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LOCATIONS FOR DESTINATION SIGNS

So much attention has been devoted to the location and illumination of front destination signs that the requirements of that large portion of the public generally classified as absent-minded seem to have been overlooked. There is not a doubt but that the transparencies visible both from the inside and the outside of the car are very greatly appreciated by the riding public, and, where the use of these is not possible, a separate inside sign is almost as much of a convenience as the one outside. Indeed, one within the rear vestibule which can readily be seen by passengers who run to catch a car on principle before ascertaining its route will save much of the conductor's time as well as unreasonable but quite inevitable ill-feeling on the part of a certain percentage of the line's patrons. The advantage of signs in the rear vestibules or at the entrance doors seems in fact to have been generally neglected by electric railways, although their satisfactory reception on such lines as have made use of them is a good indication of their value.

THE A. E. R. A. CONVENTION PROGRAM

In spite of the length of the program for the American Electric Railway Association convention at Atlantic City, it has been possible to arrange the times of the sessions of the different bodies so as to follow the usual plan. This consists of morning sessions only for all the affiliated associations, except on Monday, and afternoon sessions for the American Association, beginning on Tuesday. The list of speakers and chairmen of committees, as contained in the program published in this issue, is a guarantee of the success of the convention, and the topics to be considered are those which concern every railway company. The most radical departure made in the program of any of the associations is in that of the Engineering Association. Here it will be found that a change in the method of handling the report of the committee on standards has been adopted. This committee has heretofore presented its findings *in toto*, thus necessitating that, unless it had the last place in the entire program, it was required to make recommendations to the association upon reports of committees which had not been presented. In consequence the scheme adopted this year, in which the committee on standards will make a series of separate reports, each being presented immediately following the committee report to which it applies, will prove a welcome change in procedure.

A QUESTION OF NOMENCLATURE

We agree with Mr. Babcock, whose letter appears elsewhere in this issue, that the problem of deciding upon a proper name for the electric railway system to be used in the Norfolk & Western Railroad electrification could well be taken up by the standards committee of the American Institute of Electrical Engineers. All will admit that if the term "single phase" is applied to the system, such a term does not convey the same impression as it would have done to most persons a month or more ago. Then it would have implied the use of single-phase current both on the trolley wire and in the motors. Shall we continue to use the simple term "single phase" in referring to a road with a single-phase trolley wire and polyphase motors or shall we use a longer and composite name like "single-phase polyphase"? If but a single term is to be generally employed, "single phase" seems the only logical one, as we stated last week, but if there are any advantages in having the name more explicit, the standards committee is an appropriate body to make the selection.

PURCHASED POWER IN CENTRAL NEW YORK

Niagara power has been used for the city cars in Syracuse for a number of years. Although 160 miles from the falls, excellent service has been maintained with but a small steam plant used by the railway company for the reduction of the peaks in the load line. Until recently, however, the interurban railways connecting Rochester, Syracuse, Auburn and neighboring towns have been supplied from local steam plants. Hydroelectric power has at last prevailed because it is cheaper, and for several months these railways have been supplied with power by the Niagara, Lockport & Ontario Power Company, which purchases a block of 60,000 hp from the Ontario Power Company, of Niagara Falls, and distributes it through central and western New York. This recent contract furnishes additional evidence of the growing appreciation of the laws of economical power supply. The railways get energy at a figure at least as low as they could generate it, and they obtain in addition the security of a reserve power supply. The power company secures a good customer and through the acquired steam plants has a local

reserve and a power-factor-correcting equipment. Moreover, the power generation and transmission are handled by specialists in that line, and the energies of the railway officials formerly responsible for the steam plants are released for attention to transportation problems.

ADDITIONAL MATERIAL FOR COURTESY CARDS

In one of the well-known special columns of a New York daily which is, so to speak, conducting a campaign in favor of courtesy on the part of street railway employees there is recorded the fact that a certain conductor assisted with unusual gentleness a blind and very stout old lady from his car. In addition it seems that the conductor escorted her to the sidewalk—a very kindly, if not thoughtful, act with which it would even be difficult to find fault on the obvious ground that it was a violation of rules. Yet, at the risk of being misanthropic, it might be well to point out that the old lady displayed a perfect example of the lack of foresight supposedly characteristic of her sex in riding alone during the rush hours, and also that of the fifty or more passengers on the car who were delayed by this exhibition of courtesy a great majority probably felt that an unwarranted liberty was being taken with their time. Judging from the enthusiasm with which publicity was accorded to the incident, the popular conception of courtesy from platform men does not include consideration of the operating rules designed solely for the public benefit. And in connection with the courtesy cards now so much in vogue it might be well under conditions of city traffic to add to the text contained in them advice to the effect that politeness which involves the necessity for a conductor to leave his car or which causes delay to other passengers is neither permissible nor, in the end, desirable.

WIDER FIELDS FOR THE MOVING PICTURE

Moving pictures have already been exploited by electric railways to teach the public about accident prevention, but anyone who has studied their great development in other fields will concede that electric railways are as yet hardly awake to what this marvel of the age can do for them to serve entirely different ends. Perhaps the most profitable prospect is in the field of traffic promotion. Is there any better way of advertising a scenic route than by a moving picture of the route itself as made from a train in motion? Such panoramas have been prepared to advertise foreign pleasure resorts with the result that the pictures have attracted the patronage of people who would never have been reached by tourist literature. Recently a film was made of the interurban division of the Quebec Railway, Light & Power Company, which runs from Quebec past Montmorency Falls to the famous shrine of St. Anne de Beaupré, and ere long this beautiful portion of the St. Lawrence valley will be shown at lectures in New York and elsewhere. A really beautiful scenic film could be circulated by an interurban railway among a very large number of moving picture theaters in cities, while, on the other hand, a city railway could attract visitors from the smaller towns by circulating views of the busy streets, finer residential quarters and industries of its community.

A decidedly different application of the moving picture is that which was described by D. C. Boy, assistant chief of the educational bureau, Central Railway of Georgia, at the May 15 meeting of the Southern & Southwestern Railway Club, Atlanta. Mr. Boy discussed the utility of the moving picture in teaching a trade to apprentices. The principle is to have the several operations of a given process carried out by an expert before a moving picture camera, whereupon the apprentice can watch the film again and again until he is able to perform each movement correctly. In short, the film is used to teach a trade in the same tireless way as a phonograph is used to drill the language student in pronunciation. Of course, the novelty of the method also arouses more interest than tutorship by men who lack patience and tact. Mr. Boy stated that since May, 1912, moving pictures of locomotive firing had been shown to more than 1500 apprentices of his company. He added that the same methods were now followed by the Southern Pacific and Illinois Central Railroads, which carry the outfit on special cars.

COMPULSORY ARBITRATION FOR STRIKES

We have no doubt that if the cost to the country of the strikes which have occurred during the past twelve months should be calculated the sum total would show that such industrial conflicts are a national calamity equal in aggregate loss inflicted to that caused by the destruction of property by fire. The damage arises in three ways. First, there is a direct loss in wages to the employees on strike or thrown out of work by the strike. Second, there is the direct loss to employers, made up in part by loss of profits, in part by the interest on idle or partly idle equipment, and in part perhaps by the cost of protecting their property from assault. Finally, there is that large indirect expense to which many outsiders are subjected because of decreased business efficiency or other causes brought about by the interrupted supply to them of the service or products affected by the strike. In view of these facts, any effort made to remove the cause of this drain upon the resources of the country is laudable. But to be successful any plan must be inherently just and must recognize the rights of both parties to the dispute, because if based on wrong principles it will simply aggravate the trouble. For these reasons we believe that the plan often called "compulsory arbitration," but really the plan compelling the adoption by both parties of the findings of a board of arbitration, is a most mischievous one, assuming, for the sake of argument, that a way could be found under our state constitutions of enforcing such findings. Compulsory arbitration itself, or the power of a board to examine into an industrial dispute but with no power to enforce its verdict, is another matter entirely.

Those in favor of the method of settling industrial disputes by requiring the disputants to accept the decision of a board of arbitration often refer to the alleged success of the plan in New Zealand, but the latest reports from that country indicate that it is regarded as a failure there, not only by the employers but by the employees themselves. For a considerable time after it was established, some twenty years ago, the trend of the decisions in the cases in dispute

was in general in favor of labor. In consequence a season of industrial peace followed, because the penalties could be enforced against the employers, and they had to submit; but the arduous conditions to which capital was subjected discouraged further investment there. Now, however, it seems that even the labor element has lost faith in the plan. Thus, we learn from the *Daily Telegraph* of Sydney for July 18 that at a general labor conference held in New Zealand during the early part of July Mr. Treager, for many years head of the Labor Department of New Zealand, acknowledged that the act not only had not prevented strikes but that "no power, no locking together of any organization by any form of procedure, could prevent half a dozen or a dozen men from throwing down their tools if they found it necessary to do so."

The fact is that compulsion as regards the findings of an arbitration board means a compulsion upon employers only and that such must be the case because the employers are the only ones against whom a penalty of this kind can practically be enforced. It is true that theoretically penalties can be assessed against employees also, but in practice it has been found in both Australia and New Zealand that jail sentences against a man, and especially against a large body of men, for not working are out of the question. Hence it is significant that at the conference mentioned the resolution was adopted by a more than two-to-one majority that "The United Federation of Labor [New Zealand] will employ the strike weapon, local, general or national, whenever the circumstances demand such action."

TEACHING PUBLIC UTILITY VALUATION

The suggestion which John A. Atkinson, chairman of the Missouri Public Service Commission, has expressed an intention of making to the curators of the University of Missouri is indicative of the prominent position that the subject of physical valuation and appraisement of public utilities has assumed in the corporate world to-day. It is proposed, in brief, that a special chair should be established in the university to give instruction to young men on this question, not as it concerns gas companies or railroads or electric railways, but as it applies to public utilities of every character. The underlying motive is to have a course opened in connection with the economics and engineering departments, graduates from which may be taken into the employment of the Public Service Commission.

This plan, however, while emphasizing the weight of the valuation subject, might better be considered a crystallization of existing practices than a distinctly novel idea. For several years the leading schools of commerce and business administration have been instilling in the minds of students the principles of valuation and appraisement. Sometimes they may have appeared in a corporation finance course, in a public utility accounting class or in a course dealing with transportation and rate making; but, whatever the surroundings, education of late has seen many professorial dissertations on original cost, cost of reproduction, cost of reproduction less depreciation, capitalized earnings and other theoretical aspects of valuation and the factors underlying rate making. Such courses in the main have been elected by students who already possessed degrees in economics or engineering and have served to broaden their theoretical knowledge. Now, however, a change is suggested. Just as the subject of business organization under the advancements made by efficiency engineers was sorted out from economics and made to stand by itself, just as the study of politics and public affairs has been evolved from a medley of economics, history, and current topics, just so the question of valuation is now to emerge from various commercial, accounting and financial courses as a separate subject.

