blue prints shall be of corresponding size or of such shape as to be conveniently folded to that size.

"A thesis to be eligible for any one of the prizes need not be prepared especially for this contest. It may be the same thesis which is submitted in connection with senior graduating work; but it shall be the work of a duly accredited student of a college, university or technical school and shall conform to the requirements of the competition.

"All theses to be considered must reach the office of The J. G. Brill Company on or before July 15, 1910; shall be sent by registered mail flat (unrolled and not folded) and packed in such a manner as to insure their delivery in good condition. They shall be addressed to the Technical Department, The J. G. Brill Company, Philadelphia, Pa.

"No thesis shall bear on the text pages or other parts submitted to the jury any mark which might inform any member of the jury as to the name and address of the contestant. But each thesis shall be accompanied by a sealed envelope containing the name and address of the contestant and a certificate or statement from the authorities of the college, university or school at which he is a student to indicate that he is properly qualified as a regular student to enter the contest. The envelopes will be numbered consecutively in the order of the receipt of the theses, a corresponding number being attached to each thesis and the envelopes preserved for reference until after the jury has made its decision.

"The announcement of awards will be made at the time of the annual convention of the American Street & Interurban Railway Association in October. A copy of the announcement will be sent to the author of each thesis submitted.

"A copy of each thesis, after the completion of inspection by the jury and the announcement of awards, shall become the property of The J. G. Brill Company, and a copy shall also become the property of the American Street & Interurban Railway Association.

"Additional copies of this circular or any further information which may be necessary regarding the conditions of the contest or manner of awards may be had from Technical Department, The J. G. Brill Company, Philadelphia, Pa.

"Philadelphia, Pa., Dec. 15, 1909.

"The Brill thesis contest was inaugurated in 1908 and the award of prizes was made in 1909 to the following: First prize, Charles T. Ripley, University of Illinois; second prize, Victor D. Dressner, Brooklyn Polytechnic Institute; third prize, Robert T. Pollock, Worcester Polytechnic Institute. Mr. Ripley also won the John A. Brill medal given with the first prize.

"The contest is designed to interest the best class of students of the colleges of the United States in the attractive field for personal endeavor, scientific research and substantial reward which electric railway work offers.

"In addition to the intrinsic value of the prizes and the introduction which the winners of the prizes secure through the publication of their names in the technical journals of the country, the names of the winners are announced before the annual convention of the American Street & Interurban Railway Association and a copy of each of the winning theses becomes the property of the association, and is kept on file by the secretary.

"Contestants are at liberty to consult with their professors, electric railway officials and others, regarding the various phases of car construction and the factors which affect car design, and are invited to visit any of the Brill plants to study manufacturing methods. The actual preparation of the thesis, it is expected, will be the work of the contestant, and as far as possible the thesis should represent the ideas of the contestant."

PROGRAM OF 1910 CONVENTION OF INTERNATIONAL STREET & INTERURBAN RAILWAY ASSOCIATION

The program for the 1910 convention of the International Street & Interurban Railway Association has just been made public. This meeting will be held in Brussels on Sept. 7 to 10, inclusive, and this date will coincide with the twenty-fifth anniversary of the establishment of the association. A list of the topics to be considered and the committees which have been asked to report on them follow:

(1) Legislation on interurban and local railways in the principal countries of Europe. Committee—C. de Burlet, general manager of the Société Nationale des Chemins de fer Vicinaux.

(2) The proper system of city extension to obtain the best tramway transportation facilities. Committee—Mr. Wattmann, manager of the municipal tramways of Cologne and an associate member from France to be appointed later.

(3) Gas, oil and other internal combustion engines. Committee—Charles Thonet, general manager of the Société d'Entreprise Générale de Travaux, Liège.

(4) Construction and maintenance of overhead lines. Committee—Mr. Otto, chief engineer of the Grosse Berliner Strassenbahn.

(5) Recent improvements in rolling stock. Committee chairmen—Messrs. Spängler, manager of the Vienna Municipal Tramways on car bodies; Delmez, chief engineer of the Antwerp Tramways, on car construction and platforms; Julius, manager of the Haarlem Electric Tramways, on equipment. The other members of the committee are Messrs. Boule, manager of the Compagnie Générale Française de Tramways, Paris; d'Hoop, manager of the engineering department of the Brussels Tramway Company; Giersch, chief engineer of the Hamburg Tramways Company, Hamburg; Lineff, consulting engineer to the Moscow Corporation Tramways; Passelecq and Peiser, chief engineers of the Grosse Berliner Strassenbahn, Berlin; Réstal, general manager of the Compagnie Française des Tramways Electriques et Omnibus of Bordeaux; Rochat, general manager of the Geneva Electric Tramways; Schmidt-Eckert, manager of the Vienna Municipal Tramways; Stahl, manager of the Municipal Tramways of Düsseldorf; t'Serstevens, secretary of the International Street & Interurban Railway Association.

(6) Wattmeters and other current recorders for use on cars. Committee—Messrs. Bouton, general manager of the Compagnie des Tramways de l'Est Parisien, and Battés, manager of the Frankfort-a-Main Municipal Tramways.

(7) Construction and maintenance of city track construction. Committee—Charles Rochat, general manager of the Geneva Electric Tramways, and A. Busse, chief engineer of the Grosse Berliner Strassenbahn.

(8) Rail corrugation. Chairman—A. Busse, chief engineer of the Grosse Berliner Strassenbahn. The other members of the committee are Messrs. Boulvin, general manager of the Compagnie Générale de Railways et d'Electricité, Brussels; Professor Carns-Wilson, consulting engineer, London; Culin, chief engineer of the Hamburg Tramways; d'Hoop, manager

of the engineering department of "Les Tramways Bruxellois," Brussels; Dubs, manager of the Marseilles Tramways; Fischer, manager of Phönix Rolling Mills, Ruhrort; Mariage, chief engineer of the Compagnie Générale des Omnibus, Paris; Noir-falaise, general manager of the Liège Tramways; Petersen, manager of the Dortmund Municipal Tramways, and t'Serstevens, secretary of the International Street & Interurban Railway Association.

(9) Ties. Committee—E. A. Ziffer, president of the Bukovina Railway, Vienna.

(10) Standard classification of accounts. Mr. Géron, manager of the Compagnie Générale des Chemins de fer secondaires, Brussels.

LOW-TENSION FEEDER CALCULATIONS FOR STREET RAILWAYS

At a joint meeting of the electrical section of the Western Society of Engineers and the Chicago section of the American Institute of Electrical Engineers held on Dec. 22, R. H. Rice, assistant engineer, division of electrical transmission and distribution of the Board of Supervising Engineers, Chicago Traction read a paper on "Low-Tension Feeder Systems for Street Railways." The paper was followed by interesting discussion, during which H. M. Wheeler, assistant chief engineer, Chicago Railways Company, presented curves and methods useful in studying the interrelation of headway, speed and time and distance spacing of cars.

Mr. Rice first called attention to the extent of the surface transportation facilities in Chicago. The Chicago surface railway companies operate 687 miles of track, the cars on which are fed with current from 15 distributing centers with a total rated capacity of 95,000 kw. Only two of these distributing centers are steam power plants. The calculation of the feeders for supplying current to the large railway systems was based on the operation of 2264 cars. The substations are fed with 9000-volt a.c. purchased from a central generating station, and at the present time direct current is distributed to the cars at a pressure a little below 600 volts. When the rolling stock has been rehabilitated and the old motors replaced by those of later design 600 volts will be carried on the distributing network. The trolley wires are all sectionalized and each section is fed through one or more independent cables from a generating or substation. Trunk tie lines between the substations are not used, but certain sections of the trolley wires are fed from two stations and the total capacity of these double-fed sections is sufficient to answer the needs for tying together two stations. In case of a breakdown one station can thus distribute current through the trolley sections jointly fed, and this current in turn be distributed from the busbars of the station which is in-operative.

Mr. Rice described very completely the methods followed in calculating the design of the overhead construction and dealt in particular with the system used in determining the proper location for substations and the size of feeders. The length of trolley sections is determined by operating conditions. The step in the work of designing the distribution system was to obtain a unit figure for the power consumption of a standard type car. Fifteen tests extending over three days' time were made for this purpose. The cars were equipped with meters and careful logs were kept. Typical trolley sections were chosen and arrangements were made to keep a careful count of the number of cars on the section and to measure the power fed to the section from the substation. As the maximum peak of the day in Chicago occurs in the afternoon the investigations described above were carried on from 12 m. to 8 p. m. Preliminary to the work of laying out the feeder system a careful study was made of the safe carrying capacity of paper, rubber-covered and weatherproof insulated cables.

To determine on what basis to design the feeders curves were plotted showing the railway load throughout the day. It was interesting to note that for one substation on the Chicago

Railways Company the maximum swing is 15,600 kw. A two-hour average value was chosen as a basis for the maximum load to be fed out of a substation. Considering that a potential of 600 volts is carried on the d.c. busbars, a capacity of 40 kw per car was used to determine the required substation capacity. An average drop of 50 volts was allowable in the d.c. distribution system. Mr. Rice presented in this connection the values in current carrying capacity as allowed for the standard sizes of feeder cables protected with paper, rubber and weatherproof insulation.

In the work preliminary to laying out the distribution system a map of the railway is first drawn and the location of the cars during the afternoon rush hour is shown. With a demand of 75 amp from each car the concentrated load on each trolley section was next indicated on another map of the district to be served. With the concentrated loads thus exhibited the center of load was obtained in a way similar to the solution of a problem in moments. The number of amperes on each section and its relation to the center of load for the district determine the location of the substation and the capacity of the generating apparatus in that station. After the substation locations have been so chosen then a feeder-route diagram is made showing the location of the trolley feeders on the streets, their size and loads.

The city ordinances under which both the Chicago Railways Company and the Chicago City Railway Company are being rehabilitated specify a certain territory within which all feeders shall be carried underground. Mr. Rice exhibited drawings showing the typical feeder connections and stated that the underground work was built with a view to future increase in load. He showed labor-saving methods and curves used in calculating the drop and in locating load centers on trolley and feeder sections.

In discussing the paper of the evening, E. N. Lake, division engineer of electrical transmission and distribution, Board of Supervising Engineers, Chicago Traction, called attention to the lack of literature on the subject of feeder calculations for large street railway systems. It was interesting to note that based on the 1,000,000 circ. mil cable, which was taken as standard, an assumed load of 800 amp and an allowable drop of 50 volts, 6000 ft. was found to be the limiting economical distance for feeding. In other words, under these conditions the ideal street railway system would have its substations so located that the average length of cable would not exceed 6000 ft. Two of the largest street railway systems in Chicago now have an average length of d.c. feeder of 6700 ft.

REVISION OF INDIANA CODE OF INTERURBAN RULES

The Railroad Commission of Indiana has appointed a committee of interurban managers, consisting of C. D. Emmons, general manager, Ft. Wayne & Wabash Valley Traction Company; F. M. Durbin, general manager, Evansville & Southern Indiana Traction Company; Guy K. Jeffries, superintendent, Indianapolis & Eastern Traction Company, and H. A. Nicholl, general manager, Indiana Union Traction Company, to recommend any changes or improvements deemed necessary in the code of interurban rules approved last year by the commission for use within the State of Indiana. This committee now has the matter under consideration and will present a report to the commission very soon.

NO CONSOLIDATION OF PAPERS

Last week two or three of the daily newspapers in New York published an account of an alleged consolidation of a number of publishers of technical periodicals, among them The McGraw Publishing Company. The statement was completely without foundation. The McGraw Publishing Company has no present plans or intention of consolidating its business with any other single publisher or with a number of other publishers.

CONSOLIDATION OF CHICAGO SOUTH SIDE SURFACE RAILWAYS

An official statement announces that an agreement has been entered into whereby about 95 per cent of the shares of the Chicago City Railway Company, all of the shares of the Calumet & South Chicago Railway Company, all of the shares of the Southern Street Railway Company, and all of the shares of the Hammond, Whiting & East Chicago Railway Company have been taken over by Chicago interests. This marks the passing of the Chicago City Railway Company out of the hands of the Morgan interests. These shares, together with certain bonds heretofore placed upon the properties, will be deposited with trustees, who will issue securities based upon the stock and bonds deposited.

The doings and policies of the trustees will, by the terms of the trust agreement, be governed by a board of directors, the personnel of which is as follows: James B. Forgan, president First National Bank; John J. Mitchell, president Illinois Trust & Savings Bank; Samuel Insull, president Commonwealth Edison Company; John A. Spoor, president Union Stock Yards & Transit Company; Edward Morris, president Morris & Company, packers; Thomas E. Mitten, president Chicago City Railway Company; Emil K. Boisot, vice-president First Trust & Savings Bank; Ira M. Cobe, president Assets Realization Company. An additional director probably will be chosen later.

The separate corporate existence of the several properties will continue. T. E. Mitten will remain as president of the Chicago City Railway Company and will probably at an early date occupy the same position in the organization of all the roads.

By vesting the ownership of the shares heretofore mentioned in trustees under the proposed agreement, complete unity of management and operation of all the surface lines in the South Division of the city is accomplished. Whenever a feasible plan shall be worked out for a consolidation of all the surface lines operated in Chicago, then as to the South Division it can be dealt with from a practical standpoint, as there is one ownership instead of several, thus greatly lessening the difficulty of harmonizing a number of interests.

While no definite arrangements as yet have been entered into with other transportation companies, yet the joinder in interest of the South Division lines may fairly be considered as an important step in the direction of ultimate complete consolidation. The name of the new company will be "The Chicago City & Connecting Railways."

The proportionate amount of stocks and bonds included in this consolidation is as follows:

	Stock.	Bonds.	Total.
Chicago City Railway (quoted at 191)	\$18,000,000	\$20,000,000	\$38,000,000
Southern Street Railway.....	800,000	775,000	1,575,000
Calumet & South Chicago St. Railway	5,000,000	5,650,000	10,650,000
Hammond, Whiting & East Chicago Electric Railway.....	510,000	.....	510,000
Grand total.....	\$24,310,000	\$26,425,000	\$50,735,000

The following figures present the mileages (single track) of the four surface railway systems and the estimated number of passengers carried in the past year:

	Miles track.	Passengers carried.
Chicago City Railway.....	252.29	292,220,866
Southern Street Railway Company.....	18.28	4,004,760
Calumet & South Chicago Railway Company....	114.00	19,513,000
Hammond, Whiting & East Chicago Electric Railway	25.94	2,500,000
Totals	410.51	318,238,626

It is stated that all of the shares indicated in the tabulation above, as well as the bonds of the companies concerned, will be deposited with trustees, who will thereupon issue the stocks of the Chicago City & Connecting Railways. The trustees have not as yet been chosen. It was expected at the time of the announcement to have the actual control of the properties involved pass preferably by Jan. 1.