In view of the present-day tendency for specialized utility on the part of university curricula and the importance given to valuation by the Interstate Commerce Commission and various state commissions, this idea of a distinct course is theoretically good, but one must not lose sight of its practical limitations. The simple truth is that the subject of valuation is too inclusive and complex to be easily taught or easily comprehended. In the ultimate analysis the successful teaching of valuation and appraisement requires a man who has given many years to its actual practice, and such men will find little inducement in the teaching sphere. Then, too, the average college student is not mentally equipped to receive, nor could be obtain even from a most competent teacher in the average college course, more than a scattered and superficial knowledge of the theoretical side of the subject. No one would be so absurd as even to imagine that the ability to value "public utilities of every character" could be thus acquired. In the electric railway field, for example, with various city, suburban, interurban and underground lines, so many problems of diverse character and varied magnitude are encountered that the field seems practically inexhaustible even from the expert's viewpoint. If the proposed course is to include a study of all utilities, the best that the special chair of valuation can do for the young student is to acquaint him with the terms used, with a trifle of the general theory connected with valuation and appraisal and perhaps with a modicum of practice, so that when he secures a position with a public service commission he will possess a few of the elementary tools with which to begin work. Yet, if the proposed course succeeds merely in laying a firm foundation, the move will not have been in vain. The chief danger, however, to be guarded against, even with such a foundation, is that the immature student will look upon his thimbleful of definitions and theory as thoroughly fitting him for valuation work, which will only add to the chaos already existing in the field.

We asssume that Mr. Atkinson has, in his way, recognized the importance and difficulty of the subject of valuation and the desirability of starting early an education along that line to be perfected by later and extensive practice. This impresses us as being a more wholesome idea than that apparently entertained by the Governor of New York State, who appointed to the Public Service Commission two men whose only stated qualifications were competency at the engine throttle and affability in village politics. The training of men for public utility valuation and commission work may be attended by difficulties and limitations, but we at least concur with Mr. Atkinson as to the desirability of their being trained.

PROPOSED TRAILER OPERATION IN MONTREAL

In our issue of Aug. 2 reference was made to some drawbacks which justify the question: "Is trailer operation profitable?" These drawbacks, as then pointed out, were the increased number of stops, the unequal loading of motor car and trailer, the delay in transmitting signals, and the time required for making up trains. At least one of these objections certainly is applicable to every experiment in train operation which has been made hitherto by American street railways. It is already apparent, however, that the necessity for trailer service has created several improvements in this field, and others are under way. Unfortunately, there is little to learn from foreign practice despite the fact that trailers in Europe are as old as the electric railway itself. Usually, the trail cars and the coupling connections are of the crudest kind, and no one shows any concern over the likelihood that the trains are slower than the none-too-rapid single cars. Zurich and Vienna are among the few cities where the design of trailers as such has received some thought. As for the United States, the most important advance to date has been the well-known low-step, center-entrance trailer of the Pittsburgh Railways.

In view of the foregoing remarks it is of interest to turn to the proposed trailer operation of the Montreal Tramways. This railway has just ordered twenty-five motor and twenty-five trail cars for service on St. Catherine Street, the trunk line of Montreal. Plenty of old cars were available, but after a study of trailer operation in the United States the management was convinced that such operation would not be a real success in Montreal unless the objections which have been previously cited were met by appropriate traffic conditions and equipment. The outlook for two-car service on St. Catherine Street is indeed favorable because this avenue has a heavy all-day travel with a normal headway of one and one-half minutes. Thus the trailer can be attached early in the morning and not detached again until late at night; furthermore, these changes can be conducted at a carhouse and not in some public thoroughfare. This condition of a long heavy-traffic period avoids, therefore, the annoyance occasioned when trains are made up just before the morning and evening rush hours. An automatic coupler and a three-way connector will be provided for all braking, lighting, heating and automatic door signal lines, and these connections may be made in very little time. It is not likely that train operation will appreciably increase the number of stops in the greater part of St. Catherine Street owing to the many transfer crossings and to the fact that the larger cars on this street actually do stop or slow down at almost every intersection.

The remaining objection to two-car operation, unequal loading, is really the principal one; this will be eliminated by a design which is the practical equivalent of an articulated center-entrance car. The passengers, instead of boarding the rear platforms of both the motor car and trailer, will use the rear platform of the first car and the front platform of the second. It is plain, therefore, that boarding passengers will tend to be equally distributed because the entrances are side by side and not a car length or even half a car length apart. Each entrance platform will also have an exit aisle in addition to a front exit via the motorman's platform. As Montreal cars are operated single-ended, congestion will be reduced by the medium of a very wide aisle at the entrances and by the installation of the more attractive cross seats at the farther ends. Delays in signal transmission are to be forestalled partly by the entrance scheme, which leaves the passengers no chance for hesitation, and partly by electric door contacts, which will close the circuit of a pilot lamp in front of the motorman as soon as every door is shut. It is noteworthy that the motor equipment will have practically the same normal output as that used on the latest Montreal motor cars except for the addition of better ventilating means. The only extra cost to be expected is a higher charge for motor maintenance, and this increment will be negligible in comparison with the greater earnings which are to be expected because of the increased number of cars which can be placed upon the street.

THE ENGINEER AS AN EXECUTIVE

In these days, when engineering is the foundation of so many industrial enterprises, there are many reasons why a qualified engineer should have the executive direction of their affairs. To fill such a position properly, however, he must possess a knowledge of many matters not entirely within the bounds of his professional training. Not only must he be able to direct men, but he should be what is sometimes called a man of affairs. This means that he should have a good knowledge of the principles of law as well as of accounting and should also be conversant with the operating technique of the particular business in which he may be engaged.

We believe that this fact is more generally realized at present than a few years ago and that because of this fact most of the engineering schools are now providing instruction in commercial law and in business methods. In some cases, as with the recently announced course of the Massachusetts Institute of Technology, a special course is to be established for business and commerce, somewhat similar to the course conducted at Harvard but approached from the engineering side. But even the man who intends to follow engineering strictly should also take advantage of any opportunity which he has for gaining an acquaintance with the legal and accounting principles used in his own engineering specialty.

An evidence of the growing interest in such a broadening in training of the professional engineer is shown by the endowment three years ago with the British Institution of Civil Engineers of a series of annual lectures upon the relations between commerce and engineering. The founder, Frame Thomson, has been prominently identified with electric traction enterprises in many quarters of the globe, and he himself delivered the first three of these lectures. They showed that these relations are not confined purely to the matters of contracts, specifications and the purchase of materials and equipment, with which the engineer is assumed to be familiar. The successful engineer must also have the power of imagination to see the completed work before it is finished and the mutual relation of its various parts and should possess the ability to determine by calculations or instinct, or both, at least approximately, the com-

mercial future of the enterprise. In this way, while all hazards cannot be eliminated, the adverse contingencies will be brought within the limits of ordinary business risks. The engineer should also be conversant with the legal and financial principles of corporate organizations, through the instrumentality of which most engineering work is now conducted, and it is equally important that he should be acquainted with the modern methods of accounting for the various forms of depreciation in engineering apparatus.

These were not the only qualifications mentioned by the speaker, but they are sufficient to indicate that the future of an engineering enterprise—and transportation is of this character—does not depend wholly or even largely upon the success of its purely engineering features.

THE EXPRESSION OF STEAM TURBINE EFFICIENCY

The large number of variable factors entering into the expression of steam turbine economy has for a long time been a thorn in the side of the manufacturer who wishes to compare by simple means the efficiency of his own and other machines. Increased steam pressure, vacuum or superheat all make surprising differences in the steam consumption as expressed in pounds per horse-power-hour, and the efficiency of the electrical apparatus adds still another variable when the kilowatt-hour is used as a basis. Unfortunately, engineers in general have accustomed themselves to think of turbine efficiency in terms of steam consumption per kilowatt-hour, although for large units a more misleading basis could hardly be devised. Of two turbines, one may happen to be operated with 100 deg. more superheat and a 1-in. better vacuum than the other, with the result that it will probably show an appreciably lower water rate. Yet this lower steam consumption by no means indicates a more efficient machine. The former turbine may, indeed, show a much poorer result if operated under the less favorable conditions surrounding the latter, although so long as the relative performances are expressed in pounds of steam consumed per kilowatt-hour this would never be apparent.

To overcome this difficulty a determined effort has been made to establish the use of cyclic comparisons in expressing turbine efficiencies, as the methods of conversion of heat into work have been reduced to but a few processes out of the infinite number possible and the cycles which represent these processes establish very definite standards. For steam-operated prime movers but two cycles, those of Carnot and Rankine, have received much consideration, the former being widely known as representing the action of the perfect heat engine and the latter giving a less efficient combination of processes, which, however, approximates very closely the practical operation of steam engines and turbines.

In both cycles heat is supposed to be supplied at constant pressure, as in the admission of steam from the boiler; then adiabatic expansion takes place corresponding to that which occurs after the cut-off in an engine cylinder or in the nozzles of a turbine, and this is followed by the discharge of heat and condensation, as in the exhaust to the condenser. In the final operation required to complete the cycles, however, the two differ in a radical manner. In the Carnot cycle adiabatic compression of the vapor takes place, which returns it to its original pressure and temperature ready for the heating at constant pressure, this constituting the first step in another cycle of operations. Such a process is, of course, impracticable with existing condensers which reduce all the steam vapor to the incompressible liquid form. In the Rankine cycle, however, the last step consists in heating the liquid at constant volume, which corresponds exactly to the action of heating in the boiler the condensate received from a surface condenser. For conditions found in modern practice a theoretical engine working on the Carnot cycle will give somewhat more than 10 per cent higher efficiency than one operating on the Rankine cycle.

However, the actual application of the Rankine cycle to present practice makes it singularly valuable as a standard in demonstrating the maximum attainable result with existing machines. For any given combination of steam pressure, superheat and vacuum the steam consumption per horse-power-hour of a perfect engine operating on the Rankine cycle may be worked out by formula, and the cyclic efficiency of an actual engine operating under the same conditions may be determined by dividing the theoretical steam consumption by that actually found in practice. Such cyclic efficiencies express with reasonable accuracy the true performance of the engine over the probable range of the variable factors and present comprehensive statements of engine or turbine performance in the simplest manner under circumstances where the figures for steam consumption are apt to be misleading.

A case in point was brought up by the expression of the guaranteed performance of the Interborough turbines, described briefly in a recent issue, on the basis of the Rankine cycle. The over-all efficiency to be required was given as 75¾ per cent, including the electrical losses in the generator. This, on the basis of a steam pressure of 175-lb. gage, 120 deg. of superheat and a 29-in. vacuum, would mean a steam consumption of about 11.25 lb. per kw-hr., yet with 200 lb. steam, 200 deg. superheat and 29.2 in. of vacuum (referred to a 30-in. barometer) the steam consumption would be only about 10.1 lb. per kw-hr. Here, with only small changes in the operating conditions, the economy of the turbine, as expressed in pounds of steam consumed per hour, varied more than 10 per cent. Obviously there is good reason for abandoning the steam consumption as a basis for comparison and instead using as a standard the performance of a perfect engine.