In Chicago this consolidation is looked upon as a step toward the long discussed unification of all surface and elevated

railways and electric lighting properties. A Chicago morning paper sums up the probabilities of unification as follows:

"It is not doubted that the friendly influence which Mr Morgan has in the Chicago Railways Company will be operated harmoniously with any plan which may be evolved to put the Chicago Railways lines into the general combination. In the Railways company Henry A. Blair is one of the most important factors. The control of the Chicago Railways Company's certificates, or, rather, the capital stock against which the certificates are issued, is vested in a board of trustees. It will therefore be easy for these trustees to co-operate in the formation of a large general company. This is a matter, however, which it is thought will require careful handling.

"An important issue in the general scheme is the settlement of differences between the Chicago Railways Company and the Chicago Consolidated Traction Company and the legal absorption of the latter by the Railways Company. In the Consolidated company Charles G. Dawes has taken a leading part in straightening out its affairs, and he is one of the trustees of the Chicago Railways Company's capital stock. Barring, therefore, the personal equation, the stock holdings of all the corporations, omitting the elevateds, are in such shape as to facilitate a general consolidation."

THE ENTZ BOOSTER ABROAD

The instant reversibility of the "Entz" booster has rapidly brought it to the front in England, as appears from the fact that the Chloride Electrical Storage Company, Ltd., of Pendlebury, near Manchester, has installed a considerable number of plants for handling fluctuating loads in both electric railway and isolated plants. The results are said to show considerable economies in coal consumption and in the amount of running plant necessary to handle the load. At the power plant of the Greenock Corporation the booster plant effected a saving of 20 per cent in the amount of coal consumed, equal to 2000 tons a year. This amount, after deducting interest, sinking fund and upkeep, is sufficient to pay for the cost of the plant in four years. At the Maidstone Corporation power house, where the booster plant is handling a railway load, the percentage of coal saved was even higher, and, as in other stations where this booster has been installed, one steam unit now deals with a load which formerly required two units. A similar saving in running plant has been effected at the Halifax Corporation plant, where a 750-kw unit and one boiler have been shut down, while the load on the generating plant can be kept constant within such close limits that no alteration to the boiler dampers is required from one week end to another. Boosters of this type have also been supplied to the municipal electrical plants in Llandudno, Falkirk and Blackburn.

At the Motherwell Steel Works of David Colville & Sons, where there are about 4000 hp of motors, a booster battery plant has been installed capable of giving 1190 amp for one hour. This has brought about a considerable economy in steam consumption and a reduction at top load of 50 per cent in the amount of running plant required. One set is now free to act as a standby, while the battery acts as a further standby, besides being available as a source of supply for week-end repairs and lighting. The Hanshin Electric Railway, Japan, has installed two plants capable of dealing with 2000 amp peaks, while the Nankai Electric Railway, Japan, has also put down a plant. The Cape Town Corporation has recently set to work a battery and "Entz" booster to handle all the crane load at the docks, which are supplied from the lighting bus bars. All the peaks in this case are taken on the battery, and no fluctuation is apparent in the lighting pressure, because the booster maintains the feeder load at a definite fixed value. The Shanghai Municipal Council is now installing a booster for its street railway tramways, and the River Plate Electricity Company is putting one in for dealing with both its tramway and lighting loads at La Plata, South America.

A NEW INSULATING TAPE

The Massachusetts Chemical Company, Walpole, Mass., is now manufacturing a new grade of insulating tape, known as "Walpole" tape. It is made on a strong fabric woven especially for the purpose in $\frac{3}{4}$ -in. width. The fabric is thoroughly impregnated with a special compound having unusual qualities of insulation, adhesiveness and resistance to atmospheric action. This compound is rolled into the fabric under a pressure of many tons, filling every port, crowding between the fibers and providing an impervious coating on each side of the tape. The friction is noticeably smooth and the composition of the compound is such that its adhesiveness does not vary under extremes of temperature, but is ample for all requirements without interfering with easy handling. The compound contains nothing that will corrode copper or in any way affect materials with which it may come in contact. The round tin box in which Walpole tape is always packed in lengths of 80 ft. is distinctive. The box preserves any unused portion of the roll, and is an inducement to economy in the use of the tape.

PORTABLE INSPECTION TEST SET

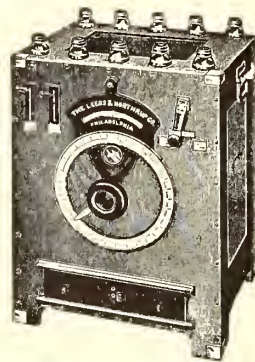
Albert B. Herrick, New York, has redesigned his inspection test set to have a self-contained portable instrument for rapidly and accurately determining the condition of the electrical equipment of electric cars. Owing to the success which Mr. Herrick has had with this set in his own work of reporting on the electrical conditions of street and interurban railways, he has arranged to have the Leeds & Northrup Company, Philadelphia, make it for general sale.

One of the most useful tests of which the set is capable is the quick and thorough inspection of the equipment of a car at periodic intervals. This is known as the inspector's test, and is accomplished by measuring for each controller point the entire resistance of the circuits through the car. If these values correspond to a standard value, the car is passed as in good condition electrically. If the values so obtained do not correspond to standard values the car is taken out of service for a detail test to discover the exact locality of the trouble. In one instance where this inspection was applied, the cars were tested on a line with three-minute headway when they came to the end of their run, without interfering with the schedule.

The set is arranged for seven tests, and connections for each test are made in the instrument simply by inserting a plug. An interlocking arrangement prevents the damaging of the instrument due to improper connections. The first test is the inspector's test already described above. The second is the detail test, whereby the resistance of any portion of the equipment may be determined separately, thus discovering the place where the trouble indicated by the first test originated.

In addition, the set may be arranged to measure resistance through a range of 1.5 ohms, or 150 ohms, thus allowing high or low resistance measurements. A setting is provided for the detection of grounds, and also one for the measurement of insulation resistance. The final test, known as the inductive balance test, enables the operator to detect a motor armature which is out of center, and also to detect reversed fields. Another very important feature of the set is the interlocking slide, which eliminates the possibility of the operator connecting the set up improperly for any test, and therefore serves as a safeguard against the burning out of the set.

The set is portable, and can be carried from place to place in the car house (or wherever else it may be employed) by



Inspection Test Set

two men. Convenient handles for this purpose are provided on the sides of the case. The testing current is 2 amp, the current being taken from the trolley circuit through lamp banks. The sockets for this purpose are shown in the illustration.

AN ODORLESS CAR DISINFECTANT

The Norman C. Hayner Company, Rochester, N. Y., is now placing before electric railway companies an odorless disinfectant, termed "Killitol." It is composed of a combination of chlorides in solution with oxygen, which kills all germ life. This disinfectant is stated to be equally effective in all kinds of car and station cleaning. Among the electric railways already using "Killitol" are the Indiana Union Traction Company, the Terre Haute, Indianapolis & Eastern Traction Company and the Indianapolis Traction & Terminal Company.

OPERATING COSTS OF THE THIRD AVENUE GASOLINE ELECTRIC CAR

The ELECTRIC RAILWAY JOURNAL of Nov. 6, 1909, contained a description of the gasoline-electric car which the General Electric Company has recently furnished to the Third Avenue Railroad. As noted in that article, the car was placed in service on the 125th Street crosstown line, which has a $2\frac{1}{2}$ -minute headway, instead of being installed at once on one of the horse railways. This was done to try out the car under more severe accelerating conditions than will obtain in the service for which the car was specified. The railway company reports that thus far the gasoline-electric vehicle has given entire satisfaction, although it has been necessary to take it off the line for a few days because of the breaking of a crankshaft. An investigation of this failure showed that it was due to a blowhole. It was necessary to discontinue the service for the time being because the company had not yet received its supply of spare parts before the accident occurred. Aside from this, no parts have required replacement or maintenance since the service was begun.

The following running costs and other data on the gasoline-electric car, covering the week from Dec. 1 to Dec. 7, inclusive, are typical of the results now being secured: The car seats only 28 passengers, but its gross revenue is practically the same as the income on the other cars of the line, which seat 46 passengers. During the week reported it carried 3345 fare passengers and 890 transfer passengers. The revenue mileage was 540, while the daily runs varied from 63 miles to 90 miles. The number of gross car-miles operated was 554, for which number there were required 222 gal. of gasoline and 5.75 gal. of cylinder oil. The gasoline cost 4.83 cents and the cylinder oil 0.48 cent per revenue car-mile. The platform expenses were the same as for regular electric cars, and amounted to 7.7 cents per revenue car-mile. The miscellaneous expenses were 0.707 cent per revenue car-mile. The total expenses per revenue car-mile were 13.717 cents, and the earnings on the same basis were 30.97 cents. The total expenses per gross car-mile were 13.368 cents; total revenue per car-mile, 30.19 cents.

Henry F. Marx, librarian of the Easton (Pa.) Public Library, has suggested a traveling public library installed in a trolley car as a means of bringing the benefits of the public libraries in large cities to the laboring classes who live a long distance from the permanent distributing stations. He believes that with a small outlay a trolley car could be purchased and equipped with several thousand books and run in on sidings near large department stores or mills during the noon hour, thereby permitting working people to secure books suited to their tastes. Pennsylvania, with its 3644 miles of trolley lines, could easily afford to institute a traveling trolley car circulating library. To sustain such a library an hour and a half a day would cost, Mr. Marx estimates, \$557 a year, including mileage of 66 miles a week, light, heat, wages and repairs.

LONDON LETTER

(From Our Regular Correspondent)

The experimental gyroscopic mono-rail carriage invented by Louis Brennan, Gillingham, Kent, was described and illustrated in the *ELECTRIC RAILWAY JOURNAL* of June 1, 1907, page 163. In November Mr. Brennan gave his first public demonstration with a full-sized gyroscope car mounted on two bogies of two wheels each. The car ran with the greatest ease on tangents and curves. The demonstration was attended by officials of the War Office and India Office. It is understood that Mr. Brennan has received subsidies for the cost of the experiments from the India Office and from an Indian official.

The London, Brighton & South Coast Railway has opened its electrified suburban line between Victoria and London Bridge, via Peckham Rye. Many references to this installation have been made in this letter, and the equipment has been described in the *ELECTRIC RAILWAY JOURNAL*. The electrified line is really a loop between Victoria Station, in the west end of London, and London Bridge Station, immediately south of the city portion of London. The distance is less than 9 miles and it took 36 minutes to make the run with steam as motive power. The electric trains cover the distance in 24 minutes, at an average speed, including stops, of 22 m.h.p. It is a single-phase alternating overhead installation, and while the Heysham system is the only other of the kind in England the Brighton Railway was the first to decide upon using single-phase in England; but the many delays encountered by the London, Brighton & South Coast Railway enabled the Midland Railway to place its line in operation first. Current purchased from the London Electric Supply Corporation is delivered at Queen's Road by a duplicate system of mains, the potential on the overhead trolley being 6,000 volts. The cars are of the side-door type, similar to the old railway carriages common in England, but with a corridor, and are much more quickly emptied and filled than the carriages of the tube railways in London. The seating capacity of each train is 218, and the cars are divided into first and third class. At Victoria Station there are seven lines equipped with overhead construction, which give access to five platforms, and at London Bridge Station five platforms similarly equipped. A 15-minute service is maintained at present, but a more frequent service will probably be adopted in an effort to recover traffic lost to the tramways. The new line will be called the South London Electric Elevated Railway. Credit for the change of motive power from steam to electricity is due William Forbes, general manager of the line. The details of the work have been in the hands of Philip Dawson, electrical adviser to the company.

The County Council and railways committee of the Isle of Wight is considering the electrification of the railways in the island. There is also under consideration an alternative proposal for constructing new light railways or electric tramways. It is somewhat doubtful, however, if much will come of this in the immediate future, as the Isle of Wight is to a large extent a pleasure resort, and it is difficult to see how the electrification of the existing railways would improve matters much.

The British Electrical Federation, which is the new name of the British Electric Traction Company, controlling a large number of the tramways in Great Britain, has devised a plan to increase earnings by adopting a farthing (one-half cent) fare. As is well known, tramway earnings have been decreasing steadily and dividends on the common shares have not been paid for some time. In addition, in many cases very little has been set aside for depreciation. The minimum fare will remain at one penny, but the fare thereafter will be, roughly, an additional farthing for each quarter of a mile. Instead of the routes being divided into distances recognized very often by public houses or road crossings, all routes will be measured and marked by posts, so that each passenger will secure the full distance value for his fare. It is understood that arrangements have been made with the mint by which about 2,225,000 farthings will be delivered to the Federation before the change is made. Passengers who object to farthings in change will receive farthing discount tickets good

for future rides. By the adoption of farthing fares it is hoped to do away with the complaints when passengers ride a short distance over the arbitrary zone and are compelled to pay a half-penny more. Under the new plan each passenger will be charged for the distance he travels.

The Glasgow tramways have long suffered from the congestion of traffic on Jamaica Street Bridge, the most important structure crossing the Clyde, and a sub-committee of the Glasgow Town Council has recommended the erection of a wing at the west side of the bridge to carry one line of traffic southward. The estimated cost of this work is £8,000. Application has been made to the tramways committee to defray this cost, on the ground that the expense is due to tramway development. Two other schemes have also been proposed. One provides for a bracket annex on either side of the bridge for the exclusive use of pedestrians, thus setting free the existing 80 ft. for vehicular traffic. The other provides for a subway under the approach to the bridge, by which vehicles on Broomielaw and Great Clyde Street could pass east and west without interrupting traffic crossing the bridge. In connection with the Glasgow tramways, James McFarlane, late convener of the tramways committee, in a paper read before the Glasgow Royal Philosophical Institution, stated that the time would very soon come in Glasgow when a universal penny fare could be given within the municipal boundary. This would mean a loss at the present time of about £25,000 a year. The number of passengers carried inside the city was six times the number carried outside. At present 88 per cent of the traffic represented 1d. fares, and under 8 per cent 1½d. fares. A large saving would be effected in the checking and other clerical work, however, and the staff of inspectors could be reduced.