Unfortunately, the formulas for determining the theoretical efficiency or steam consumption on the Rankine cycle basis are of extreme complexity, and so far as we know none of the engineering handbooks contains tables to supply the information without necessity for calculation, although one enterprising turbine manufacturer has worked out an ingenious set of curves which approximate the data. Under these circumstances it is hardly likely that engineers in general will accustom themselves to thinking of turbine performance in terms of comparison with a perfect engine working on the Rankine cycle, and if the manufacturers are in earnest in their attempt to establish the method it would seem that the most necessary step would be the preparation and publication of tables of theoretical water rates worked out upon this basis.

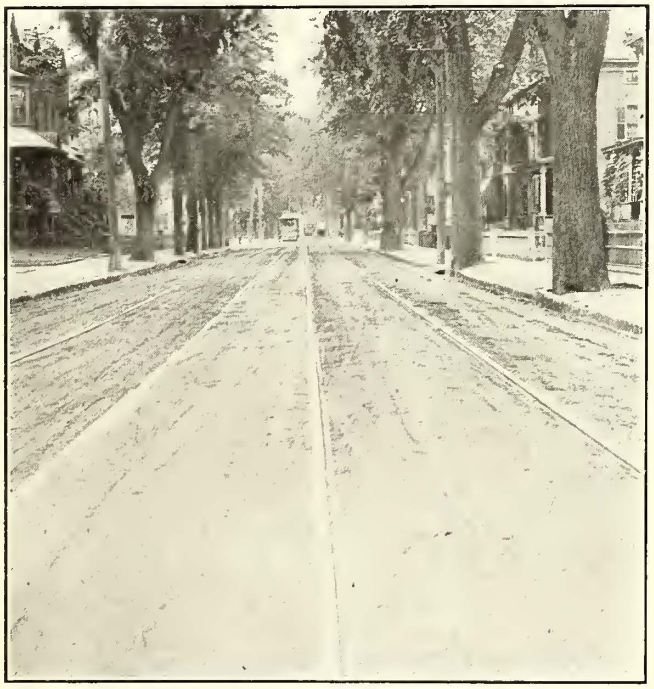
T-Rail in Paved Streets

The Writer Shows the Connection Between T-Rail Construction and Types of Paving as Disclosed by the Experiences of the Connecticut Company—Views Are Presented of the Effect of Service on Different Classes of Rail and Pavement Combinations

BY R. C. CRAM, ASSISTANT ENGINEER WAY AND STRUCTURE DEPARTMENT BROOKLYN RAPID TRANSIT SYSTEM AND FORMERLY ASSISTANT ENGINEER OF THE CONNECTICUT COMPANY

The issue of the Electric Railway Journal for Aug. 30, 1913, contained an article on "Way Construction of the Connecticut Company" showing several cross-sections of rails and pavements which had been developed by that company to meet the local requirements of the towns and cities in which its tracks are located.

It will be noted that only one of these cross-sections showed a groove girder rail, while all the others showed T-rail in connection with various types of pavement. This predominance of T-rail has come about partly as a legacy from the original constructors of the various properties now under control of the company and partly through the consistent endeavor of the company to substitute T-rail for girder rail in all reconstruction of girder rail tracks.



Rail and Paving Results—Nineteen-Year-Old T-Rail in Oiled Macadam

Rail and Paving Results—Hump Block Paving, Bridgeport, After Three and a Half Years' Service

When it is considered that the Connecticut Company operates practically 75 per cent of the total mileage in Connecticut and that its system embraces nearly all the principal cities of the State, the experience of the company with regard to T-rail in paved streets should be of much value.

Before proceeding to a study of the Connecticut Company's work it will be of interest to determine the situation with regard to the use of T-rail in connection with the entire mileage of the electric railways in the State of Connecticut.

Division of T-Rails and Girder Rails in Connecticut

Recourse is had to the report of the Public Utilities Commission of Connecticut for the year ended June 30, 1912, which is one of the very few state reports giving data as to type of rails and pavements used by street railways. An analysis of the report shows that the ten operating companies reported a total of 1055 miles of single track. Five companies, operating about 150 miles, reported no girder rail whatever, thus confining the use of girder rail to the other five, four of which reported only 7 miles of girder rail about evenly divided between the tram and the groove girder types.

Of the total mileage in the State, approximately 93 per cent is laid with 40-lb./95-lb. T-rail, 4½ per cent with 70-lb./96-lb. tram girder and 2½ per cent with 85-lb./125-lb. groove girder. It may be remarked here that substantially 91 per cent of the girder rail mileage is confined to the lines of the Connecticut Company, with about 60 per cent of this confined, in turn, to the lines in Hartford. In that city practically all of the original tracks were laid with tram girder rail, and these must be replaced with groove girder, as occasion arises, in accordance with an agreement between the city and the company made several years prior to the time that the Connecticut Company acquired control of the property.

Division of Pavements in Connecticut

With regard to pavement, an analysis of the report shows a total of 336 miles of single track paved with various types of pavement. Included in pavement, however, are 26 miles of stone ballast (backfill above ties) which is not properly to be considered as pavement except for purposes of accounting. The net mileage of paved track is found to be 310 miles, or approximately 29 per cent of the total mileage of tracks reported. The Connecticut Company reported 288.1 miles paved, or substantially 93 per cent of the total paved mileage.

Table I has been prepared to show the amounts of various types of pavement in percentage of paved mileage:

TABLE I—CLASS OF PAVEMENT IN PERCENTAGE OF PAVED MILEAGE

	Per Cent
Macadam	67.1
Brick	13.0
Cobble	5.6
Asphalt	5.4
Belgian and granite block	4.9
Wood block	1.8
Bituminous—macadam and bitulithic	1.1
Granitoid	0.8
Hassam	0.3

If the mileage within the limits of the city of Hartford is excluded, it appears that about 90 per cent of the paved mileage in Connecticut is laid in conjunction with T-rail.

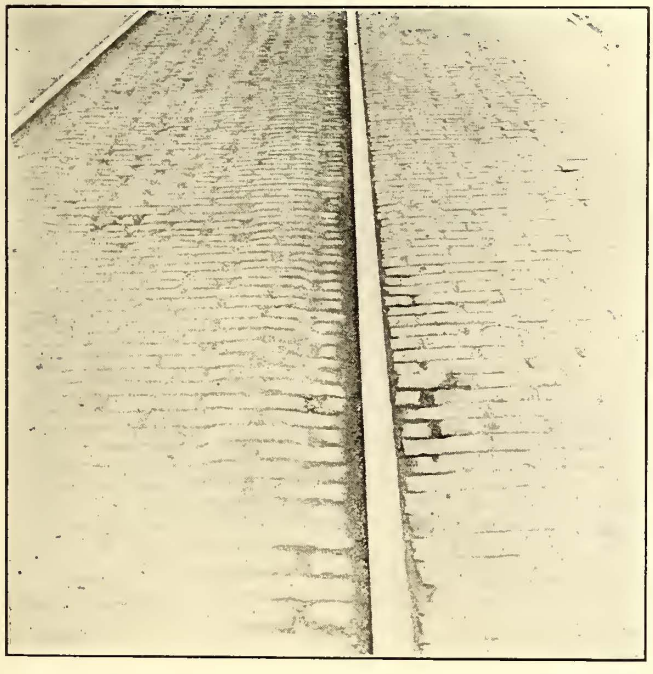
T-RAIL AND PAVEMENT DATA ON CONNECTICUT COMPANY'S LINES

In order to indicate the T-rail and pavement situation on the lines of the Connecticut Company, in the five largest cities in the State, Tables II and III have been prepared.

TABLE II—PERCENTAGE OF CONNECTICUT COMPANY'S MILEAGE PAVED AND PERCENTAGE OF T-RAIL IN FIVE LARGEST CITIES

City	Population	Mileage in City Limits	Per Cent Paved	Per Cent T-Rail	Per Cent Tram-Girder	Per Cent Groove Girder
New Haven	133,605	67.0	86.0	100.0	...	...
Bridgeport	102,054	40.0	99.0	88.0	8.0	4.0
Hartford	98,915	50.0	96.0	10.0	50.0	40.0
Waterbury	73,141	34.0	79.0	88.0	8.0	4.0
New Britain	43,916	13.0	81.0	100.0	...	...

In commenting on Tables I and III it is to be noted that macadam, in general, is the predominating pavement in the largest cities, as well as in the total paved mileage in the State. The exception noted for the city of Waterbury, where cobble is found to predominate, is accounted for mainly by the fact that much of the mileage in that city is laid on quite heavy grades, where macadam is exceptionally hard to maintain between the rails, and also because



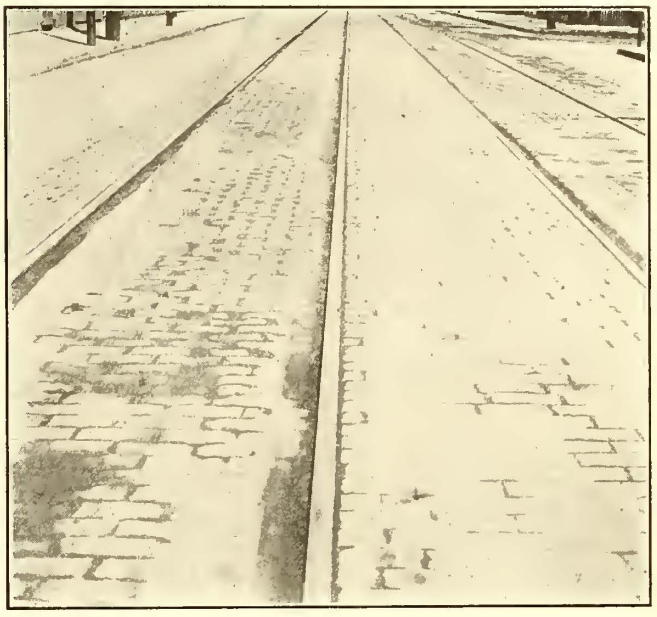
Rail and Paving Results—T-Rail in Ordinary Brick Two Years After Paving Shown Above Had Been Repaired

it has generally been the custom to pave the tracks there with cobble whether the roadways outside are paved or not.

REQUIREMENTS MET IN T-RAIL PAVING DESIGNS

The accompanying halftones are presented in order to bring out the features of the standard cross sections, previously referred to, for T-rail track pavement. These sections provide for the use of standard paving brick, wood block or granite block and therefore do not require any special form of groove or nose block at the gage lines. Most of these cross-sections were developed about 1906, after a study of the then prevailing forms of construction in connection with T-rail throughout the State.

The objects sought were to provide a minimum flangeway for the maximum wheel flange in use, to eliminate both groove rail and special groove or nose block, to provide a reasonably smooth crossing for team traffic at right angles



Rail and Paving Results—Grooved Brick Pavement Three and a Half Years Old with T-Rail

to the tracks and to provide facilities for wagon wheels to turn out from the tracks with comparative ease as well as with safety. It is believed that these objects have been and are being satisfactorily attained, as observation and the continued acceptance of the cross-sections by the Public Utilities Commission and by the several cities would indicate. This is particularly worthy of note because the commission is the sole authority on the type of track construction to be used in streets, and its approval must be had in all cases of track reconstruction. In this connection it should be stated that while the commission, in many instances, has approved the installations of T-rail, it recog-

TABLE III—CLASSIFICATION OF PAVED MILEAGE OF THE CONNECTICUT COMPANY WITHIN CITY LIMITS OF THE FIVE LARGEST CITIES (IN PERCENTAGE OF PAVED MILEAGE)

City	Macadam	Brick	Wood Block	Cobble	Granite Block	Belgian Block	Asphalt	Bitulithic	Granitoid	Total
New Haven	52.0	13.0	4.0	10.0	0.5	7.0	1.5	5.0	7.0	100
Hartford	76.0	....	0.5	....	...	...	23.5	....	...	100
Bridgeport	61.0	16.0	20.0	....	2.0	...	1.0	....	...	100
Waterbury	6.0	21.0	1.0	52.0	11.0	...	....	9.0	...	100
New Britain	76.0	....	....	....	...	...	1.0	23.0	...	100

NOTE—Belgian and granite block are not separated in State report. Bitulithic included under bituminous macadam.

nizes the fact that at times there may be some locations where groove girder rail would be preferable, also that the width and grade of streets and the volume and character of traffic must be carefully considered in any decision as to which rail may be the more suitable under all conditions. In only one case so far, however, has the commission ordered a groove rail construction, after full investigation in the manner described.

EXPERIENCE WITH MACADAM PAVING

As to pavement, the experience in Connecticut has probably been about as extensive as that of any of the other important systems. The railways in Connecticut have only a limited control over the type of pavement laid within the

track area, since they are required by statute to lay the same type of pavement in their section of the road as that laid by the municipalities in the other part of the street. Nevertheless, they are not required to lay a pavement which is more expensive, nor are they absolutely held to the same type, provided they lay a pavement which is considered equally good with that laid without the railway area. As a rule, however, the practice is to lay the same type, the work being done by the same contractor under a separate contract with the railway company. There have been a few exceptions to this rule, where the contractor's bid for the railway work was in excess of the bid for the rest of the roadway.

MACADAM

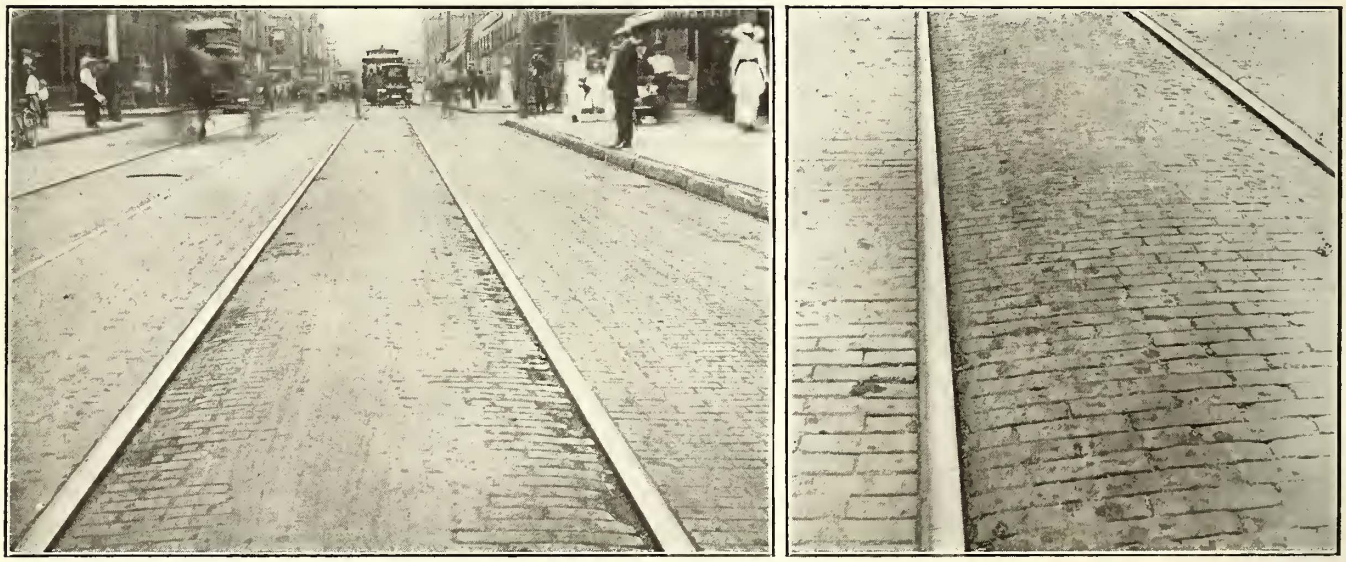
The predominance of macadam may be accounted for, in general, by its low first cost, the abundance of trap rock and the fact that until the advent of the automobile a good water-bound macadam roadway was sufficient to withstand all but the most concentrated traffic in the immediate centers of the cities and towns. Moreover, it can be well laid even with a 5-in., 80-lb. T-rail, is maintained at moderate cost and is somewhat more adaptable for use with T-rail than with the girder rail. It is thought that the tendency toward oiled macadam and the more recent forms of bituminous macadam will result in the continued use of such macadam pavement in connection with tracks where traffic is moderate and where the width of streets does not cause excessive wagon tracking at the gage lines.

An example of a T-rail installation in oiled macadam is shown in the view on page 368. This track was built with 7-in., 70-lb. T-rail in 1894 and had ordinary joints until 1910, when these joints were replaced by electric welds. This track has been re-tied once, and it is believed that the rail will last five or six years more under present traffic conditions. The width between the curbs is 31 ft.

BRICK PAVEMENT

According to the tables, brick pavement is found to be next in extent. The older types consisted mainly of the small vitrified shale pavers, while the more recent ones are constructed with the present standard paving brick or block. They have been laid almost universally with cement grouted joints on a sand cushion and a 6-in. concrete base. The quite general adoption of brick in the past as a pavement may have been due to the reason that until the introduction of the modern types of grouted granite and wood-block pavements, it was the only alternative to asphalt in the so-called "permanent pavement" class, and asphalt has never found much favor in Connecticut cities.

As a track pavement, brick has proved quite satisfactory up to the point where traffic, following the rails, becomes excessive. It can be well laid in connection with T-rail, and is quite readily replaced after street openings and track repairs, though at considerable loss of material. The use of any form of special "nose" or groove blocks, however, has proved very objectionable, and the results from such installations under heavy traffic at the rails are clearly shown in three illustrations on pages 368 and 369. Moreover, it should be stated here that these installations of groove block were made only under vigorous protest on the part of the company. In the pavement shown in the right-hand view on page 368 the failure of the rail block began to be serious after three years. In this case the entire area between the rails was replaced with wood block during the fifth year, and this wood-block paving is standing well after two years' wear. Another installation of "Arthur hump" groove blocks, shown in the upper view on page 369, was laid in the same year, 1906. It commenced to fail in the same manner in the year 1909. Repairs were made in 1911 just prior to the expiration of the guarantee period, by the installation of standard blocks at the gage lines after the concrete base was chipped down to receive these blocks. The blocks were then pitch-jointed, as the work had to be done under traffic. This repair is shown in the lower left-hand view on page 369, which is from a photograph taken in July of this year at the same spot as the preceding.



Rail and Paving Results—T-Rail in Regular Brick, Four Years Old, Showing Wear from Heavy Traffic in Narrow Street; and T-Rail in Regular Brick, Three and One-Half Years Old, on Wider Street with Slightly Less Traffic

It is pertinent to state here that experience with the standard brick at the gage line indicates that they should never be laid under the rail head with T-rail, that the best result is obtained by laying all headers and that only the best materials and workmanship will prove satisfactory.

As tending to show that even the best quality of paving brick will not withstand excessive gage-line traffic, the left-hand view on this page, taken in July, 1913, is presented. This pavement was laid in 1909 by the company's forces and in the best manner. The rail is 7-in., 95-lb. T. The tracks are on 9-ft. centers, and the width between curb lines varies between 31½ ft. and 32 ft., leaving a roadway about 8 ft. in width. A very heavy traffic is sustained, and teams are standing at the curbs almost constantly during the greater part of the day, thus forcing the traffic to the rails. After about two years, extensive repairs were required and, as will be seen, more will soon be necessary. As a companion, the right-hand view on this page, also taken in July of this year, is given to show the lack of such wear in a wider street with the same type of con-

struction throughout and laid less than one year later. The street here is 42 ft. wide between curbs, with tracks on 10 ft. centers. A somewhat lighter traffic is sustained, but it is believed that the lack of wear may be almost wholly ascribed to the width of the street. It is also thought that this comparison alone justifies the belief that when track pavement is under consideration the width of the street and the character and volume of traffic must be more thoroughly taken into account, as influencing wear, in the selection of a proper paving material.

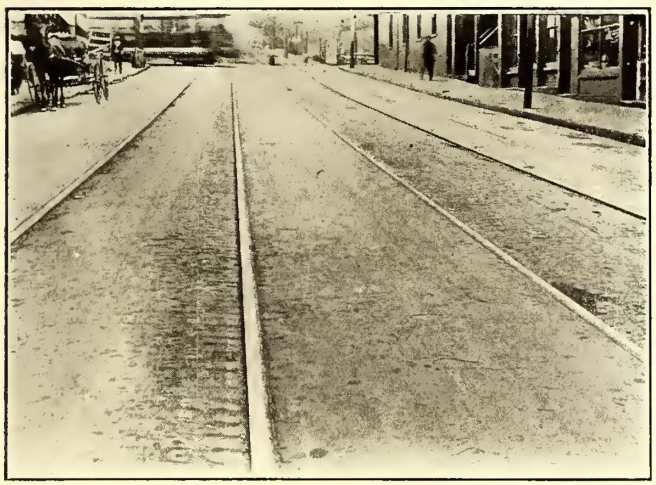
COBBLE PAVING

While cobble appears as next in importance in Table I, it will suffice to say that its use is generally confined to tracks in outlying districts, often on grades, in streets as yet otherwise unpaved. As a material for this purpose cobble is very good, providing good foothold for horses and preventing the rutting out between the rails which usually occurs, after a time, where tracks are merely backfilled with earth or gravel.

ASPHALT PAVING

Asphalt occupies a rather false position in the list, since it is confined practically to one city. What little remains in tracks elsewhere will no doubt be displaced within a year or two. There is every reason to believe that much of the disfavor in which asphalt is now held as a pavement for railway streets in Connecticut is the result of its installation in connection with tracks which were too old and were in no way as substantial as the modern construction. Later installations would indicate that asphalt can be laid and fairly well maintained, under moderate traffic, in connection with a heavy groove girder rail. It is thought, however, that the well-known troubles incidental to asphalt maintenance are sufficiently grave to make its installation undesirable and something to be avoided as far as possible.

In connection with the use of asphalt on the 2-ft. strips along the roadways, it may often be policy to allow its use, but here also it is better to avoid it, if possible, and use instead either wood or granite blocks laid stretcher in areas where asphalt is insisted upon for the roadways by the authorities.



Rail and Paving Results —Two-Year-Old T-Rail in Grouted Granite Block on Grade in Narrow Street

BELGIAN AND GRANITE PAVING

Belgian block occupies about the same position as cobble in so far as its value or use as a pavement is concerned, and it is rapidly disappearing.