The London County Council is to seek Parliamentary powers during the next session for extensive new lines and the making of new streets, widening others and incidental work connected with a tramway along the Edgware Road, which will extend from the Marble Arch to Criklewood, by way of Maida Vale and Finchley Road. This route is now served by motor omnibuses which charge 3d., whereas the County Council says the fare between the Marble Arch and Criklewood on its lines would be only 2d., and that the line it proposes would relieve the housing problem in the vicinity of Oxford Street. When the bill was successfully opposed three years ago Paddington Borough Council pointed out that Edgware Road was not wide enough for tramways: that the advent of tramways would depreciate the value of property and that the scheme provided only a dead end at the Marble Arch, with no through communication. Other routes are also to be covered, such as from Chalk Farm to Child's Hill, which would connect with the Marble Arch route and give it greater value. Perhaps the most important of the schemes at present receiving the attention of the Council is for the through-running of cars between the Council's tramways from Aldgate to Bow and certain of the tramways of West Ham and East Ham Corporations and Leyton Urban District Council. Should the proposed agreement be effected, it would enable passengers to travel, without changing, from Aldgate to Epping Forest, via Bow Bridge, Stratford Broadway, Leytonstone and Whipps Cross. It is proposed that each authority shall (1) take all the fares on its own cars, (2) defray its own operating expenses, (3) supply electricity free in its own area, and (4) run cars according to the length of track in its own area. The reconstructed electric tramway between the Archway Tavern, Highgate and Euston Road, via Camden Town, has been opened. It runs along the important main thoroughfares of Junction Road, Fortress Road and Kentish Town Road, and forms an important link with the London County Council's tramways from Highgate to the city on one side and from Finsbury Park to Tottenham Court Road on the other side. By changing at Camden Town passengers can travel to King's Cross and Holborn.

At a meeting of Salteats Town Council a letter was read from the promoters of the Ardrossan & Salteats Tramways Order, stating that they had secured the cooperation of George Balfour, who was applying for lighting orders in the district, and he expected as soon as these orders were obtained that the construction of the tramways would be proceeded with.

A. C. S.

News of Electric Railways

Chicago City Railway Rehabilitation Progress

Announcement that the Chicago City Railway Company has practically finished the rehabilitation of its property as required by the ordinance of Feb. 11, 1907, has just been made. The work is stated to have been 97 per cent completed on Dec. 1, 1909. A recapitulation of the rehabilitation work of the Chicago City Railway Company, with comparative ordinance requirements, is shown in the following table:

	Percentage completed.
1. To remove from the streets all (34.71 miles) cable track and to substitute therefor electric track.....	100
2. To rebuild at least 60 miles (single) of electric track.....	100
3. To construct and equip necessary system of power distribution and substations, as approved by board of supervising engineers, Chicago traction:	
(a) Renewal of trolley wire.....	98
(b) Underground conduit.....	99
(c) Underground feeders.....	98
(d) Return feeders.....	95
(e) Substations.....	99
4. To rebuild and re-equip its carhouses so as to enable it to properly clean and maintain its cars; four new carhouses required, capacity 1051 double-truck cars.....	100
5. To increase its rolling stock to at least 800 modern double-truck cars.....	100
Average completion of work required during three years' period of "immediate rehabilitation".....	98
Period of "immediate rehabilitation" expires three years after acceptance of ordinance, or on April 15, 1910; percentage of time expired at Dec. 1, 1909.....	87.5
Original valuation as per ordinance.....	\$21,000,000.00
Additional property, June, 1906, to Feb. 1, 1907.....	1,816,853.19
Rehabilitation expenditure to Nov. 1, 1909, as per certificates of board of supervising engineers.....	15,166,234.51

Total purchase price to city.....\$37,983,087.70

In amplification of the above schedule of rehabilitation it is stated that:

"1. The company has electrified all its old cable track and has reconstructed more than 60 miles of electric track.

"2. The company has laid 520,000 sq. yd. of paving, mostly granite block.

"3. The installation of underground feeders represents the taking down of an approximately equal mileage of overhead feeders in the 'underground district,' and as the underground cable is usually a larger cable, it represents an increase in the capacity of the power distribution system. The result is seen in the superior lighting of cars and their increased speed during 'rush hours.' New return feeders also are an important factor in power distribution.

"4. A storage battery at the Plymouth Court substation has sufficient capacity to handle the entire downtown load for a period of 15 to 20 minutes, thus providing against accident to the generating system and a tieup in the downtown traffic. A storage battery at Seventy-eighth Street and Vincennes Road can be similarly employed, although the principal function of both batteries is to regulate the load during rush hours. The company now purchases all its electrical energy from the Commonwealth Edison Company.

"5. For the proper housing, cleaning and maintenance of its passenger cars, the company has built four new car houses with a total capacity of 1076 double-truck cars. These buildings are equipped with the most modern facilities for the cleaning, repairing and inspection of cars. In construction they are fireproof and so arranged that a car may enter at one end after a day's service and be pulled out of the other cleaned and inspected ready for the next day's work. In addition to offices, these car houses are provided with clubrooms and toilet rooms for the exclusive use of trainmen. The company has taken special pains to provide for the comfort of its men, and the four car houses now in service are models of a most modern type.

"6. Practically all the company's double-truck cars have been converted for the 'pay-as-you-enter' service. Simultaneously with necessary alterations for this purpose, the older cars were completely overhauled and fitted with such improvements as the folding step and sliding vestibule doors, which are operated by the motormen.

"The premiums paid by the Chicago City Railway Company on fire insurance are, by the provisions of its ordinance, charged as an operating expense. The insurance now carried protects the company against 100 per cent loss on

\$10,235,000 worth of property at a premium of 48 cents per \$100, this low rate being attributable in the main to fireproof construction of buildings and improved inspection of the company's property. In July, 1905, the company paid in premiums \$51,060 on \$2,300,000 of property insured, whereas in November, 1909, only \$49,128 was paid on nearly five times that amount. The significance of the present low rate may be best shown by the following comparison with the premium rates for insurance upon the company's property for four years:

Year.	Insurable property.	Insurance carried.	Premium.
July, 1905.....	\$5,300,000	\$2,300,000	\$51,060
January, 1906.....	6,441,869	6,441,869	64,418
January, 1907.....	7,442,500	7,442,500	60,864
October, 1907.....	9,660,000	9,660,000	65,688
June, 1908.....	9,775,000	9,775,000	58,650
April, 1909.....	10,300,000	10,300,000	51,500
November, 1909.....	10,235,000	10,235,000	49,128

Transit Affairs in New York

Proceedings have been instituted in the Supreme Court by Attorney-General O'Malley of New York against the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway, Bleecker Street Railway, Fulton Street Railway, Twenty-third Street Railway, and Metropolitan Street Railway to forfeit the franchises covering certain routes on the ground that the companies no longer operate railways there in good faith; that the companies have not used these franchises as parts of any regularly operated routes for several years; that for long intervals they have abandoned the operation of cars, and at other times have operated but one horse-car or two a day; and that the cars of the companies have not been operated in accordance with public convenience, as required by the terms of the franchise. Mr. O'Malley acted upon a communication received from the Public Service Commission of the First District.

Judge Lacombe, of the United States Circuit Court, has authorized F. W. Whitridge, receiver of the Third Avenue Railroad, to issue \$1,500,000 in certificates at 6 per cent interest and directed him to pay \$1,000,000 to the city for back taxes and to compromise the remainder of the amount due. The city alleges the arrears to be \$2,871,399.

Cleveland Traction Situation

At the meeting of the City Council of Cleveland on the evening of Dec. 20, 1909, a franchise was granted the Cleveland Railway to operate on Superior Avenue, St. Clair Avenue and all the other routes on which it is claimed grants expire in January, 1911. The fare is to be 3 cents and the grants are good until June 1, 1910. This grant was made in order to force the company to accept the rate of fare named, as all the lines have been operated at a 5-cent fare. The city legal department admits that the system operated under the orders of the Federal Court may continue to charge the original fare until the new grant becomes operative through a referendum vote. The company has not taken any action on this grant and probably will not do so. It is subject to a referendum vote, the same as the other grant.

Considerable discussion has taken place over the plan decided upon to make good the guarantee given to purchasers of stock of the Forest City Railway who obtained their holdings through the municipal stock exchange. According to the belief of Judge Tayler, the stock of the Cleveland Railway, held in the regular way, will be worth par and 1/12 per cent when the new grant becomes operative, while the guaranteed stock will have a value equal to par and 7 1/2 per cent.

The signing of the grant made to the Cleveland Railway under Judge Tayler's plan by vice-Mayor Lapp, noted in the ELECTRIC RAILWAY JOURNAL of Dec. 25, 1909, page 1274, has resulted in considerable comment. Mayor Johnson has not intimated what stand he will take in the referendum campaign. Petitions prepared at the City Hall are being circulated and it was said on Dec. 23, 1909, that a sufficient number of names had been secured to make a referendum vote cer-

tain. It is the thought that haste was made in securing signatures so that the present administration could fix the date of the vote. Judge Tayler desires that the vote be taken in February, but the Mayor favors a later date.

The Low Fare Railway and the Municipal Traction Company have consented in writing to accept the Tayler ordinance. Late in the week ending Dec. 25, 1909, the Forest City Railway had not filed an acceptance, but it was said the company would accept the grant as soon as Fred C. Alber, secretary, returns to the city.

At a deposition hearing on the subway matter held a few days ago, attorneys for the petitioners in the injunction case against the Cleveland Underground Rapid Transit Company attempted to show that the vote in the City Council gave to the company a grant that was arranged in caucuses between the Mayor and the City Council.

Judge Vickery of the Common Pleas Court has refused to dissolve the temporary restraining order against the publication of the franchise ordinance recently granted the Cleveland Underground Rapid Transit Company. He held that the delay would make it possible to consider the question at length.

Association Meetings

- Wisconsin Electric & Interurban Railway Association.—Milwaukee, Wis., Jan. 19 and 20.
- Central Electric Traffic Association.—Columbus, Ohio, Jan. 26.
- Central Electric Railway Association.—Columbus, Ohio, Jan. 27.
- Street Railway Association of the State of New York.—Rochester, N. Y., March 1 and 2.
- Central Electric Accounting Conference.—Fort Wayne, Ind., March 12.

Change in Motive Power of Lima-Defiance Division of Ohio Electric Railway.—The electrification of the Columbus & Lake Michigan Railroad, purchased by the Ohio Electric Railway two years ago, has been completed and a regular schedule established. The company will continue to operate freight trains over the line by steam.

Pennsylvania Railroad Commission.—It is expected that at the next meeting of the Pennsylvania State Railroad Commission a new secretary will be announced, inasmuch as H. S. Calvert's resignation took effect on Dec. 31, 1909. Marshal J. P. Dohony is now attending to the duties of the secretary. The annual report of the commission is being prepared for submission to the Governor in January. A complaint has been received by the commission about the condition of the roadbed of an unnamed electric railway near North East. Citizens of Wilkinsburg have complained about the service and equipment of the line which the Pittsburgh Railways operates between Wilkinsburg and Pittsburgh. Emil Swenson is expected to report on street railway service in Pittsburgh at the next meeting of the commission.

Boston Elevated Railway Expansion Discussed.—At a meeting of the Chamber of Commerce of Boston, held at the American House on Dec. 21, 1909, William A. Bancroft, president of the Boston Elevated Railway, favored a proposed bill to allow the company to purchase a controlling interest in suburban electric railways for the purpose of forming a centralized operating organization of high efficiency. Mr. Bancroft said that the charter of the Boston Elevated Railway restricts it to a 5-cent fare, and that this militates against expansion into the suburban field. He urged the removal of this restriction, and enumerated the benefits secured by Henry M. Whitney in combining the surface railways of Boston many years ago. Since Mr. Whitney's time, 250 miles of track have been built, and the investment increased from \$17,000,000 to \$70,000,000, with \$34,000,000 required for improvements practically agreed to by the company. Among the advantages of consolidation were improved service, increased operating economy, increased pay and pensions to employees. The company must secure traffic to help pay the charges on the extensive subway and tunnel system of Boston. Frederic E. Snow, of Gaston, Snow & Saltonstall, counsel for the company, explained the bill which the company desires to have passed, and showed how the Railroad Commission would supervise all issues of securities.

Financial and Corporate

New York Stock and Money Markets

December 23, 1909.

For the few days previous to the holidays the Wall Street market was extremely dull, with prices inclined to sag. At the opening yesterday there occurred a 10-minute flurry in Rock Island common, and to-day the market was much more active and prices generally advanced. The copper stocks were especially strong. Traction shares have been steady and fairly active during the week.

The money market has been a trifle more irregular and rates have been somewhat higher. Rates to-day were: Call, 5 to 5¾ per cent; 90 days, 4½ to 4¾ per cent.

Other Markets

It has been a rather dull week for traction shares in the Philadelphia market, although every day has witnessed a few transactions in Rapid Transit and Union Traction. Prices have changed only fractionally during the week.

In the Boston market there continues to be considerable trading in the issues of Massachusetts Electric. The common stock has been particularly active, but neither this nor the preferred has advanced in price. There has been light trading in Boston Suburban and Boston Elevated.

In Chicago there has been quite liberal trading in Series 1 and 2 of the Chicago Railways Company. Series 1 has been particularly active and the price has advanced to 109. Series 2, at the same time, has declined about 2 points.

There have been few traction stocks in the Baltimore trading. The bonds of the United Railways Company, however continue to be active at prices that are unchanged.

At the weekly auction of securities in New York the only tractions sold were \$2,000 South Shore Traction Company 5 per cent bonds, at 96¼.