Granite block as a track pavement has until recently been in little use in Connecticut. Such as there was consisted of the ancient type of 8-in. deep blocks, laid on sand, mainly with sand joints. Within the past two or three years the value of the modern type of comparatively smooth granite pavement began to be appreciated, and several installations have now been made. The construction has been composed of a moderately soft New Hampshire granite, with blocks about 5 in. deep, 4 in. wide and 8 in. to 10 in. long, laid with 1:1 cement-grouted joints on a 1½-in. sand cushion and a 6-in. concrete base. This construction has been adopted usually where grades and very heavy traffic are found. Such an installation, in connection with 7-in., 95-lb. T-rail, is shown in the left-hand view on this page.

Rail and Paving Results—Four-Year-Old T-Rail in Wood Block on Narrow Street

This pavement was laid in 1911, while the view was taken in July, 1913. As yet the wear is imperceptible and much of the grout may still be seen, although the pavement sustains a heavy traffic leading to a bridge. The dark spots which may be mistaken for defects are either accumulations of dirt or motor oil drippings. This street is 35 ft. wide between curb, with tracks on 10-ft. centers.

In connection with grouted granite-block pavement it may be well to mention a method of construction which is coming into use, although the writer has not seen it in Connecticut. The procedure consists simply in splitting old 8-in. to 12-in. granite blocks into from two to three parts, each about 4 in. deep, and laying them with the new split faces upward, all other parts of the construction being the same as with new granite. The cost of this method is, of course, much less than with new block, and the resulting pavement seems to be practically as good.

WOOD-BLOCK PAVING

Wood block has been steadily coming into favor in Connecticut. The relative importance of this kind of paving is not properly shown in Table I because several extensive installations were in progress at the date of the report on which the table is based. As a paving material it rivals granite even when wear is considered and is more readily cut in around obstructions. While trouble is had at times from the tendency of the blocks to buckle under certain conditions, such troubles are usually quite easy to remedy. The result is a smooth, clean, quiet pavement which is highly desirable, especially in residential sections. It is adaptable to both T and groove rail and may be quickly replaced after track repairs, even in the winter time, with the least loss of material. It has been customary to lay this pavement on a 6-in. concrete base with 1-in. sand cushion and sand joints.

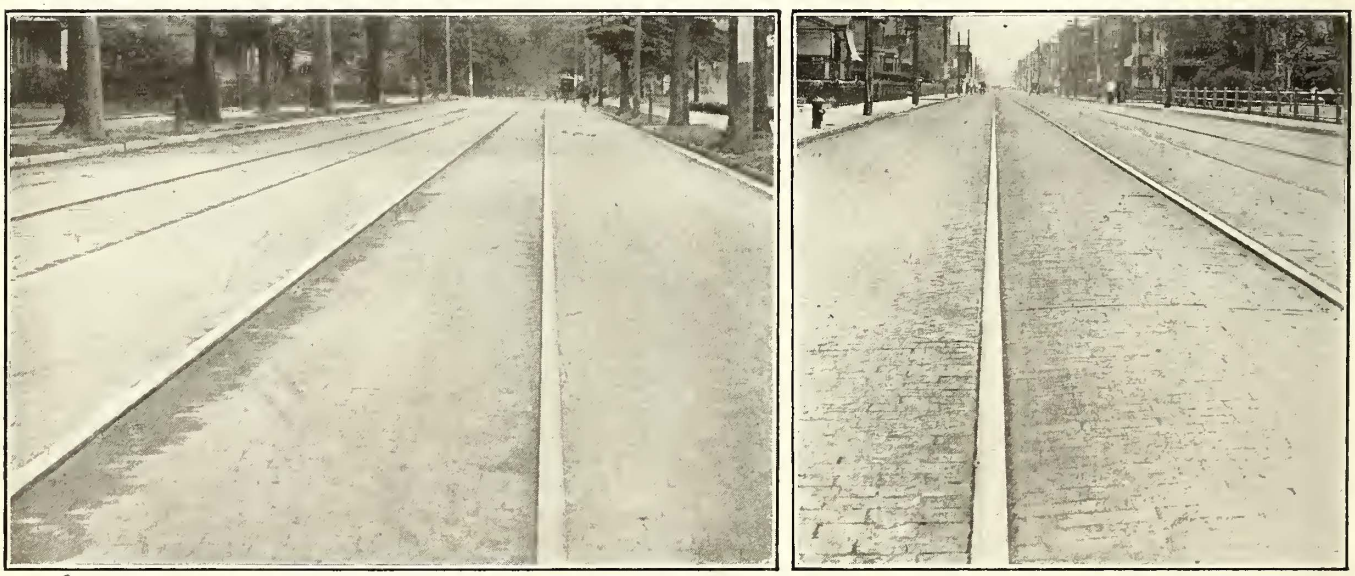
The wood-block pavement, as presented in the right-hand view on this page, was laid in 1907, but the view was taken in 1911. In this section of track, which is about 2700 ft. long, it became necessary to remove the blocks temporarily in 1910 in order to raise the concrete base and install cement rail filler, the purpose being to get the block up and out from under the rail heads as originally laid. The work

was done and the block was relaid with a loss of about 35 sq. yd. The left-hand view on this page, taken in July of this year at the same place as that shown in the previous cut, indicates no apparent change in conditions. The pavement was installed in connection with 7-in., 95-lb. T-rail without tie-rods, tracks on 9-ft. 8½-in. centers and a width between curb of 34 ft. One other view, taken in July of this year, of a wood-block installation is also shown on this page. This pavement was laid in 1911, with 7-in., 95-lb. T-rail, no tie-rods, tracks on 9-ft. centers and a width of 36 ft. between curbs. The street sustains a comparatively heavy traffic as it leads to important industrial plants.

BITUMINOUS MACADAM AND BITULITHIC PAVEMENT

The experience with bituminous macadam is not of sufficient length to enable a more definite opinion to be formed than that expressed in reference to ordinary macadam.

With regard to bitulithic, however, it has been found that it is quite satisfactory for streets carrying a moderate traffic. When laid in conjunction with T-rails it has been deemed advisable to place wood or granite block at either side of the rail heads. Several large installations have been made, the two earliest in 1906. Neither of these required any expensive attention from the contractor at the expiration of the five-year guarantee period. In fact, after seven years they appear to be good for an indefinite period. The most objectionable feature would seem to be the dependence upon the contractor for such repairs as may be necessary from time to time.



Rail and Paving Results—Construction of Installation Shown on Right-Hand Side Page 371 After Six Years' Service; and T-Rail with Wood Block, Two Years Old, in Narrow Street

GRANITOID AND HASSAM PAVING

Granitoid is a pavement with a concrete surface, usually laid out in block form on top to prevent slip. Where installed in Connecticut no attempt was made to interpose any form of joint or shock absorber between the rail and the pavement. It presents a neat appearance, but the block formations soon disappear under traffic. It is thought that perhaps for light traffic it may answer quite well, especially when first cost and comparative ease of repair are considered; but for heavy traffic following the rails, especially T-rails, the writer believes it will prove unsuitable. Such installations as have been made are also too recent to allow the formation of a well-defined opinion.

The experience with Hassam pavement has been confined to one early installation which was not very extensive. The contractors were experimenting with it themselves. It should suffice to say that it gives evidence of being worthy of further consideration and investigation for use in places where the requirements call for a low-cost, fairly durable pavement.

GENERAL CONCLUSIONS

In any track construction in paved streets, the pavement is perhaps the most important feature, both in relation to total cost of the track construction and the use of the street by the public. The writer believes that much of the objection which has been raised to the T-rail construction should more properly have been brought against the type of pavement used in connection with that rail. This observation is the result of experience in connection with several agitations over the T-rail question in Connecticut cities, where it was found that agitation ceased after a T-rail installation had been made in accordance with the Connecticut Company's standard cross-sections to replace old tram girder and asphalt pavement construction. In fact, the new T-rail construction has been praised highly by both the press and members of civic associations. The further importance of the pavement and its proper construction in connection with T-rail is more forcibly brought to mind when it is remembered that it is in connection with the pavement that the other users of the street are concerned in the problem and that the public, as personified by teamsters, automobilists and civic authorities, has a large control over the type of rail to be used in most municipalities, either through the influence of civic associations or by direct authority. It is from these sources that almost all of the objections to T-rail construction originate. Sometimes they are honest attempts to correct very visible pavement evils, but more often, especially upon the part of authorities, they are made chiefly for political purposes.

The revival of interest in T-rail track construction in paved streets points out the timeliness of the investigation of the subject by the committee on way matters of the American Electric Railway Engineering Association. The writer refers to these studies as timely, because several more or less new designs for this type of construction have been advanced recently, each having some acceptable features, but practically none having all of them combined. If this advantageous form of construction is to gain its proper place, the features of design which meet and overcome the objections to T-rail and pavement must be more fully known. One has only to read the discussion of a type of T-rail and pavement held recently before the American Society of Civil Engineers to realize the importance of this statement.

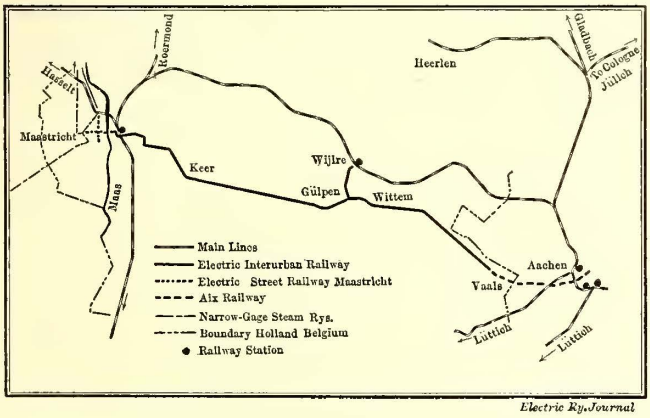
The subject is so very broad, however, that criticism and

discussion of one or two new types adds little to the general knowledge concerning it. What are required, rather, are discussion and data covering the types of construction which have already been in use a sufficient length of time to indicate at least what modifications and combinations may be required to secure a type of construction which will meet most nearly the general conditions throughout the country.

In conclusion the writer should state that he is not fully convinced that the T-rail is the best one to use under all conditions, from the standpoint of maintenance cost. The possible exception is a narrow street with very heavy traffic which is apt to follow the rails. The use of groove girder rail under these conditions may well be considered, because the groove will take the larger portion of the wear, thus reducing the wear on the pavement. This brings us to the consideration of the relative importance of paving materials themselves. The lack of definite information as to the life of paving materials in connection with track, of whatever type of construction, is keenly felt. The advantage of traffic counts or records covering this phase of the subject has been pointed out. It is hoped that the way departments of some large companies will undertake traffic counts designed to obtain records of this character, along the lines laid down for obtaining such records by the American Society for Municipal Improvements.

A NEW HIGH-TENSION DIRECT-CURRENT RAILWAY FOR HOLLAND

The Netherlands government has recently concluded an agreement with the Allgemeine Elektricitäts Gesellschaft for the construction of a narrow-gage electric railway between Maastricht, Holland, and Aachen, Germany, via Vaals, with a branch from Gülpen to Wijlre. As shown in the accompanying map, the electric line will afford a shorter connection between Maastricht and Aachen than the present steam trunk line, aside from the fact that it will serve territory which now has no transportation service whatever. The condition that cheap energy could be obtained



Map Showing Route of New Line Between Maastricht and Aachen

from a power station at the nearby state mines led to the choice of electricity, despite the fact that the other narrow-gage lines in this territory are operated by steam in all cases.

The interurban line proper and the Maastricht street railway system will be supplied from a central station at the state mines at Herlen through a power company whose high-tension transmission lines traverse the territory to be served by the new railway. The line will be operated with high-tension direct current, but the energy purchased will be three-phase alternating current. The initial price will be approximately 1 cent per kw-hr. as measured at the substations of the railway. The interurban division between Maastricht and Vaals at the Aachen boundary will be 15.8 miles long. It will be located on right-of-way, but as close to the highway as possible. The branch to Wijlre will be 1.25 miles long, the street railway in Maastricht as first constructed about 2 miles long and the entrance into Aachen about 3.1 miles long. Aachen and Maastricht have populations of 157,000 and 37,000 respectively, and the intervening territory has about 25,000 inhabitants, according to recent estimates.

Owing to the undeveloped nature of the territory, the new line will be subsidized by the communities served. The Maastricht and Aachen sections will be run as local street railways. As the several franchises embody some interesting conditions, they will be summarized in the following paragraphs.

The city of Maastricht has agreed to pay the operating company for ten years and annual deficit not exceeding $1,200. The fixed charges covering the Allgemeine company's investment in rolling stock and the city's investment in way construction are to be taken from an equal division of the surplus remaining after all operating costs and previous operating deficits have been paid. The maintenance of the track and paving will be in the hands of the city, although the interurban cars will also operate over the city tracks. The city reserves the right to take over the system at the end of thirty years or at succeeding intervals of five years each. If the city does acquire the property, it will permit the interurban line to operate over its track upon proportional payments covering the maintenance and renewal charges against the section used, upon payment for the energy taken and, further, upon payment of 0.4 cent for every passenger brought into the city. On the other hand, the city has agreed to make good any losses which the company might suffer from the construction of competing lines, and it has also agreed to provide connections to other narrow-gage lines. The electric railway in Maastricht will supersede horse lines.

At Aachen the interurban line has made a contract with the local railway company whereby passengers from the interurban line can be carried over the Aachen line without transfers. In payment for this use of the tracks all local fares collected on the city tracks are to be given to the Aachen company.

The interurban franchise, covering passenger and freight business, was granted by the Netherlands government for an indeterminate period. The government has loaned the railway $130,000, in addition to which the provincial government and interested communities have voted loans for twenty-five years at the rate of $6,720 a year. These sums do not have to be repaid until the interest on the investment exceeds 5 per cent and until all operating losses have been absorbed. State ownership of the interurban section is permissible at the end of twenty-five years, provided the state offers an equivalent for the capitalized net earnings. The state also has the privilege of buying the railways at any time on payment of the new replacement value of the way, of the estimated use value of the rolling stock and of a premium whose amount will depend upon the results of operation up to the time of purchase.

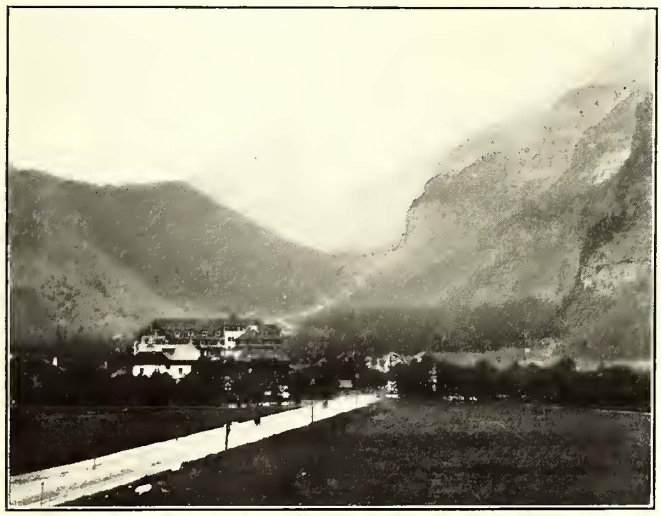
A concise volume, which contains statistics showing the foreign trade of each country of the world during 1911 compared with the previous year, has just been issued by the Bureau of Foreign and Domestic Commerce at Washington. This publication shows the principal articles and their value entering into the trade of each country and the itemization of the imports from and exports to the United States. The statistics were prepared by American consular officers and supplemented by other official data. The volume has been revised and brought up to date so far as statistics were available. Copies of the book may be obtained from the Superintendent of Documents, Washington, D. C., for 35 cents each.

Notes on European Electric Railways

Impressions Gained During a Recent Trip Over the New Lötschberg Railway in Switzerland and the Older Lecco-Colico Line in Northern Italy—One Is Single-Phase, the Other Is Three-Phase

BY LOUIS BELL, PH.D.

The Electric Railway Journal has described the progress of the construction of the important Lötschberg railway and has had something to say about the electrical details of the remarkable new 2500-hp Oerlikon single-phase locomotives used on the line. I shall not attempt, therefore, to describe the technical features of these machines, but rather will attempt to give some notion of what the system seems like from the standpoint of railway operation. To begin with, the Lötschberg line is an outcome of the necessities arising from the peculiar topography of that part of the country. Right through the heart of Switzerland from the Lake of Geneva, stretching a little north of east half the length of the country runs a huge mountain mass. In a general westward direction and turning sharply northward around the western end of the mass runs the Rhone; eastward and sweeping northward around the eastern end runs the upper Rhine. The watershed between the two sources is in the neighborhood of the St. Gotthard as a culminating point, whence also flow streams north and south.



Lötschberg Railway—Views Near Kandersteg Near the Northern End of the Line

Now, the main channel of traffic has been via the St. Gotthard tunnel, which is nearly in the center of Switzerland. The other great tunnel, under the Simplon, gives access to the Rhone valley, but it must be followed clear to the Lake of Geneva before opportunity comes to turn northward to reach the region north of the Bernese Alps, which form the eastern portion of the huge mountain mass. The St. Gotthard line, following the streams running north and south, and going under the mountains, bears eastward into the Italian lake district. But until now there has been no direct route from northwestern Switzerland through into Italy. The Lötschberg line was built to fill this very definite want and comes, as will be seen by the map on page 644 of the Electric Railway Journal for Oct. 7, 1911, by a fairly direct course from Berne to Spiez on the Lake of Thun, and thence up the wild valley of the Kander, which it follows as far as practicable. Then it goes under the mountains by a succession of tunnels, the main one nearly 9 miles long, until it emerges on the brink of the Rhone valley and follows it on sharply descending grades to Brieg, just at the entrance to the Simplon tunnel. It is not a long line, only about 46 miles in all, to cover a distance of less than 30 miles as the crow flies, but it has cost hard on to $450,000 per mile, and when you go over it you wonder how they ever got out of it even at that figure. Its two ends are about 2000 ft. above sea level, and its middle, in the depths of the great tunnel, rises to about 4100 ft. From end to end it is a sensational succession of curves, grades, spiral bridges and tunnels.

You meet it, coming north, as I did, at Brieg, which you reach after being shot through the Simplon tunnel in a little over twenty minutes by the big three-phase locomotive from Iselle on the Italian side. You dive under your train in a subway and emerging find a bright new line of corridor cars bearing the label of the Lötschberg line. The first thing to strike one in strolling about the platform—they never hurry at junctions over here—is the extreme simplicity of the overhead work compared with that at your back toward the Simplon: just a nice, clean, well-insulated catenary construction with a modest trolley wire that looks as innocent as if it were carrying 500 volts instead of 15,000. One of the illustrations on the opposite page gives a view of the yard as seen from beside the train.

Presently one of the long single-phase locomotives slips quietly up the track beside you with never a wink at the pantograph collectors and shunts gently on ahead of the train. It is no small affair, this engine, with an over-all length of about 50 ft., a weight of 107 metric tons, of which a little more than three-quarters is on the drivers, and a rating of 2500 hp for one and one-half hours—the full length of a trip over the line. And the driving wheels look businesslike too, five pairs of them coupled, about 55 in. in diameter. The earlier locomotive for this line had six pairs of drivers, three pairs being coupled to each motor. The present one, although with two motors, has all the drivers pulling together and consequently the motors also. The two motors, each of 1250 hp, are sixteen-pole machines, taking current at a maximum voltage of 500. They are stated to be series-compensated, but with just what form of compensation I am uncertain—I hope that the details will soon be published—but I note that in nearly all descriptions of single-phase traction motors this matter is

touched very lightly. However, all the compensating schemes seem to work if carried out judiciously. There are two transformers with forced ventilation each with a regulating secondary in 45-volt stages, the contactor for this regulation being mounted on the transformer and operated by an auxiliary motor. The pantograph trolleys impress one with the ease and smoothness of their working and they certainly function admirably at full speed and load—the curves give one ample opportunity to inspect them.

A second view shows the particular locomotive coupled to the train as I waited, and there were two similar ones standing in the yard. In due season the train starts up with exceeding smoothness, thanks to the regulating transformer and also to the Continental system of coupling, which is slow but effective in abolishing shocks. Full speed is reached quickly, and the train pushes ahead up a steady grade, mounting the brim of the Rhone valley. The road is standard-gage, and the train with its regular corridor cars and driver is not a particularly light one. There is no doubt of the ample power as the grades are conquered, and presently she is running along the mountain side, with the Rhone valley a quarter of a mile below and the river winding down it—of a curious greenish hue like most streams from glaciated mountains, a sort of pale, off-color turquoise.

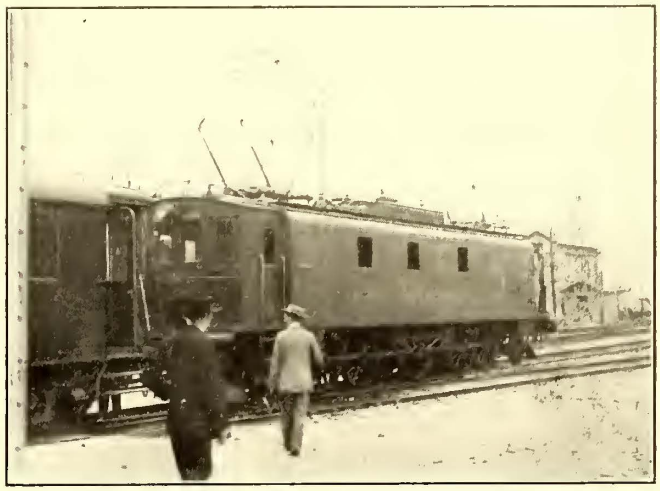
I am not going to trouble you with banal comments on the scenery. If you want its details consult Baedeker—"To the left, fine view of the Kiental with the Blümlisalp and Gspaltenhorn," etc., etc.—but I do assure you that no one but a two-headed man with rubber necks could properly take in the startling sights on both sides of the train at once. You are over gorges and under cliffs, through tunnels and shooting along the edge of precipices all at pretty high speed, until you go through the Lötschberg tunnel proper and emerge near Kandersteg to find more of the same awaiting you. Two accompanying views are merely snapshots of the wild scenery about Kandersteg, taken when the train slackened speed enough to permit it. The roadbed is somewhat rough from its newness, and with its assortment of sensational curves never will be exactly smooth. We left Brieg about 12.30 and reached Spiez at 2 p. m. after

Lötschberg Railway—View of Overhead Construction

what is assuredly one of the most impressive railway rides in the world.