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

American Railways Company.....	447¼	447¼
Aurora, Elgin & Chicago Railroad (common).....	*57	*57
Aurora, Elgin & Chicago Railroad (preferred).....	*92	*92
Boston Elevated Railway.....	a131½	132½
Boston & Suburban Electric Companies.....	a16	15
Boston & Suburban Electric Companies (preferred).....	75	*75
Boston & Worcester Electric Companies (common).....	a12	a12
Boston & Worcester Electric Companies (preferred).....	a49	a48
Brooklyn Rapid Transit Company.....	80¾	79½
Brooklyn Rapid Transit Company, 1st pref., conv. 4s.....	86¾	86¾
Capital Traction Company, Washington.....	a133	*133½
Chicago City Railway.....	a190	*190
Chicago & Oak Park Elevated Railroad (common).....	*2	*2
Chicago & Oak Park Elevated Railroad (preferred).....	*10	*10
Chicago Railways, pteptg., ctf. 1.....	a110	a110
Chicago Railways, pteptg., ctf. 2.....	a34	a33
Chicago Railways, pteptg., ctf. 3.....	a16	a15
Chicago Railways, pteptg., ctf. 4s.....	*10	*10
Cleveland Railways.....	*84	*84
Consolidated Traction of New Jersey.....	a76½	a77½
Consolidated Traction of New Jersey, 5 per cent bonds.....	a106	*106
Detroit United Railway.....	*63	*65
General Electric Company.....	160½	159½
Georgia Railway & Electric Company (common).....	a105	102½
Georgia Railway & Electric Company (preferred).....	*87	87
Interborough-Metropolitan Company (common).....	24½	24¾
Interborough-Metropolitan Company (preferred).....	61½	62
Interborough-Metropolitan Company (4½s).....	83¾	83¾
Kansas City Railway & Light Company (common).....	a34	a33
Kansas City Railway & Light Company (preferred).....	*79	*79
Manhattan Railway.....	139	*140
Massachusetts Electric Companies (common).....	a16½	a16¼
Massachusetts Electric Companies (preferred).....	a76½	a79
Metropolitan West Side, Chicago (common).....	a19½	a19
Metropolitan West Side, Chicago (preferred).....	a58	a57
Metropolitan Street Railway.....	*20	*23
Milwaukee Electric Railway & Light (preferred).....	*110	*110
North American Company.....	85	*85
Northwestern Elevated Railroad (common).....	a18	a18
Northwestern Elevated Railroad (preferred).....	a68	a68
Philadelphia Company, Pittsburg (common).....	a50¼	a50¼
Philadelphia Company, Pittsburg (preferred).....	a45¼	a45¼
Philadelphia Rapid Transit Company.....	a27¾	a27
Philadelphia Traction Company.....	a90	a89
Public Service Corporation, 5 per cent col. notes.....	*100½	*100½
Public Service Corporation, cts.....	a100¼	*101½
Seattle Electric Company (common).....	a115¼	a115¼
Seattle Electric Company (preferred).....	104	104
South Side Elevated Railroad (Chicago).....	a55	a56
Third Avenue Railroad, New York.....	165½	165½
Toledo Railways & Light Company.....	95½	*95½
Twin City Rapid Transit, Minneapolis (common).....	114	116
Union Traction Company, Philadelphia.....	a52½	a52
United Rys. & Electric Company, Baltimore.....	a14½	a14½
United Rys. Inv. Co. (common).....	*42¾	*42¾
United Rys. Inv. Co. (preferred).....	*73¾	*71¾
Washington Ry. & Electric Company (common).....	42	*43½
Washington Ry. & Electric Company (preferred).....	a91¼	*91½
West End Street Railway, Boston (common).....	a94	a95½
West End Street Railway, Boston (preferred).....	a106	*106
Westinghouse Electric & Mfg. Company.....	81½	82¼
Westinghouse Elec. & Mfg. Company (1st pref.).....	*135	130

a Asked.

* Last Sale.

Brunswick Terminal & Railway Securities Company, Brunswick, Ga.—The New York Stock Exchange has authorized the substitution of \$5,000,000 stock of the Brunswick Terminal & Railway Securities Company for a similar amount of stock of the Brunswick Dock & City Improvement Company, the former name of the company, with authority to list \$2,000,000 of additional stock to acquire the capital stock of the Mutual Light & Water Company and the bonds of the Suburban Railway.

Boone (Ia.) Electric Company.—An announcement regarding the Iowa Light & Traction Company, over the signatures of H. S. Osborne, Andrew Stevenson and J. H. McBride, contains the following: "An agreement has been reached between John Reynolds, trustee, and Messrs. Hughes, McBride and Stevenson to cancel the option contract entered into between them on July 7, 1909, for the sale and transfer of the Boone Electric Street Railway & Light Company, the Boone Suburban Railway Company and the Central Heating plant. It would not serve any useful purpose to enter into a detailed statement of all the causes that have contributed to defeat the plans which were entered into in good faith by both parties."

Camden & Trenton Railway, Camden, N. J.—Bondholders of the Camden & Trenton Railway, the Trenton & New Brunswick Railway, and the New Jersey Short Line Railway for which the New York-Philadelphia Company is the holding company, held a meeting in Burlington, N. J., on Dec. 24, 1909, and formed plans for a reorganization of all the companies. The interests at this meeting distrusted the plan of reorganization proposed by a bondholders' committee of the Camden & Trenton Railway.

Coney Island & Brooklyn Railroad, Brooklyn, N. Y.—The hearing on the application of the Coney Island & Brooklyn Railroad to the Public Service Commission of the First District of New York for permission to issue \$462,000 of bonds to pay for removing its tracks from the side to the center of Coney Island Avenue will be continued before Commissioner Bassett on Jan. 3, 1910.

Du Bois Electric & Traction Company, Du Bois, Pa.—Geo. B. Atlee, of Geo. B. Atlee & Company, Philadelphia, Pa., has been elected a director of the Du Bois Electric & Traction Company.

Indianapolis & Louisville Traction Company, Louisville, Ky.—The Indianapolis & Louisville Traction Company has filed in favor of the Colonial Trust Company, Pittsburgh, Pa., as trustee, a mortgage to secure an issue of \$600,000 of bonds of which at least \$400,000 will be issued in lieu and in substitution for \$400,000 of 6 per cent notes made in 1907 and now being called in. The remainder of the new bonds will be issued from time to time for other purchases.

Kansas City Railway & Light Company, Kansas City, Mo.—The Kansas City Railway & Light Company has called for redemption \$49,000 of first mortgage 5 per cent bonds of the Corriang Consolidated Street Railway, dated 1886. They were paid on Jan. 1, 1910, at 110 and interest at the office of The Central Trust Company, New York, N. Y., trustee.

Mahoning & Shenango Railway & Light Company, Youngstown, Ohio.—Lee, Higginson & Company, Boston, Mass., New York, N. Y., and Chicago, Ill., and Blair & Company, New York, N. Y., offer for subscription at 97 and interest, yielding approximately 5½ per cent, the unsold portion of \$3,800,000 of first consolidated refunding mortgage 5 per cent bonds of the Mahoning & Shenango Railway & Light Company dated Nov. 1, 1905, and due Jan. 1, 1916, but redeemable at 105 and interest on any interest date.

Metropolitan West Side Elevated Railway, Chicago, Ill.—Following the meeting of the directors of the Metropolitan West Side Elevated Railway, held on Dec. 21, 1909, a statement was authorized to the effect that "it is the opinion of the directors that the financial condition and the earnings of the company will warrant the resumption of dividends of the preferred stock in the next calendar year at the rate of 3 per cent in four quarterly payments, beginning March 1." The last disbursement of the preferred stock of the company was three-quarters of 1 per cent and was made on Dec. 30, 1907.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis.—The annual meeting of the stockholders of the

Milwaukee Electric Railway & Light Company will be held in Milwaukee on Feb. 17, 1910.

New York, Westchester & Boston Railway, New York, N. Y.—The Public Service Commission of the Second District of New York has approved the proposed form of agreement of the consolidation of the New York, Westchester & Boston Railway and the New York & Port Chester Railroad, and the corporations are authorized to enter into and execute the agreement of consolidation.

Public Service Corporation of New Jersey, Newark, N. J.—The Public Service Corporation of New Jersey on Dec. 28, 1909, declared a quarterly dividend of 1¼ per cent on the stock, payable on Dec. 31, 1909, to stock of record on Dec. 28, 1909. The directors of the company at a meeting on Dec. 28, 1909, created the positions of third and fourth vice-presidents of the company. Randal Morgan, Philadelphia, Pa., was chosen third vice-president, and Anthony R. Kuser, Newark, N. J., fourth vice-president. Both Mr. Morgan and Mr. Kuser were formerly vice-presidents and have been members of the executive committee of the directors since the organization of the Public Service Corporation in 1903. The same positions were created in the Public Service Gas Company and the Public Service Railway and Mr. Morgan and Mr. Kuser were elected to fill them.

Toledo, Ann Arbor & Detroit Electric Railroad, Toledo, Ohio.—James A. Wallace, Des Moines, Ia., announced in Toledo recently that a syndicate of Chicago men and their associates had purchased the property of the Toledo, Ann Arbor & Detroit Electric Railway, from Andrew E. Lee, ex-Governor of South Dakota, and that arrangements had been made to complete the road. According to Mr. Wallace it is proposed to issue \$200,000 of cumulative preferred stock for subscription in Toledo and along the line, the syndicate to furnish the \$600,000, estimated as needed to complete the road, through a bond issue. The property is said to represent an expenditure of about \$400,000.

Toledo & Indiana Railway, Toledo, Ohio.—The property of the Toledo & Indiana Railway will again be offered for sale by C. F. M. Niles at auction at Toledo on Jan. 18, 1910. The upset price has been fixed at two-thirds of the appraised value of the property, or about \$614,000. The setting aside of the sale of this property held on Nov. 27, 1909, was noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 18, 1909, page 1247.

Twin City Rapid Transit Company, Minneapolis, Minn.—The Twin City Rapid Transit Company has called for redemption \$21,000 bonds issued in 1880 by the Minneapolis Street Railway, which will be redeemed at 105 and interest on May 1, 1910, by the Farmers' Loan & Trust Company, New York, N. Y.

United Service Company, New York, N. Y.—The United Service Company has been incorporated under the laws of New York with an authorized capital of \$100,000 of which \$35,000 is paid in cash for the purpose of dealing in supplies of all kinds, especially equipment and supplies necessary for the operation of steam and electric railways, electric light companies, gas companies and water companies. It will do the purchasing for the subsidiary companies of the Susquehanna Railway, Light & Power Company, and on Jan. 1, 1910, took over the business of the Railway Equipment Company, which heretofore has done a similar business; and all contracts now existing with the Railways Equipment Company will be assigned to the United Service Company. The office of the United Service Company is at 40 Wall Street, New York, N. Y., and the officers are: S. J. Dill, president; Henry Morgan, vice-president; A. V. Wainwright, secretary; W. D. Martin, treasurer; F. G. Robinson, purchasing agent. The directors are: S. J. Dill, Henry Morgan, A. V. Wainwright, W. D. Martin, and George Bullock. All the stock of the United Service Company is owned by the Susquehanna Railway, Light & Power Company.

Whatcom County Railway & Light Company, Bellingham, Wash.—Stone & Webster, Boston, Mass., offer, subject to previous sale, \$100,000 of 6 per cent cumulative preferred stock of the Whatcom County Railway & Light Company at 95 to yield more than 6.30 per cent. A statement of the company for the year ended Oct. 31, 1909, shows gross earnings of \$401,186; net earnings of \$175,546, and a surplus of \$36,078, after deducting interest, taxes and dividends at 6 per cent on \$650,000 of 6 per cent preferred stock.

Traffic and Transportation

Decision in Massachusetts Regarding Transportation of Intoxicated Persons

A brief extract was published in the *ELECTRIC RAILWAY JOURNAL* of Dec. 25, 1909, from the finding of the Railroad Commission of Massachusetts relative to the transportation of intoxicated persons on the street railways of the State in connection with a complaint originating in Worcester. The complete finding of the commission follows:

"This complaint is brought under the provisions of the acts of 1906, chapter 463, part 1, section 9, which provides that if the board is of opinion that a change 'in the mode of operating a railroad or a railway and conducting its business is reasonable and expedient in order to promote the security, convenience and accommodation of the public, it shall in writing inform the corporation or company of the improvements and changes which it recommends should be made.'

"The principal allegation of the complaint is of the presence of intoxicated persons, whose conduct is in many instances such as to cause a nuisance and a disturbance of the peace upon the cars of the Worcester Consolidated Street Railway. The statutes of the Commonwealth make adequate provision for the peace of its citizens, and declare drunkenness a misdemeanor. A statutory function of city and town authorities is, through the medium of their police officers, to preserve the peace of their several communities and the law contemplates that this shall be done without direction by the Railroad Commission.

"Special provisions of statute with respect to railroad and street railway police are found in acts of 1906, chapter 463, part 1, sections 49 and 55, inclusive, and define with particularity the method of appointment, the term of office and powers and duties of such officials. It is clear, from an examination of these statutes, that adequate provision has been made for the protection of passengers of common carriers, and that it was the intent of the general court to afford police protection, in addition to that furnished by the municipal authorities, for such common carriers.

"It remains, therefore, for the commission to determine whether the Worcester Consolidated Railway is sufficiently availing itself of these provisions of statute. Conditions similar to those in Worcester have been brought to the attention of the commission in Fall River. Both of these cities are no-license cities, and it appears that certain residents of each, for the purpose of obtaining liquor, ride upon street railways to adjacent towns where such liquor is sold. In some instances these persons become intoxicated and return in that condition in the electric cars. This state of affairs creates conditions which at times outrage all sense of delicacy or decency.

"In the cities the police are of sufficient number to preserve order and make arrests when occasion requires, but on long interurban rides a territory is covered where local officers are frequently beyond call of the employees of the companies. While local officers should be relied upon in town centers to co-operate with the employees of the company to prevent intoxicated persons from boarding the car, the management of the company ought at all times to afford protection to passengers. This does not appear to have been accomplished, and we therefore direct the attention of street railways to the provisions of the statute providing for street railway police, and recommend that seasonable and efficient measures be taken to secure to their patrons the protection to which they are entitled by law.

"We fully realize that complaints against intoxicated persons upon railroads and street railways are not new and, doubtless, as long as persons become intoxicated, conditions such as now complained of must to some degree exist. But we are clearly of opinion that these conditions can be minimized, and that managers of companies can, with cordial co-operation of public authority, secure this result. Whenever conditions lead to the presence of intoxicated persons upon cars, an active and energetic enforcement of the law will tend, in our opinion, to substantial improvement, and we are convinced that the traveling public can be freed in a large measure from the annoyance caused by their presence.

"Certain suggestions have been made to us with respect to partitions in cars, and extra cars at certain hours in the

evening, as a means of segregating persons under the influence of liquor. We doubt the practicability of these suggestions, and if found feasible we should be extremely reluctant to make such recommendations. Street railways are engaged in the business of carrying passengers in such a manner as to promote their security, convenience and accommodation, and it is their plain duty to put into effect every known instrumentality of law in order to render such service to the public. The operation of partition cars or extras is but an invitation to a class the street railway is not intended to serve. Such persons should be, not upon the railway, but in the custody of the law."

Snow Storm Interferes with Traffic in East

The storm which visited New York, New England, New Jersey and Pennsylvania on Dec. 25 and 26, 1909, interfered seriously with the schedules and service of the electric railways. In Boston many of the surface lines of the Boston Elevated Railway were tied up for the first time in more than 12 years. The lines which suffered most were those on the north side of the city leading into the Sullivan Square station. Throughout Boston proper, the car service was, on the whole, well maintained, and the principal routes on the south and west to the suburban districts of South Boston, Dorchester, Roxbury, Brookline, Newton and Cambridge were kept reasonably free from blockades. About 3000 men were employed in removing snow from the tracks and streets, and the company's snow plough brigade performed effective service beginning on Dec. 25, when the fall reached a depth of 1 in. The company was somewhat handicapped by a shortage of men for its shovel service, on account of the recent holiday. Fifteen crews of linemen were at work on the overhead system repairing breaks, and by 7:25 p. m., Dec. 26, the lines were in normal condition. On the elevated division not a trip was lost by a train and the delays were less in number and extent than on a busy day in the holiday season. An extra force was maintained at switches and signals for the removal of snow and ice, and the normal schedule was maintained with only trifling variations in the service.

The reports from New York State, New Jersey and Pennsylvania indicate that where schedules were maintained at all it was only with the greatest difficulty. The wind was very high during the entire period of the storm and in the open country the snow piled up in drifts which could only be removed by shovels. In New York City the subway naturally was used, even for short rides, with the result that considerable difficulty was encountered in handling the traffic, the lines all operating on a holiday schedule. Early in the morning of Dec. 26 there were five blocks on the elevated in New York, the longest 20 minutes. Very few surface cars were running around 2 a. m. The Metropolitan Street Railway had 48 sweepers and 20 scrapers going before daylight, and the only block after 9 a. m. came from a clogged switch in Vanderbilt Avenue, which stalled the uptown Madison Avenue line, the Forty-second Street cross-town line and the Park Avenue uptown line for 45 minutes. The Brooklyn Rapid Transit Company early abandoned operation on several of its unimportant suburban lines, concentrating its attention and equipment on such city trunk lines as Fulton Street, Gates Avenue, Nostrand Avenue, Putnam Avenue, etc. Service within the city proper was entirely abandoned on the Park Avenue, Graham Avenue and Grand Street lines. An elevated train operating on the surface between Ulmer Park and Coney Island became stalled, and many of the passengers passed the night in the cars rather than brave the storm to reach their destination by another route.

Basis of Inquiry Into Increase in Fare by Puget Sound Electric Railway

Complaint having been made to the Railroad Commission of Washington about the increase on Oct. 17, 1909, in the regular rates on the Puget Sound Electric Railway, Tacoma, Wash., to practically 2 cents per mile with an increase in the through rate between Seattle and Tacoma from \$1 to \$1.25 and changes in the commutation rates, as published in the *ELECTRIC RAILWAY JOURNAL* of Nov. 6, 1909, page 1000, the

commission has decided to hold a series of public hearings beginning Jan. 3, 1910, to determine whether the company is justified in exacting the increase from patrons. The commission has issued a statement in which it says:

"Immediately upon the company advancing the rates, anticipating that complaint would be made, necessitating a hearing, we had our engineer enter upon an investigation of the accounting and engineering records of the defendant company, with a view to ascertaining:

"First.—The amount of money actually expended in the construction of the road and the particular item for which the moneys were paid, ascertaining the unit quantities of labor performed, material moved and furnished, with unit prices paid, so that we would be enabled at that time to check up and ascertain fully, not only the amount of money which the record shows has been expended, but whether the same had been properly, economically and in good faith expended.

"Second.—To ascertain these several units, so that, by applying prevailing unit prices, we would be able to ascertain the cost of reproducing the property in its present condition.

"Third.—To ascertain the depreciation that has accrued to the bridges, structures, improvements and equipments, so as to ascertain the present value of the road.

"Fourth.—To ascertain from the accounting records the gross receipts, operating expenses and an analysis of their operating expenses for the purpose of ascertaining whether the same had been reasonable and normal, with a view of introducing in evidence this testimony so as to give a complete financial and operating history of the road down to date."

Hearing on Service in Fairhaven, Mass.—A petition has been addressed to the Railroad Commission of Massachusetts by the selectmen of Fairhaven, requesting a hearing in reference to the frequency of service and the type of cars in use in Fairhaven by the Union Street Railway, New Bedford, Mass.

California Company Modifies Transfers to Curtail Abuses.—The San Diego (Cal.) Electric Railway has recently modified its transfer system so as to curtail abuses in looping and disregard of the time limit. Transfers are now punched for the month, day, issuing line, line issued to, and time to the nearest 15 minutes.

Scope of Illinois Traction Benefit Association Increased.—It has been decided by the employees of the Illinois Traction System, most of whom belong to the system's hospital association, to add a death benefit to the accident insurance which was arranged when the association was organized. A sliding scale of assessments has been agreed upon, ranging from 25 cents to \$4, according to the salary of the employee. It is estimated that this will provide an average death benefit of \$1,000 for each employee.

Date of Hearing Before Railway Commissioners of Canada on Brakes.—The hearing before the Board of Railway Commissioners of Canada to consider the subject of equipping electric cars with automatic air brakes as well as hand brakes which was to have been held on Dec. 7, 1909, and the postponement of which was noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 18, 1909, will be held at Ottawa, Feb. 4, 1910. Col. H. H. McLean, K. C., counsel for the Canadian Street Railway Association, having requested that the companies be given more time in which to prepare their case.

Non-Compliance with Order of Commission Results in Suit.—The Public Service Commission of the Second District of New York has instructed its counsel to begin an action against the Black River Traction Company, Watertown, N. Y., to recover the penalty prescribed by law for failure and neglect by the company to observe and obey an order of the commission requiring it to install derailleurs at all steam railroad crossings upon its road extending along High Street, Watertown. The commission has also instructed counsel to commence a mandamus proceeding by reason of the violation of the order of the commission.

Decision in Indiana Regarding Construction of a Second Track.—The Supreme Court of Indiana has decided that neither the State nor the city can surrender the police power to guard the lives, health and safety of citizens in a decision which applies to steam railroads and electric rail-

ways. The Grand Trunk Railroad attempted to build a second track in Division Street, South Bend, but the city authorities stopped the work. The railroad then asked for an injunction to restrain the city from interfering with its plans. The Supreme Court held that a single track having been built and operated for 30 years without any attempt to lay a double track in accordance with the terms of the original grant, the City Council has power to repeal the privilege of laying another track in the street.

Increase in Wages in New Jersey.—The directors of the Public Service Railway at a meeting on Dec. 28, 1909, decided to increase the wages of motormen and conductors in accordance with the following scale, effective on Jan. 1, 1910: First year, 21 cents an hour; second year, 22 cents an hour; third year, 23 cents an hour; tenth year men, 24 cents an hour. In 1911 the first year men are to receive a further increase to 22 cents an hour; second year men, 23 cents an hour; third year men, 24 cents an hour; tenth year men, 24½ cents an hour. In 1912 the first year men are to receive 23 cents an hour; second year men, 24 cents an hour, and third year men and upward, 25 cents an hour. The present scale of wages is 20 cents for first year men, 21 cents for from second to fifth year, 22 cents for from fifth to tenth year, and 23 cents for 10-year men and over.

Prizes for Accident Essays in Philadelphia.—Motormen and conductors in the employ of the Philadelphia (Pa.) Rapid Transit Company have been asked to write essays on subjects dealt with in the bulletins of the bureau for the prevention of accidents of the company. Heretofore the company gave cash prizes for suggestions, but it is announced that awards amounting to \$200 would now be given for the best papers on that subject. The essays are limited to 400 words, and must be submitted between Jan. 1, 1910, and Feb. 1, 1910. The men are advised that the papers will be judged upon the thoughts, ideas and suggestions. For the best of these essays the company offers 20 \$5 prizes, 25 prizes of \$2 and 50 awards at \$1 each. The plan, now suspended, of giving an unlimited number of \$2 prizes for suggestions from motormen and conductors, has brought the company scores of useful ideas, and stimulated the interest and observation of the men.

Change of Rates on New York Line.—Effective on Jan. 15, 1910, the Western New York & Pennsylvania Traction Company, Olean, N. Y., will make several changes in its passenger rates. The round-trip fare in either direction between Olean and Allegany will be reduced from 20 cents to 15 cents; 46-trip monthly scholar's ticket fares between any two local points within the State of New York where the regular one-way fare is 10 cents or more will be made one-half the regular one-way fare; ticket books containing 52 coupons each good for passage in either direction between Portville and Olean, will be sold for \$3.25 per book, but will be good only during the month in which they are issued and on cars leaving Portville or Olean between 6 a. m. and 7:30 a. m., and 5 p. m. and 7 p. m.; ticket books containing 110 coupons of a face value of 5 cents each between all local points within the State of New York will be sold for \$5 per book.

Bill to Require Interchange of Transfers in Washington.—The bill introduced at the last session of Congress to require the free interchange of transfers between the Capital Traction Company and the Washington Railway & Electric Company has been referred to the District committees. In transmitting the bill the District Commissioners said: "The Commissioners have in the past given their approval to this proposition and have met all objections of the railways as to matters of finance and administrative difficulty with the statement of their belief that the financial burden which would be imposed by the passage of such a bill would not be a heavy one and the administrative difficulty would be easily surmountable. The proposition of the interchange of transfers between the competing railways is one involving distinct and very great convenience to the railway traveling public. The incidental financial loss to the railways would be very slight, and should be required of them in view of the fact that the franchises of these companies are valuable, practically perpetual and certainly not more than moderately taxed. The Commissioners recommend favorable action on this bill with the addition of a penalty clause."

Personal Mention

Mr. W. H. Seip has been appointed superintendent of the west division of the Denver (Col.) City Tramway, to succeed Mr. W. M. Casey.

Mr. W. M. Casey, superintendent of the west division of Denver (Col.) City Tramway, has been appointed trainmaster of the company, in charge of the division superintendents, dispatchers and trainmen.

Mr. F. W. Laurence has resigned as general superintendent of the Chattanooga Railway & Light Company, Chattanooga, Tenn., to become engineer of the Electrical Securities Corporation, New York, N. Y., to succeed Mr. F. L. Dame.

Mr. B. J. Arnold, chairman of the Board of Supervising Engineers, Chicago Traction, and consulting engineer of the Public Service Commission of the First District of New York, was married on Dec. 22, 1909, to Mrs. Margaret Latimer Fonda, New York.

Mr. F. L. Stockberger, whose resignation as purchasing agent for the receiver of the Municipal Traction Company, Cleveland, Ohio, was noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 25, 1909, has become connected with the Champion Range Company, Cleveland, Ohio.

Mr. F. E. Reidhead has retired as manager of the Paducah (Ky.) Traction Company to return to the home office of the Stone & Webster Management Association, Boston, Mass. He has succeeded as manager of the Paducah Traction Company by Mr. H. B. Sewall.

Mr. George R. Williams, trainmaster of the Eastern Pennsylvania Railways, Pottsville, Pa., has been appointed division superintendent of the company with offices in Lansford, to succeed Mr. J. C. Bell, who has been appointed superintendent of railways of the company.

Mr. Robert E. Ligon, who for a year and a half has been managing receiver of the Anderson (S. C.) Traction Company, retired from the company on Dec. 15, 1909, on which date the receivership was terminated. Mr. Ligon will devote himself to his manufacturing interests.

Mr. J. C. Bell, division superintendent of the Eastern Pennsylvania Railways, Pottsville, Pa., has been appointed superintendent of railways of the company, with offices in Palo Alto, in charge of the transportation and roadway departments, to succeed Mr. Clinton E. Palmer, whose resignation to become general superintendent of the Chicago, Lake Shore & South Bend Railway, Michigan City, Ind., was noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 25, 1909.

Mr. Henry Branson has been appointed to succeed Mr. Fred H. Lincoln as assistant general manager of the Philadelphia (Pa.) Rapid Transit Company, with the title of superintendent of rolling stock and equipment. For the last four years Mr. Branson has been in charge of the shops of the company at Fifth and Sixth Streets, Philadelphia. He was a car-house foreman of the company for six years. His total service with the company covers a period of 16 years.

Mr. Charles B. Wells, assistant superintendent of the Denver (Col.) City Tramway, has been appointed superintendent of transportation of the company to succeed S. W. Cantril, deceased. Mr. Wells has been a resident of Denver for 22 years. He entered the employ of the Denver City Tramway as stenographer and clerk under Mr. C. K. Durbin. Subsequently he was appointed chief clerk. Later he was advanced to the position of assistant superintendent of the company.

Mr. L. E. Holderman has resigned the position of assistant general manager of the Terre Haute division, Terre Haute, Indianapolis & Eastern Traction Company, and has been appointed general manager of the Central States Tie & Gravel Company of Terre Haute. Previous to his service of two and a half years with the Terre Haute railway and lighting property Mr. Holderman was employed in various capacities on the property of the Eastern Wisconsin Railway & Light Company at Fond du Lac, Wis. At different times his duties included the superintendency of track, overhead and the light and power departments.

Mr. Arthur W. Dean, State engineer of New Hampshire since 1904, and formerly engineer of the New Hampshire Traction Company, which company is the predecessor of

the New Hampshire Electric Railways, Haverhill, Mass., has been appointed secretary of the Massachusetts Highway Commission, succeeding Mr. Austin B. Fletcher, resigned. Mr. Dean was born in Taunton, Mass., and was graduated from the Massachusetts Institute of Technology in 1892. He was city engineer of Nashua, and was connected with the New Hampshire Traction Company from 1902 to 1904, assisting in the construction of 130 miles of electric railway.

Mr. J. H. Hamilton has resigned as superintendent of the Templeton Street Railway, East Templeton, Mass. Mr. Hamilton entered railway work as a car inspector with the Taunton (Mass.) Street Railway in 1899. When the Old Colony Street Railway was formed in 1901, Mr. Hamilton was transferred to Brockton as foreman of the operating car house and of air brakes. He resigned from the Old Colony Street Railway to become master mechanic of the Claremont Railway & Lighting Company, Claremont, N. H., in the employ of which company he continued from June 1, 1903, until May 1, 1904, when he accepted the position of superintendent of the Templeton Street Railway.

Mr. J. M. Goodwin, whose appointment as superintendent of the Sherbrooke (Que.) Street Railway to succeed Mr. P. J. Slattery, resigned, as announced in the *ELECTRIC RAILWAY JOURNAL* of Dec. 4, 1909, was graduated from the Bliss Electrical School, Washington, D. C., in the summer of 1906. For the first six months after being graduated he was connected with the Western Electric Company as an apprentice in the company's factory in New York. From Dec. 1, 1906, until May 1, 1909, he was connected with the Canadian Westinghouse Company, Hamilton, Ont., pursuing the company's engineering apprenticeship course. For the last six months Mr. Goodwin has been engaged in the electrical contracting business in Chicago in his own interest.

Mr. H. B. Sewall has assumed the duties of manager of the Paducah (Ky.) Traction Company and the Paducah Light & Power Company as the successor to Mr. F. E. Reidhead, who has returned to the home office of the Stone & Webster Management Association, Boston, Mass. Mr. Sewall was previously connected with the Minneapolis General Electric Company, the employ of which he entered in June, 1906. Since October, 1908, he has acted as local treasurer of the company in Minneapolis. Previous to becoming connected with the Minneapolis General Electric Company, Mr. Sewall was with the Dallas (Tex.) Electric Corporation. He also acted for three years as assistant treasurer of the Lowell (Mass.) Electric Light Corporation.