But I would advise those who wish to see it not to take it in in the course of a journey as I did, but to make a day's excursion of it from Spiez or Interlaken so as to get some real grasp of the fleeting scenery. One trip along the line is not enough. Incidentally I may mention that the Lötschberg line will prove a boon to visitors who are bound to or from Zermatt, previously reached by travelers not going by the Simplon only by a rather tedious trip up the Rhone valley to Visp. Now one can slip down from the country north of the Bernese Oberland very easily and then loop westward toward Geneva.

The road, from the standpoint either of electrical or civil engineering, is of immense interest. A single trip with an eye on the performance of the engine leaves one with an abiding faith in the practical capabilities of the single-phase locomotive. This road is no place for motors of



Lötschberg Railway—New Single-Phase Locomotive

dubious qualities—far from it—and the present locomotives are certainly from a practical standpoint up to their job. They are probably not yet so good as they may be eventually, but after one has had experience with them and the Simplon machines as well he is not in a mood to listen with patience to long-winded papers explaining how uneconomical, inefficient and unreliable a. c. railway motors are and ever must be. And until some one devises a scheme for using 15,000 volts d. c. on the trolley wire it is up to the man who stands pat on d. c. to do the explaining and experimenting when big long-distance work is on hand. The overhead structure of the Lötschberg speaks for itself.

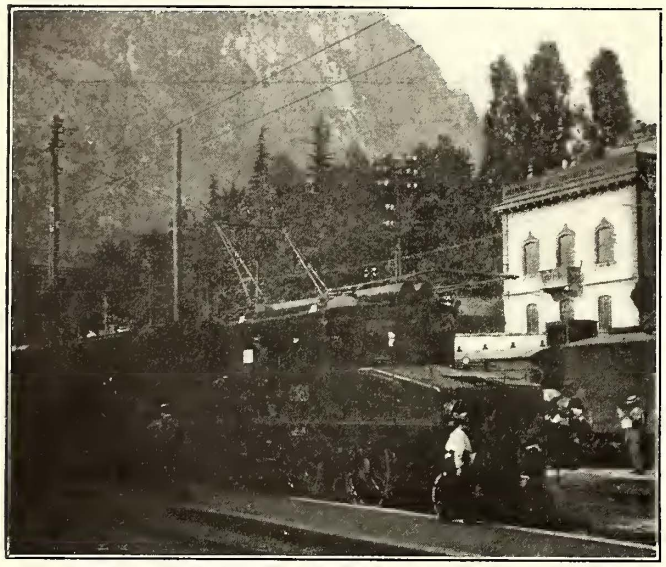
NOTES ON THE LECCO-COLICO-SONDRIO LINE

This line is one of the earlier and more important of the three-phase railways of the Italian system. Its equipment, from the technical standpoint, has been often described so that here I shall waste no time in again going into these matters of detail. Some account of its present status of actual operation may not, however, be unwelcome to readers of the ELECTRIC RAILWAY JOURNAL who know it only by general repute.

It runs along the eastern shore of the Lake of Como, or rather that branch of it which is known as the Lake of Lecco, from Lecco itself, the junction point with the steam lines coming up from the general direction of Milan and the south, to Colico, where it turns sharply eastward and winds its way up the valley to Sondrio. From the constructional standpoint the line is interesting, with its many tunnels. It runs along the lake shore at a general height of 150 ft. or 200 ft., without any formidable grades in the southern portion of the route, although in the Colico-Sondrio section there are plenty of them.

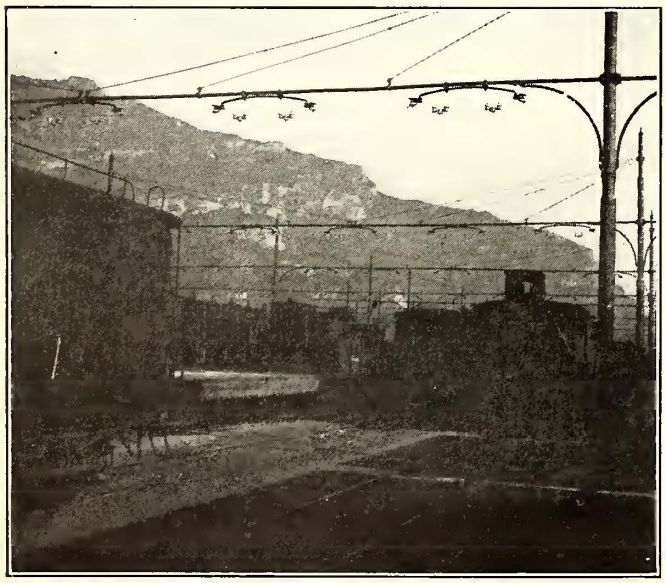
The overhead construction is rather simple—two trolley wires suspended roughly a couple of feet apart on an ordinary bracket construction. The locomotive has but a single trolley, resembling the bow form in common use on the Continent, but with two sections of tubular contractor perhaps 2½ in. in diameter, insulated from each other, of course, but carried on the same axial support. One of the accompanying views is at the station at Lecco and shows one of the electric locomotives. Those which I saw were all of Gauz manufacture, looking very compact and power-

ful. The arrangement of drivers is out of the ordinary in these machines, somewhat different from the earlier types and much the same as on the latest Lötschberg locomotives already described. The two motor armatures drive cranks which are united by a jack shaft which carries the main driving crank, the other drivers being united to it by ordi-



Lecco Railway—Three-Phase Locomotives at Lecco

nary connecting rods. It looks queer at first glance, but it keeps everything pulling together and seems to work admirably. There is a single pair of small pilot wheels at each end of the locomotive, but nearly all the weight is on the drivers. They are doing considerable work of extension at Lecco, building a large addition to the three-phase yards, and, escaping the eyes of the officials, I wandered down into it and investigated. A view is shown of the new construction. It is of tubular iron poles bearing carefully trussed tubular cross members from which are carried the



Lecco Railway—Overhead Yard Construction

brackets with the suspended insulators. The construction spans five tracks, and while surprisingly light it looks strong and simple, and is a wide variation from the lattice poles and cross members generally used.

On the way back I devoted myself to line inspection. They are working up from Lecco with line reconstruction. The new line is of tubular poles set in concrete perhaps 40 ft. in over-all height, with three short steel cross-arms clamped firmly in place, and is fitted to carry two three-phase circuits. It is a good piece of line work, resembling several new Italian lines which I saw later. These poles are usually tapered in four sections, the lowest one about 8 in. in diameter, the uppermost scarcely half that figure.

The practical working of the Lecco-Colico-Sondrio line, from all I can learn, is excellent. Its locomotives handle the regular through trains easily, and it forms a commonplace section of the Italian railways in their ordinary course of operation. In other words, it represents main-line practice and makes good at the job. It is worth noting that all the really serious electric work here, as elsewhere, is with locomotives. The often-mentioned plan of running large single cars at short intervals has really never been carried out—the added cost of operation both for power and labor seems to be too seriously against it. Over here there is a rather general use of trailers even on the train lines, and in larger work the well-accepted principle of the economy of long trains is fully recognized. Just putting on an electric locomotive instead of a steam one, as in the case of this line, seems to be the normal and natural way of passing to electric traction.

TESTS OF BALL AND ROLLER BEARINGS AT ROCHESTER

The Rochester Lines of the New York State Railways have for the past twenty months been investigating the operation of ball bearings and roller bearings for street car service. The tests are being made under the direction of G. M. Cameron, master mechanic. In the spring of 1911 one car was equipped with roller bearings and one with ball bearings and tests of energy consumption were made. The cars were then put into regular service and have been in operation ever since with only very slight intermissions for repairs due to minor imperfections of the bearings. These endurance tests will be continued to determine the useful life of the bearings.

The cars equipped with the anti-friction bearings are of the prepayment type, each weighing without passengers 48,600 lb., the maximum passenger load being estimated at 11,250 lb. The total weight not carried by the journals is 10,838 lb., so that the maximum estimated load on each of the eight journals is, therefore, 6127 lb., or 3132 lb. per bearing. The bearings were designed by the manufacturers for this load. The cars are equipped with Brill 27-F-E-1 trucks and four G.E.-219 motors. The roller bearings cost, in place, about seven times as much as plain bearings and one-half as much as the ball bearings.

The energy tests showed a saving in energy ranging between 12 per cent and 13 per cent, or nearly the theoretical maximum, which Mr. Cameron estimates at 15 per cent. This maximum is all of the energy which is consumed by the bearings, the rest of the energy consumed by the car being due to motor losses, air resistance, gear friction, flange friction, etc. The difference in energy consumption between the two types of bearing is so small as to be negligible. With energy at 1 cent per kw-hr., and allowing 33,000 miles per year travel for the car, the saving in this item is from $130 to $140 as compared with plain bearings. To offset this are the interest charges on the investment and the still indeterminate depreciation.

The indications from the endurance tests so far are that the anti-friction bearings are durable and that a length of life can be expected sufficient to justify their cost so far as economy is concerned. Undoubtedly if these bearings could be produced at such a cost that a three-year life would show a good saving there would be a greater incentive for experimenting with them. Under the conditions of the present test, with a life of less than three years for the roller bearings and somewhere over five years for the ball bearings, the energy saving and the maintenance costs balance each other.

Rapid Transit Development in Berlin and New York

A Review of the Development of Subway and Elevated Lines in These Cities—Includes Maps and Tables Showing Present and Authorized Lines in Both Cities and Their Mileage

The approval of the contracts between the city of New York and the Interborough Rapid Transit Company and the Brooklyn Rapid Transit Company for an extensive network of additional rapid transit lines should lend timely interest to the following review of rapid transit development in Berlin and New York.