Mr. A. C. Kennedy, whose appointment as purchasing agent for the receivers of the Municipal Traction Company, Cleveland, Ohio, was announced in the *ELECTRIC RAILWAY JOURNAL* of Dec. 25, 1909, was born in Cleveland in 1880, and was educated in the public schools and at the city high school in Cleveland. Mr. Kennedy began his electric railway career in the office of Mr. Charles W. Wason, purchasing agent of the Cleveland, Painesville & Eastern Railway, in 1898, and entered the office of purchasing agent of the Cleveland Electric Railway with Mr. Wason in 1899. Mr. George A. Stanley subsequently became purchasing agent of the company, and Mr. Kennedy remained with the company as chief clerk to Mr. Stanley until the Municipal Traction Company took over the property.

Mr. E. F. Schneider, secretary of the Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio, has been appointed general manager of the company to succeed Mr. C. N. Wilcox, who resigned in August, 1909, to become general manager of the Chicago, Lake Shore & South Bend Railway, Michigan City, Ind. Mr. Schneider has been interested in interurban electric railways since 1894, when the Cleveland & Berea Railway was constructed. He has been connected with the Cleveland, Southwestern & Columbus Railway for 11 years and has been secretary of the company for the last 10 years. In addition, he has acted as purchasing agent and head of the claim department of the company. Mr. Schneider began his business career as commercial representative for a drug house in Cleveland.

OBITUARY

C. E. Somers, master mechanic of the Fairmont & Clarksburg Traction Company, Fairmont, W. Va., met with an accident recently in performing his duties for the company which resulted in his death on Dec. 22, 1909.

Construction News

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

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

RECENT INCORPORATIONS

***Idaho Falls (Idaho) Electric Railroad.**—Incorporated to build a 34-mile electric railway in the vicinity of Idaho Falls. E. Beugler, New York, N. Y., is closing the final details for the right-of-way and franchises. Capital stock, \$1,000,000. Officers: J. L. Miller, Idaho Falls, president; A. V. Scott, Idaho Falls, secretary. Among those interested are H. S. Sewell, New York, N. Y.; F. S. Cleveland and Ray K. Kramer, Pittsburgh, Pa.

Kokomo Western Traction Company, Kokomo, Ind.—Incorporated in Indiana to build an electric railway between Kokomo and Young America. Headquarters, Kokomo. Capital stock, \$10,000. Directors: C. C. McFann, Anderson Johnson, George W. Charles, M. R. Doyson, all of Kokomo, and O. C. Gard, Young America. [E. R. J., Aug. 21, '09.]

***Toledo, Napoleon & Lima Railway, Toledo, Ohio.**—Incorporated in Ohio for the purpose of constructing an electric railway from Toledo to Lima, passing through Lucas, Henry, Defiance, Putnam and Allen Counties. Capital stock, \$100,000. Headquarters, Toledo. Incorporators: M. M. Dailey, W. D. Bishoff, M. E. Donaldson, N. W. Gillette and T. E. Gillette.

Union Traction & Terminal Company, Marshfield, Ore.—Incorporated in Oregon to build an electric railway in North Bend and Marshfield, also connecting the two cities. Principal office, Marshfield. Capital stock, \$100,000. Incorporators: J. M. Blake, G. W. Kaufman and R. O. Graves. [E. R. J., Dec. 18, '09.]

Grays Harbor Interurban Company, Hoquiam, Wash.—Incorporated for the purpose of building an electric railway from Hoquiam to Tacoma, via Olympia. Capital stock, \$500,000. Incorporators: R. F. Lytle, A. L. Paine and E. O. McGlauffin, all of Hoquiam; W. H. Abel and Eldredge Wheeler, Montesano; A. M. Abel and P. S. Locke, Aberdeen. [E. R. J., Dec. 25, '09.]

FRANCHISES

Los Angeles, Cal.—The Los Angeles Railway has purchased for \$100 a franchise from the City Council for new lines on Alpine Street, from Main Street to Buena Vista Street, and on Ann Street from Main Street to San Fernando Street.

Oakland, Cal.—Application has been made to the City Council by the Peninsular Railroad for a franchise for a street railway starting at Fourteenth Street and Franklin Street, to the Sixteenth Street depot, forming a loop at the depot to Eighteenth Street, back on Eighteenth Street to Brush Street, up Brush to Twenty-first Street and thence back to Fourteenth Street and Franklin Street.

Ontario, Cal.—The City Council has sold to W. G. Kerhoff, representing the Pacific Electric Railway, a franchise for an electric railway to enter the northern part of Ontario.

***San Bernardino, Cal.**—W. W. Poole has petitioned the Board of Supervisors for a franchise for an electric railway from the Riverside-San Bernardino County line toward Rialto.

Athens, Ga.—The City Council has granted a franchise to the Athens Electric Railway, covering the extension of a number of lines in Athens. Under the terms of the franchise, the company is required to pay over to the city a percentage of the gross receipts, this percentage increasing by periods of ten and twenty years.

Maple Park, Ill.—The Town Council has granted a franchise to the Chicago, Aurora & De Kalb Railroad for an electric railway through Maple Park. The company proposes to build an electric railway from Aurora to DeKalb. J. H. Bliss, Sugar Grove, is interested. [E. R. J., July 3, '09.]

Springfield, Ill.—The Sangamon County Board of Supervisors has granted a franchise to the Springfield & Jacksonville Interurban Railway to construct an interurban railway along the public highway between Springfield and the

western boundary of the county. The company plans to build an electric railway from Springfield to Jacksonville, via Berlin, a distance of 33 miles. John Melick, Springfield, chief engineer. [E. R. J., May 29, '09.]

***Brandon, Man.**—E. J. Gifford and H. J. Skynner have applied to the City Council for a franchise to build a street railway and power plant in Brandon.

Clovis, New Mex.—The City Council has granted to E. J. Howard, J. D. Hammett and A. R. Hammett, Moberly, Mo., capitalists, a franchise for a street railway in Clovis. [E. R. J., July 17, '09.]

New York, N. Y.—The Board of Estimate and Apportionment has granted a franchise to the South Shore Traction Company to cross the Queensboro Bridge to the Manhattan terminus, and in Queens continuing by various streets to Jamaica.

Zanesville, Ohio.—The County Commissioners have granted a 25-year franchise to the Zanesville & Meigs Valley Traction for an electric railway through Morgan County. The company proposes to build a line from Zanesville to Beverly, via McConnellsville. H. D. Blodgett, Zanesville, general manager. [E. R. J., Sept. 4, '09.]

***Brantford, Ont.**—T. R. Varding, Buffalo, N. Y., has applied to the Municipal Council for a franchise for an electric railway within the township.

***Grants Pass, Ore.**—The City Council has granted to J. R. Allen a 50-year franchise for an electric railway in Grants Pass. The franchise stipulates that the company begin work within a year and pave and repair such streets as may be used within the track and 18 in. abutting thereon.

Sayre, Pa.—The Waverly, Sayre & Athens Traction Company, Waverly, N. Y., has applied to the Borough Council for an extension of its franchise to lay tracks on Desmond Street and Chemung Street.

Montreal, Que.—The Montreal Street Railway has been given a franchise to construct and operate street railways upon certain streets in St. Louis, adjoining Montreal. The by-law granting the franchise was adopted at a meeting of the Council on Dec. 21.

Houston, Tex.—The County Commissioners of Harris County have approved a contract granting the Galveston-Houston Electric Railway the privilege of crossing all roads in the county. [E. R. J., April 24, '09.]

Centralia, Wash.—The Twin City Light & Traction Company, Chehalis, which proposes to build an electric railway between Centralia and Chehalis, has applied to the City Council for a six-months' extension of its franchise in which to complete its railway. [E. R. J., Oct. 30, '09.]

TRACK AND ROADWAY

Birmingham & Edgewood Electric Railway, Birmingham, Ala.—This company advises that it expects to complete its 4-mile line between Birmingham and Edgewood during 1910. [E. R. J., Nov. 6, '09.]

British Columbia Electric Railway, Ltd., Vancouver, B. C.—This company will build 2 miles of new track within the city limits during 1910. W. H. Hazlitt, purchasing agent.

United Railroads, San Francisco, Cal.—This company advises that it plans to add 7 miles of new track to its lines in 1910. Thomas Finigan, purchasing agent.

Washington, Spa Springs & Gretta Railroad, Washington, D. C.—This company has begun grading on the Bladensburg Road for its electric railway which is to extend a distance of about 7 miles from Branchville, Md., to the intersection of Fifteenth Street and H Street, Northeast, in Washington, where its passengers will be able to take the H Street line into the heart of the city. The Washington terminus will be in front of the present Washington terminus of the Washington, Baltimore & Annapolis Electric Railway. The Cranford Paving Company, Washington, has been awarded a subcontract for the construction of the first section of the line. [E. R. J., Dec. 4, '09.]

***Marion, Ill.**—It is stated John Murphy, Eldorado, Ill., is promoting a company to build an electric railway from Marion to Mount Vernon, Ind., thus connecting the lines between Evansville and St. Louis.

Murphysboro Electric Railway, Light, Heat & Power Company, Murphysboro, Ill.—During 1910 this company will

build 7 miles of new track between Murphysboro and Carbondale. A. B. Newton, general manager.

Kokomo Western Traction Company, Kokomo, Ind.—A petition has been filed by this company with the Howard County Commissioners asking that a special election be called in Center Township for the purpose of voting a subsidy of \$35,000 in aid of the proposed electric railway to connect Kokomo and Young America, 20 miles. This action was taken by Kokomo business men who desire that the line shall be built. The company has just been incorporated with a capital stock of \$10,000. C. C. McFann, president. [E. R. J., Aug. 21, '09.]

Ottumwa, Ia.—T. D. Foster, president of the Ottumwa Interurban Construction Company, Ottumwa, writes that matters have not advanced beyond the preliminary stage in the building of the proposed electric railway between Ottumwa and Oskaloosa. The promoters are working on the right of way, and no definite route has as yet been decided upon. [E. R. J., Dec. 4, '09.]

***Central Kansas Interurban Railway, Abilene, Kan.**—This company has been organized in Abilene to build a railway from Newton through Canton, Spring Valley, Roxbury and Gypsum to the south side of the river, with a branch to Abilene and one to Salina. Gasoline motor cars will be operated over the road. C. B. Kirkland, Salina, treasurer. Among those interested are J. C. Nicholson, Newton, and J. E. Brewer, Abilene.

Connecticut Valley Street Railway, Greenfield, Mass.—This company has petitioned the Legislature for authority to locate a street railway in the Mount Sugar Loaf reservation in South Deerfield. It is stated that the company plans to construct an electric railway to the summit of Mount Sugar Loaf.

***Chapala Hydro Electric & Irrigation Company, Guadalajara, Mex.**—This company is preparing plans for the construction of an electric railway from Guadalajara to Lake Chapala, a distance of 23 miles. The maximum grade will not exceed 2 per cent. According to present plans, the company will have its terminals at San Pedro, Guadalajara, where connection will be made with the street railway of that city. E. Pinson, general manager. L. Matty has charge of the preliminary work.

Twin City General Electric Company, Ironwood, Mich.—During 1910 this company expects to complete a 6-mile extension between Ironwood and Bessemer. F. H. Pearce, purchasing agent.

Twin City & Lake Superior Railway, Minneapolis, Minn.—It is stated that this company will soon issue \$2,500,000 in bonds for the completion of its proposed 130-mile electric railway which is to extend from Minneapolis to Duluth and Superior. About 60 miles of the route have been graded. L. N. Loomis, Minneapolis, president.

Albany, N. Y.—The United Traction Company has been granted an extension of one year, until Jan. 1, 1911, to complete the construction of its street railway across Arbor Hill from Clinton Avenue and Ten Broeck Street.

Hornell-Bath Interurban Railway, Hornell, N. Y.—The Public Service Commission of the Second District has granted a certificate of public convenience and necessity to this company, which proposes to build an electric street railway between Hornell and Bath, passing through Howard, Fremont and Avoca, a distance of 24 miles. [E. R. J., Dec. 4, '09.]

Interborough Rapid Transit Company, New York, N. Y.—This company has contracted with the American Bridge Company for 500 tons of structural steel for elevated and station work.

Cincinnati (Ohio) Traction Company.—This company will add 2 miles of new track to its line during 1910. C. Burckmyer, purchasing agent.

***Salem, Ohio.**—Press reports state that Peter McCave, Greenford, is interested in a proposition to build an electric railway from Salem to Youngstown by way of New Albany, Greenford, Calla, Canfield and Lanterman's Falls. It is the intention to build a branch from near Gettysburg south to Washingtonville, Leetonia, Franklin Square and Shelton's Grove to Lisbon. The project also includes a belt line for Salem.

Zanesville & Meigs Valley Traction Company, Zanesville, Ohio.—This company announces that it will place the contract for the construction of its projected railway from Zanesville to Beverly on May 1, 1910, and work will be commenced on the new line within 15 days thereafter. The preliminary survey has been completed. In addition to the route as at first proposed, the company will build an 8-mile branch to McConnelville. The main line will begin at Eighth and Marietta Streets in Zanesville and run direct to Beverly, a distance of 41 miles. The principal towns on the run are: Duncan Falls, Museville, Rowland, Cloud, Unionville and Mill Grove. The maximum grade is but 1½ per cent, while the maximum curve is 7 deg. The company proposes to build a 24-mile extension from Beverly to Parkersburg, but this has not yet been surveyed and will be a matter for later consideration. H. D. Blodgett, general manager. [E. R. J., Sept. 4, '09.]

Lawton & Fort Sill Electric Railway, Lawton, Okla.—It is stated that this company has decided to issue bonds to the amount of \$150,000 in order to meet the expenditures, both in the construction of the proposed electric railway through Lawton and connecting Lawton with Fort Sill and Medicine Park. [E. R. J., Dec. 11, '09.]

Oklahoma, Kansas & Missouri Interurban Railway, Miami, Okla.—This company contemplates the construction of 105 miles of new line during 1910 to extend from Joplin to Bartlesville. The railway will also touch Hattenville, Miami, Spring City, Peoria, Grapaw, Blue Jacket and Welsch. Franklin M. Smith, president. [E. R. J., April 17, '09.]

London & Lake Erie Railway & Transportation Company, London, Ont.—It is announced that this company, which is the successor to the Southwestern Traction Company, will expend \$150,000 for improvements to the system, the nature of which has not been disclosed. [E. R. J., Nov. 13, '09.]

***Arnprior & Pontiac Electric Railway, Ottawa, Ont.**—This company has been organized for the purpose of building an electric railway from Campbells Bay, Que., via Chats Falls and Graham's Bay, near Ottawa, Ont., to High Falls, 75 miles. Arthur H. Brice, Ottawa, chief engineer.

Port Arthur & Fort William Electric Railway, Port Arthur, Ont.—An extension 4 miles in length will be built during 1910 by this company. N. C. Pilcher, purchasing agent.

***Waterloo, Ont.**—J. S. Clarke recently submitted a proposal to the County Council of Waterloo for the building of an electric railway from Port Dover to Brantford, passing through Ayr and Roseville to Berlin and Waterloo, with branches to other municipalities in the county.

***Johnstown & Greensburg Electric Railway, Latrobe, Pa.**—This company, which proposes to build a 45-mile electric railway between Johnstown and Greensburg, announces that it has secured nearly all the rights of way over the section of the route between Greensburg and Derry and more than half obtained between Derry and Johnstown. It is stated that the Fetterman Engineering Company, Johnstown, will begin work shortly on the location of the route through Sang Hollow, from Morrellville to Seward. The promoters of the new line are said to be identified with the Indiana County Railways. It is to be a high-speed line, and is to carry both passengers and freight. The line will serve a population of about 131,000. The grades will not exceed 4 per cent and the curvatures 5 deg. Officers: Warner Utts, Derry, president; W. E. Hildebrand, Seward, vice-president; R. G. Lohr, Latrobe, secretary; H. H. Smith, Latrobe, treasurer.

Slippery Rock & Grove City Railway, Slippery Rock, Pa.—This company announces that it will receive bids on Jan. 10 for the construction of its proposed 9-mile street railway between Slippery Rock and Grove City. Gasoline motor cars will be operated. [E. R. J., Dec. 4, '09.]

Chambersburg, Greencastle & Waynesboro Electric Railway, Waynesboro, Pa.—The directors of this company have decided to issue bonds to the amount of \$400,000, and among the improvements projected is an extension of about 4 miles from Pen-Mar via Highfield to Blue Ridge Summit, and possibly to Monterey Springs.

Nashville & Adairville Railway, Nashville, Tenn.—S. C. Robb, Nashville, one of the incorporators of this company, has announced that if the people along the line of the proposed railway would subscribe stock to the amount of \$100,000 the line would be immediately located and contracts for its construction awarded. It will be standard gage, with 70-lb. steel rails, the ultimate purpose being to convert it into a steam road and extend it from Adairville, by way of Morgantown, to Leitchfield, thus by a connection with the Illinois Central Railroad making a second line from Nashville to Louisville. The line from Nashville to Adairville will be by way of Goodlettsville, White House, Cross Plains and Orlinda. [E. R. J., Dec. 8, '09.]

City & Elm Grove Railroad, Wheeling, W. Va.—This company expects to build 1½ miles of new track, using 7-in. 70-lb. and A. S. C. E. 85-lb. T-rails. Contracts for this work will be placed during the next four weeks. J. W. Smith, general manager.

Seattle-Everett Interurban Railway, Seattle, Wash.—During 1910 about 4 miles of new track will be constructed by this company between Seattle and Everett. George Newell, purchasing agent.

SHOPS AND BUILDINGS

Nelson (B. C.) Electric Tramway.—This company will erect a new car house at Nelson to be 28 ft. x 80 ft. in size. Alex. Carrie, architect.

Pacific Electric Railway, Los Angeles, Cal.—Plans are being prepared by this company for the construction of a reinforced concrete station in Long Beach to cost \$135,000.

Augusta-Aiken Railway & Electric Company, Augusta, Ga.—This company has purchased a site, 175 ft. x 90 ft., on which to erect freight and passenger terminals. The building will be two stories high and will be 165 ft. x 90 ft. The structure will be built of brick and will cost \$20,000.

Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind.—This company is considering plans for the construction of a terminal station to cost \$250,000 on the corner of Eighth Street and Cherry Street, Terre Haute.

Corsicana (Tex.) Traction Company.—This company is building a reinforced concrete car house in Corsicana. J. W. Carpenter, president.

Port Arthur (Tex.) Traction Company.—This company will begin work at once on a new car house to be located at Houston Avenue and Seventh Street, Port Arthur. The building will be built of brick, with a concrete roof, and will be 80 ft. x 120 ft. in size. It will have a storage capacity of 12 cars and will contain a repair shop, the general offices of the company, together with a room for its employees, which will be fitted with all conveniences. The contract has been let.

POWER HOUSES AND SUBSTATIONS

Nelson (B. C.) Electric Tramway.—This company will erect a new substation in Nelson.

Denver City Tramway, Denver, Col.—This company has begun work on the extension to its Platte Street power plant. The addition will be 140 ft. x 110 ft. in size. When completed the whole building will be 429 ft. x 100 ft. The boiler room will contain six 750-hp boilers.

Cedar Rapids & Marion City Railway, Cedar Rapids, Ia.—This company has recently placed a contract with the Allis-Chalmers Company for a 22-46-48 cross-compound engine and 800-kw railway generator, also with the Erie City Iron Works for a 500-hp water-tube boiler.

People's Railway, Dayton, Ohio.—It is stated that this company is considering plans for the erection of a power plant in Dayton, 250 ft. x 180 ft., to cost \$125,000.

Winchester & Washington Railway, Winchester, Va.—This company is said to have engaged P. O. Keilholtz, Baltimore, Md., to prepare plans and specifications and superintend the construction of a steam power plant at Millville as auxiliary to its water power plant. The company proposes to install a 1500-kw plant, 2200 volts, three phase, 60 cycles, for electric light and power purposes; also for distribution through Jefferson and Berkeley Counties, West Virginia, and through Clarke and Frederick Counties of Virginia. It is stated that contracts will be awarded on Jan. 15. The new plant is estimated to cost \$100,000.

Manufactures & Supplies

ROLLING STOCK

Capital Beach & Milford Railroad, Lincoln, Neb., will buy 10 double-truck summer cars for park service.

Montreal (Que.) Street Railway will have 25 all-steel cars built by the Ottawa Car Company delivered at once.

Belton & Temple Traction Company, Temple, Tex., will place an order for one semi-convertible passenger car during 1910.

Morgantown & Dunkard Valley Railroad, Morgantown, W. Va., contemplates ordering four passenger and two freight cars during 1910.

Connecticut Valley Street Railway, Greenfield, Mass., will order in 1910 one double-truck flat car, 40 ft. long, with vestibuled ends, to be equipped with four motors.

Kansas City-Western Railway, Leavenworth, Kan., will buy two large interurban cars early in 1910 to seat 60 people. The cars are to be equipped with G.E. multiple type in control and G.E.-73 motors.

New York & Long Island Traction Company, Hempstead, N. Y., has bought 10 sets quadruple motor equipment from Westinghouse Electric & Manufacturing Company and 10 sets of trucks from The J. G. Brill Company.

Wabash & Northern Indiana Traction Company, Warsaw, Ind., mentioned in the ELECTRIC RAILWAY JOURNAL of Nov. 20, 1909, as having ordered seven cars from Jewett Car Company, has drawn the following specifications for these combination passenger, smoking and baggage cars:

Seating capacity.....	60	Car trimmings.....	bronze
Weight.....	30,000 lb.	Curtain fix....	Curtain S. Co.
Wheel base.....	6 ft. 6 in.	Curtain material...	Pantasote
Length of body....	47 ft. 7 in.	Fenders	Pilot
Length over vesti-		Gongs	12 in.
bule	52 ft. 5 in.	Heaters.....	Peter Smith
Length over all....	53 ft. 9 in.	Headlights....	G.E. Form B
Width inside.....	8 ft. 6 in.	Roofs.....	steam type
Width over all....	9 ft. 3 in.	Sanders	Nichols-Intern
Height inside.....	8 ft. 2 in.	Seats.....	Hale & Kilburn
Height sill to trolley		Step treads.....	Am. Safety
base	10 ft.	Trolley retrievers,	
Height rail to sills..	3 ft. 4 in.	Knutson No. 2	
Body	wood	Trucks.....	Am. Loco. MCB
Underframe.....	wood and steel	Varnish	Hildreth
Air brakes.....	West.	Vestibule.....	rear only
Brakes	Peacock	Fire extinguisher...	Eastman

TRADE NOTES

Hale & Kilburn Manufacturing Company, Philadelphia, Pa., will move its New York office from 33 Union Square to 39 Union Square on Feb. 1, 1910.

G. E. Watts, Atlanta, Ga., well known among electric railway men throughout the South, has been appointed southern representative of the R. D. Nuttall Company, Pittsburgh, Pa.

Elliott Brothers, Lewisham, London, S. E., England., have issued a pamphlet describing the Wimpenis accelerometer and grade measurer. This instrument measures acceleration, retardation as in braking, retardation due to frictional resistance when coasting, braking efficiency, tractive effort at different speeds, grades, etc.

Central States Tie & Gravel Company, Terre Haute, Ind., has been incorporated to engage in business of furnishing ties and gravel for railway track construction. The officers are: President, F. C. Meredith; treasurer, W. H. Harris; secretary and manager, L. E. Holderman. The active conduct of the business will be in the hands of Mr. Holderman, who has had a wide experience in electric railway work.

Jewett Car Company, Newark, Ohio, advises that the fire which occurred at its plant on Dec. 27, 1909, did not prove as serious as first reported in the newspapers. One mill and a lumber shed were destroyed but the company's manufacturing work has not been delayed in the least. In fact, the capacity of the shops will be doubled in a few weeks when the company receives some new motor-driven machines.

A. Origet & Company, 27-29 West Twenty-third Street, New York, N. Y., desire export prices on the following classes of steel rails delivered F. O. B. Havre or Boulogne,

France: T-rails weighing 12, 15, 18, 20 kg per meter (24, 30, 36, 40 lb. per yd.); grooved or girder rails weighing 38, 40, 45 kg per meter (76, 80, 90 lb. per yd.). The bids should include prices for all metal appurtenances such as spikes, bolts and fish-plates.

Frederic H. Keyes, Boston, Mass., formerly general manager of the Robb-Mumford Boiler Company, has associated himself with Messrs. Timothy W. Sprague, Henry Docker Jackson, and others, to carry on a general consulting engineering business under the name of Timothy W. Sprague, Frederic H. Keys, Henry D. Jackson & Associates, 88 Broad Street, Boston, Mass. The new firm proposes to make complete reports, investigations, and furnish designs and supervision for power plants for lighting, railway or industrial purposes; also mining reports, investigations and power plants.

Willans & Robinson, Rugby, Eng., have been awarded the contract for the turbines for the extension of the Sydney (N. S. W.) Tramway, and Dick, Kerr & Company have been awarded the contract for the alternators. Two units of 4000 kw each, running at 750 r.p.m., are to be installed. The prices originally submitted included a 400-kw unit in addition to the two 4000-kw units. They follow: British Thomson-Houston turbines, \$161,770; British Westinghouse turbines, \$170,035; Oerlikon turbines, \$179,435; Willans & Robinson turbines, \$203,450; Escher-Wyss turbines, \$210,875; Willans & Robinson turbines, Dick, Kerr alternators, accepted at \$222,735.

Eppinger & Russell Company, New York, N. Y., in addition to its creosoting works now in operation at Long Island City, N. Y., has completed its new plant in Jacksonville, Fla. The new works are said to be the largest creosoting plant on the Atlantic Coast and are fully equipped with the most modern and best appliances and machinery, thus enabling work to be done at a minimum cost. In addition the plant is so located that rail or vessel shipments can be made to all points, and material can be obtained at the lowest figures. The company is prepared to accept orders for creosote paving blocks, piling, lumber and ties. Its experience in creosoting covers a period of 32 years.

P. O. Keilholtz, who has been consulting engineer for the railway and lighting properties of Baltimore, Md., for more than 20 years, has opened an office as consulting engineer in the Continental Building of that city. Mr. Keilholtz has been closely identified with most of the important electrical work planned and constructed in Baltimore during the last 20 years. He is a graduate of the Engineering Corps of the United States Naval Academy, and after resigning from the navy he took a post-graduate course at the John Hopkins University. Besides having an intimate knowledge of the construction of steam and hydraulic apparatus, he is eminently qualified to take the products of different manufacturers and combine them into a complete and efficient operating plant. Mr. Keilholtz has just been commissioned to prepare the plans and supervise the construction of a \$100,000 power plant at Milville, Va., for the Winchester & Washington City Railway.

Ohio Brass Company, Mansfield, Ohio, has appointed the Holabird-Reynolds Company, San Francisco; Holabird-Reynolds Electric Company, Los Angeles, and Holabird Electric Company, Seattle, exclusive sales agents for its O-B Hi-Tension porcelain insulators in the States of California, Oregon and Washington. Pierson, Roeding & Company, with offices at San Francisco, Los Angeles and Seattle, will continue to be the Ohio Brass Company's exclusive sales agents for overhead material, rail bonds, car equipment specialties and catenary material, including such special porcelain insulators as are used in catenary construction. The Hendrie & Bolthoff Manufacturing & Supply Company, Denver, Col., has been appointed as special sales agents for the mining trade in Colorado, Wyoming, Utah, Arizona and New Mexico, as well as from certain railway properties located in the mining districts of this territory. The business of railway and mining companies located at Salt Lake City, Denver, Cheyenne, Colorado Springs, Pueblo and Telluride, will be, as heretofore, handled by its regular salesman, F. V. Cook, who will also give special attention to the sale of Hi-Tension insulators in all five of the States mentioned. J. C. Barr, 84 State Street, Boston, Mass., has been appointed Boston sales agent

for the Ohio Brass Company and will solicit business in all of the New England States with the exception of Connecticut. R. G. Campbell, of the New York office, will continue to visit the trade in Connecticut in addition to his other territory.

Railway Business Association, New York, N. Y., announces the appointment by George A. Post, president of the association, of the following executive members, all of whom have accepted: E. L. Adreon, vice-president, American Brake Company, St. Louis, Mo.; W. E. Clow, president, James B. Clow & Son, Chicago, Ill.; J. S. Coffin, president, Franklin Railway Supply Company, New York City; Oliver Crosby, president, American Hoist & Derrick Company, St. Paul, Minn.; John F. Dickson, president, Dickson Car Wheel Company, Houston, Tex.; W. C. Dodd, president, National Lock Washer Company, Newark, N. J.; Henry Elliot, president, Elliot Frog & Switch Company, East St. Louis, Ill.; Alba B. Johnson, vice-president and treasurer, Baldwin Locomotive Works, Philadelphia, Pa.; A. M. Kittredge, president, Barney & Smith Car Company, Dayton, Ohio; W. B. Leach, general manager and treasurer, Hunt-Spiller Manufacturing Corporation, Boston, Mass.; E. B. Leigh, president, Chicago Railway Equipment Company, Chicago, Ill.; W. H. Miner, president, W. H. Miner Company, Chicago, Ill.; Alfred A. Pope, president, National Malleable Castings Company, Cleveland, Ohio; Col. H. G. Prout, vice-president, Union Switch & Signal Company, Swissvale, Pa.; James Viles, treasurer, Buda Company, Chicago, Ill.; W. H. Whiteside, president, Allis-Chalmers Company, Milwaukee, Wis.; W. P. Worth, treasurer, Worth Brothers Company, Coatesville, Pa.; J. H. Schwacke, manager and secretary, William Sellers & Company, Philadelphia, Pa.

ADVERTISING LITERATURE

Wheel Truing Brake Shoe Company, Detroit, Mich., has issued a decorated folding postal, conveying the compliments of the season. There is, of course, a reminder of the efficiency of the company's brake shoes at all seasons of the year.

Western Electric Company, New York, N. Y., has published a new issue of Bulletin No. 5131, which describes in detail type IL motors and generators. A new issue of Bulletin No. 5132 has been published, describing type ELC interpole motors.

The J. G. Brill Company, Philadelphia, Pa., in *Brill's Magazine* for December, 1909, prints the twelfth of the series of articles describing the conditions which govern the type of car for city service. Portland, Ore., is the city considered. Other descriptions of special interest are one-man, pay-as-you-enter cars for Brunswick, Ga., and the tramway system of Shanghai, China.

Joseph Dixon Crucible Company, Jersey City, N. J., has published the eleventh edition of "Graphite as a Lubricant." Every two or three years the company republishes "Graphite as a Lubricant." The present edition is more compact than its predecessor, despite the fact that large type with liberal margins obtains throughout the 64 pages of the book. A copy of "Graphite as a Lubricant" will be sent free on request.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has issued the Westinghouse diary for 1910. This well-arranged book has been published annually for six years. The edition for 1910 has been enlarged, however, and the scope of its contents increased. An alphabetical index to the contents is printed on the fifth and sixth pages. The cover is of brown, flexible leather and bears the Westinghouse imprint.

Goldschmidt-Thermit Company, New York, N. Y., in the contents of *Reactions* for the fourth quarter of 1909, has included the following articles: "Thermit Repairs Sanctioned by British Corporation for the Survey and Registry of Shipping," "Tests of Thermit Welds," "Australian-Thermit Company, Ltd.," "Pulley Repaired in Wilds of North Carolina," "Chromium: Its History and Application," "Welding Special Work in Los Angeles." The text is accompanied by many excellent illustrations, one of which, a full page, shows a fly-wheel being hauled into position for welding a break in the rim. This issue of *Reactions* contains the index to Volume II.

TABLE OF MONTHLY EARNINGS.

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement, "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. *Including Taxes. †Deficit. ‡Includes Ferry earnings up to Apr. 1, 1909.

Company	Period	Gross Income	Operating Expenses	Gross Income Less Operating Expenses	Deductions From Income	Net Income	Company	Period	Gross Income	Operating Expenses	Gross Income Less Operating Expenses	Deductions From Income	Net Income
AKRON, O. Northern Ohio Tr. & Light Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	175,743 151,934 1,994,729 1,730,019	99,973 87,976 1,088,502 1,000,276	75,770 63,958 906,227 729,743	43,400 87,012 480,856 482,533	32,370 19,947 425,371 247,210	MILWAUKEE, WIS. Milwaukee Elec. Ry. & Lt. Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	383,156 341,602 3,919,653 3,589,995	188,486 160,909 1,914,554 1,813,479	194,670 180,693 2,005,098 1,776,515	112,913 101,056 1,178,518 1,095,286	81,75 79,63 826,58 681,23
BELLINGHAM, WASH. Whatcom Co. Ry. & Lt. Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	35,672 31,758 401,186 358,466	19,608 17,766 225,640 205,398	16,064 13,991 175,546 153,067	8,469 9,026 100,468 97,139	7,595 4,965 75,078 55,928	Milwaukee Lt., Ht. & Trac. Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	118,001 108,378 1,353,070 1,289,118	32,607 29,629 357,509 340,647	85,394 78,750 995,501 948,471	65,476 59,057 711,712 656,210	19,91 19,69 283,78 292,26
BINGHAMTON, N. Y. Binghamton St. Ry.	1m., Sept. '09 1 " " '08 9 " " '09 9 " " '08	29,531 27,662 260,252 238,796	18,094 15,392 148,101 140,394	11,437 12,270 112,151 98,402	9,037 9,024 81,466 74,827	2,400 3,246 30,685 23,575	MINNEAPOLIS, MINN. Twin City Rapid Transit Co.	1m., Oct. '09 1 " " '08 10 " " '09 10 " " '08	596,963 554,166 5,773,383 5,319,968	277,175 265,893 2,709,742 2,637,918	319,788 288,273 3,063,640 2,682,050	140,251 138,667 1,388,761 1,283,789	179,53 149,60 1,674,87 1,398,26
CHARLESTON, S. C. Charleston Con. Ry., Gas & Elcc. Co.	1m., Nov. '09 1 " " '08 9 " " '09 9 " " '08	65,368 63,912 580,557 569,663	40,807 40,559 370,715 368,223	24,561 23,353 209,842 201,440	13,917 13,817 125,250 124,175	10,645 9,536 84,592 77,265	MONTREAL, CAN. Montreal St. Ry.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	334,871 301,578 688,878 630,186	200,138 180,682 374,873 346,106	134,734 120,896 314,006 284,080	30,785 29,662 61,864 59,842	103,94 91,23 252,14 224,23
CHICAGO, ILL. Aurora, Elgin & Chicago Railroad.	1m., Oct. '09 1 " " '08 4 " " '09 4 " " '08	137,563 121,523 618,016 561,555	73,772 67,047 302,383 281,229	63,791 54,484 315,433 280,326	29,413 27,731 117,077 110,758	34,377 3,246 198,357 169,568	NASHVILLE, TENN. Nashville Railway & Light Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	149,426 138,598 1,565,101 1,447,946	83,181 79,271 919,503 865,550	66,245 59,327 645,598 582,396	33,023 32,507 361,329 352,127	33,26 26,83 284,21 230,21
Chicago Railways.	1m., Oct. '09 11 " " '08 10 " " '09 10 " " '08	1,109,640 968,543 10,244,248 9,003,164	776,748 677,979 6,755,675	332,892 290,564 3,488,573 .....	..... ..... ..... .....	..... ..... ..... .....	NORFOLK, VA. Norfolk & Ports- mouth Trac. Co.	1m., Oct. '09 1 " " '08 10 " " '09 10 " " '08	156,540 156,796 1,592,739 1,552,029	87,974 88,317 921,337 923,587	68,566 68,479 671,402 628,442	62,416 65,376 645,690 657,959	6,11 3,11 25,75 129,57
CLEVELAND, O. Cleveland, Paines- ville & Eastern R.R.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	25,900 22,525 297,573 272,976	15,020 13,483 151,480 155,787	10,880 9,042 146,093 117,189	8,457 8,088 92,855 88,459	2,423 954 53,237 28,730	OKLAHOMA, OKLA. Oklahoma City Ry.	1m., Oct. '09 1 " " '08	49,683 31,199	27,363 19,166	22,320 12,033	..........	..........
Lake Shore El. Ry.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	90,705 80,476 1,020,022 955,364	48,984 47,440 538,429 534,355	41,721 33,036 481,592 421,009	35,393 34,292 379,939 356,252	6,325 11,209 101,653 64,757	PADUCAH, KY. Paducah Traction & Light Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	18,924 16,706 225,608 228,513	11,764 10,269 132,238 136,200	7,160 6,437 93,370 92,313	6,625 6,690 81,726 83,182	512 1,66 11,66 9,11
DALLAS, TEX. Dallas Electric Cor- poration.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	147,838 134,140 1,291,164 1,160,604	80,397 63,912 809,900 778,414	67,441 60,373 481,264 382,189	27,471 27,554 338,780 352,151	39,970 32,819 142,484 30,039	PENSACOLA, FLA. Pensacola Electric Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	21,027 18,346 242,539 209,587	12,379 10,432 139,127 148,853	8,648 7,913 103,412 60,734	4,474 4,262 52,077 51,453	4,11 3,66 51,33 9,22
DETROIT, MICH. Detroit United Rail- way.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	676,482 570,711 7,351,390 6,508,894	440,750 *374,685 4,614,783 *4,182,788	235,732 196,026 2,736,607 2,326,106	*157,919 132,819 *1,723,399 1,485,058	88,421 69,704 1,145,342 898,966	PHILADELPHIA, PA. American Ry. Co.	1m., Nov. '09 1 " " '08 5 " " '09 5 " " '08	235,700 219,511 1,311,175 1,235,732	....................	....................	....................	....................
DULUTH, MINN. Duluth-Superior Trac. Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	85,509 76,835 896,346 810,836	47,403 47,999 525,383 494,510	38,106 28,836 370,963 316,326	20,757 16,701 209,603 202,368	17,349 12,135 161,360 113,958	PLYMOUTH, MASS. Brockton & Plym- outh St. Ry. Co.	1m., Oct. '09 1 " " '08 10 " " '09 10 " " '08	10,253 9,767 114,156 105,973	7,592 6,216 79,648 75,777	2,661 3,551 34,508 30,196	1,75 2,151 18,102 22,482	911 1,41 16,41 7,71
EAST ST. LOUIS, ILL. East St. Louis & Suburban Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	177,712 170,739 1,850,565 1,837,239	89,840 88,122 1,001,050 960,163	87,872 82,617 849,515 877,076	49,942 48,800 544,544 534,274	37,930 33,817 304,971 342,802	PORTLAND, ORE. Portland Ry., Lt. & Pwr. Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	411,001 370,378 4,385,356 3,964,880	174,270 165,331 2,014,219 1,944,563	236,731 205,047 2,371,137 2,020,317	125,019 116,039 1,363,227 1,267,936	111,79 89,01 1,007,91 752,33
EL PASO, TEX. El Paso Elec. Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	58,347 44,913 588,012 528,654	35,712 33,544 368,245 377,808	22,635 11,369 219,767 150,846	8,421 7,107 95,691 83,290	14,215 4,262 124,076 66,916	ST. JOSEPH, MO. St. Joseph Ry., Lt., Heat & Pwr. Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	82,296 75,963 826,467 887,606	42,335 36,777 460,032 419,058	39,961 39,186 427,435 407,648	21,608 20,992 235,209 226,294	18,33 18,11 192,29 181,33
FAIRMONT, W. VA. Fairmont & Clarks- burg Trac. Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	37,032 30,924 388,690 353,311	15,749 12,373 149,413 132,971	21,283 18,551 239,277 220,340	..... ..... ..... .....	..... ..... ..... .....	ST. LOUIS, MO. United Rys. Co. of St. Louis.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	927,450 872,339 10,193,103 9,682,878	*581,014 *536,636 *6,426,687 *6,182,030	346,436 335,703 3,766,416 3,500,848	232,107 233,694 2,566,006 2,564,872	114,33 102,01 1,200,44 935,91
FT. WAYNE, IND. Ft. Wayne & Wa- bash Valley Tr. Co.	1m., Oct. '09 1 " " '08 10 " " '09 10 " " '08	122,806 113,391 1,161,156 1,092,090	70,386 59,931 678,925 613,400	52,420 53,459 482,231 478,690	..... ..... ..... .....	..... ..... ..... .....	SAN FRANCISCO, CAL. United Rail- roads of San Fran- cisco.	1m., Oct. '09 1 " " '08 10 " " '09 10 " " '08	733,766 609,042 6,190,805 5,688,378	361,636 336,815 3,709,875 3,583,346	372,130 272,227 2,680,930 2,105,032	....................	....................
FORT WORTH, TEX. Northern Tex- as Elec. Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	135,697 119,299 1,236,545 1,057,761	64,595 56,103 684,563 614,110	71,102 63,195 551,982 443,651	16,190 15,187 200,973 185,862	54,913 48,008 351,009 257,788	SAVANNAH, GA. Savannah Elec. Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	50,618 51,071 611,387 591,536	32,973 30,303 394,081 391,942	17,646 20,767 217,306 199,614	17,621 17,578 209,181 206,979	3,11 8,11 17,33 17,33
GALVESTON, TEX. Galveston-Houston Elec. Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	102,014 94,348 1,198,064 1,064,411	64,652 52,842 703,830 619,700	37,362 41,506 494,234 444,711	22,486 20,192 259,492 241,760	14,877 21,314 234,743 202,950	SEATTLE, WASH. Seattle Elec. Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	544,077 401,935 5,734,623 4,453,076	326,201 233,624 3,330,894 2,631,972	217,877 168,310 2,403,729 1,821,104	102,169 97,084 1,225,881 1,067,350	115,79 71,71 1,177,81 753,71
HARRISBURG, PA. Central Penn. Trac. Co.	1m., Nov. '09 1 " " '08 11 " " '09 11 " " '08	60,227 56,000 687,747 647,214	46,325 44,951 509,519 511,853	13,902 11,049 178,228 135,361	..... ..... ..... .....	..... ..... ..... .....	SYDNEY, N. S. Cape Breton Elec. Co., Ltd.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	23,228 22,166 257,173 252,178	12,237 12,750 141,870 144,874	10,991 9,416 95,303 107,304	5,066 4,955 60,188 59,354	5,91 4,41 35,11 47,91
HOUGHTON, MICH. Houghton County Tr. Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	26,543 21,654 315,393 258,708	13,070 10,941 170,131 146,599	13,473 10,712 145,262 112,110	6,216 5,380 71,645 57,598	7,258 5,333 73,617 54,512	TAMPA, FLA. Tampa Elec. Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	50,759 47,354 586,253 544,966	26,791 30,170 349,110 360,826	23,968 17,184 237,143 184,140	4,623 4,381 56,182 32,151	19,33 12,81 180,59 151,59
JACKSONVILLE, FLA. Jacksonville Elec. Co.	1m., Oct. '09 1 " " '08 12 " " '09 12 " " '08	41,567 38,509 468,002 419,405	22,136 21,144 265,784 250,706	19,430 17,365 202,219 168,699	9,452 9,124 112,187 109,214	9,978 8,240 90,031 59,484	TOLEDO, O. Toledo Rys. & Lt. Co.	1m., Oct. '09 1 " " '08 10 " " '09 10 " " '08	239,619 218,261 2,253,254 2,086,156	129,719 119,982 1,263,769 1,139,806	109,900 98,279 959,485 946,350	75,615 71,953 727,818 707,696	34,28 26,33 231,06 238,06