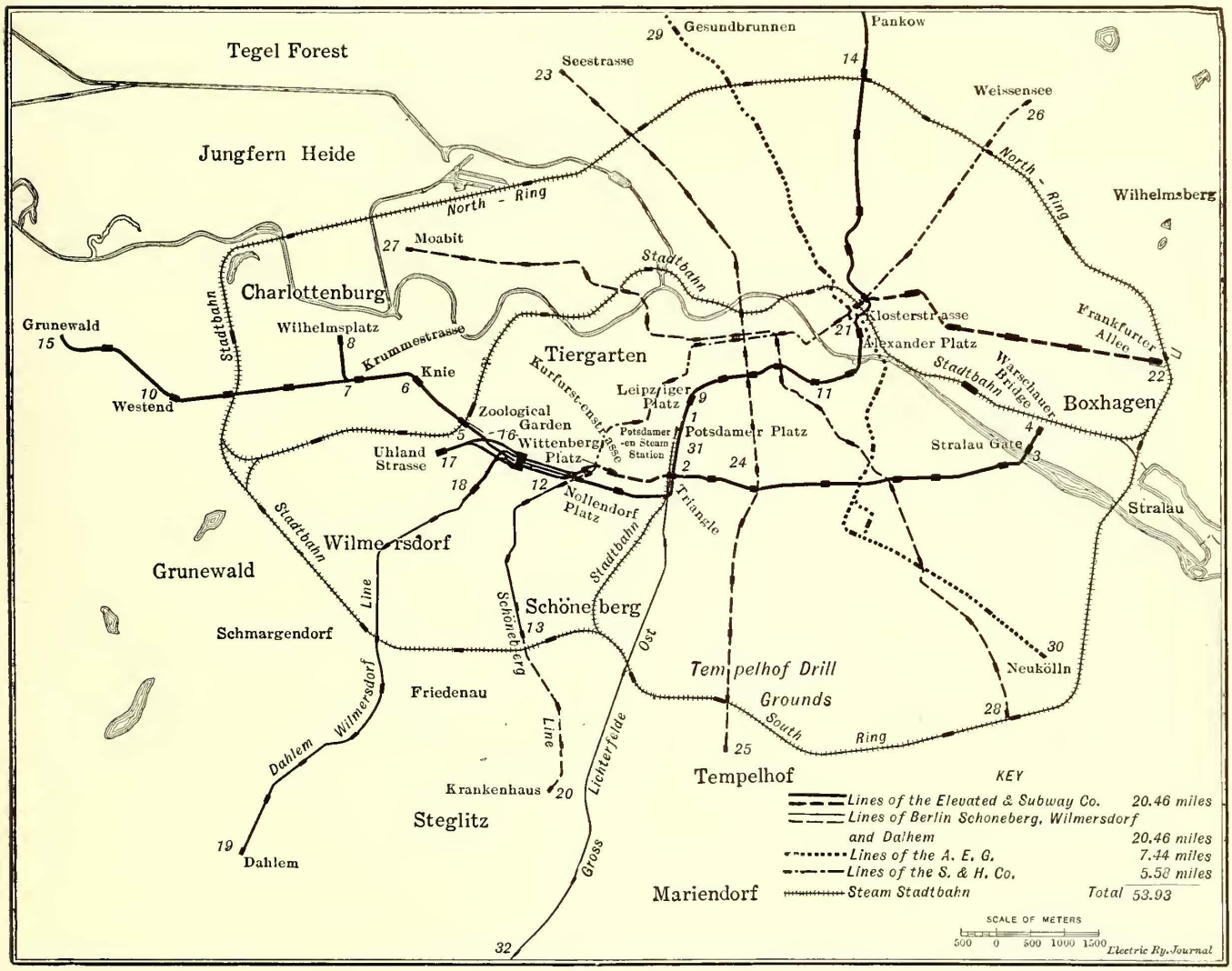
DEVELOPMENTS IN BERLIN

Up to about ten years ago the only non-surface line in Berlin was the Stadtbahn, a belt line system consisting of a northern, central and southern section with direct connection to most of the trunk lines. On Feb. 18, 1902, however, the Berlin Elevated & Underground Railway Company placed in operation the first section of its east-west trunk line. Since then additional lines have been constructed or proposed by this company, by other private interests and by the municipalities. The lines built by the original company afforded direct communication from the prosperous territory in the west to the great business and social centers of Berlin, while the new north and south lines will give better traveling facilities between the industrial districts and the homes of the working classes. The Stadtbahn is still operated by steam, but funds for electrifying 294 miles (single track) of city and suburban lines have been voted by the Prussian Diet.

The accompanying map shows all of the present electric rapid transit lines of Berlin and those which have been approved for construction, while the accompanying Table I presents the dates on which each section was opened to the public.

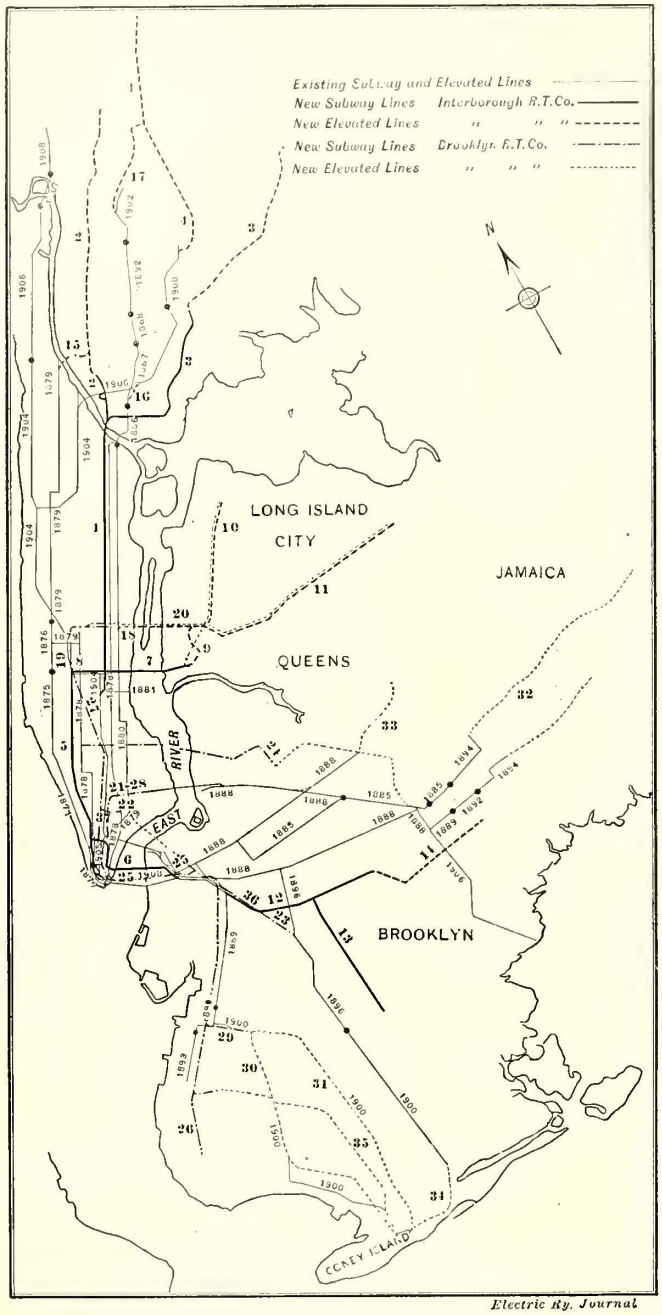
The Elevated & Underground Railway also operates, or will operate, the feeder lines owned by the municipalities of Schöneberg, Wilmersdorf and Dahlen. The Schöneberg line is not physically connected to the trunk railway because that municipality plans to operate its cars over a future extension northeast into Berlin, but passengers may buy tickets at Schöneberg stations to any station on the trunk line and vice versa.

At Wittenbergplatz trains converge from the three western terminals of the trunk line and, in the near future, will do so from the Wilmersdorf line. This traffic, as well as



Berlin and New York Rapid Transit Development—Map of Berlin and Suburbs, Showing Present and Authorized Rapid Transit Non-Surface Lines

that from Schöneberg, must be carried on a two-track line which now has a two-and-one-half minute rush-hour and a four-minute normal headway. The station platforms and signal system impose limitations which will make any radical improvement in capacity impracticable. To relieve its main line, the company therefore is planning a separate route to the "triangle," which was changed from a one-level to a two-level transfer station because of a serious side-



Electric Ry. Journal

Berlin and New York Rapid Transit Development—Map of New York and Brooklyn, Showing Existing and Authorized Elevated and Subway Lines

wiping accident which occurred on Sept. 26, 1908, as described in the Electric Railway Journal for Oct. 10, 1908.

The original zone fares of the Berlin system have recently been reduced as they became prohibitive for the longer runs. The fare reductions, which also include the Schöneberg line, are on the following basis: 15 pf. (3¾ cents) reduced to 10 pf. (2½ cents); 20 pf. (5 cents) to 15 pf. (3¾ cents); 25 pf. (6¼ cents) to 20 pf. (5 cents), and 30 pf. (7½ cents) to 25 pf. (6¼ cents). The reduction is so applied that instead of adding 5 pf. (1¼ cents) for every three stations to the 10 pf. (2½ cents) minimum, this increment is added for successive zones of three, four and five additional stations, etc., so that the further the passenger rides, the greater is the number of stations for the additional fare. The report of the Elevated & Underground Railway for the year 1912 shows that 62,731,827 passengers were carrried and that the gross earnings were $2,042,369. The average earnings per passenger were 3.25 cents. The greatest number of passengers carried in one day was 223,992. The company operates 143 motor cars and 116 trailers in trains of two to six cars for a total performance of 2,349,275 car miles. An attempt was made by the company recently to abandon the use of smoking compartments because of the confusion to passengers when boarding trains. The company was obliged, however, to continue the present plan because any change was vetoed by the authorities.

The Schöneberg municipality's subway was described in the Electric Railway Journal for Aug. 5, 1911. The construction is of the most costly character, and as a large part of it was made through undeveloped territory, the traffic has not yet reached the density which profitable subway operation demands. The first year's service shows a deficit of $375,000. The Wilmersdorf Railway, now under construction, is similar to that of Schöneberg except that an open cut is used in the less developed territory.

The Siemens & Halske Company has received the contract for the construction of the North-South subway, which will pass through one of the best sections of the city, particularly Friedrichstrasse, the Broadway of Berlin. The map and table also show the route of the line to be built by the Allgemeine Company as well as the mileage of all other lines, built or proposed.

Table I—Electric Elevated and Underground Railways of Berlin

Section	Construction	Placed in Operation
	Lines in Operation	
1-2-3	Subway and elevated, Potsdamerplatz-Stralau Gate.	Feb. 18, 1902
1-2-5	Subway and elevated, Potsdamerplatz-Zoological Garden	Mar. 11, 1902
3-2-5	Intermediate division, Stralau Gate-Zoological Garden	Mar. 25, 1902
3-4	Elevated, Stralau Gate-Warschauer Bridge	Aug. 14, 1902
5-6	Subway, Zoological Garden-Knie	Dec. 14, 1902
6-7-8	Subway, Knie-Wilhelmsplatz	May 14, 1906
9	Subway, Leipzigerplatz station	Sept. 28, 1907
7-10	Subway, Krummestrasse-Westend	Mar. 29, 1908
9-11	Subway, Leipzigerplatz-Spittelmarkt	Oct. 1, 1908
12-13	Subway of city of Schöneberg, Nollendorfplatz-Hauptstrasse	Dec. 1, 1910
11-14	Subway and elevated, Spittelmarkt-Alexanderplatz-Nordring	July 1, 1913
2	Elimination of Triangle	Nov. 3, 1912
	Other Electrically Operated Lines	
31-32	Berlin Municipal Suburban line (Potsdam steam railway station), Gross Lichterfelde—Ost	.....
	Latest and Proposed Elevated and Subway Lines	
10-15	Westend-Grunewald with terminal	Completed
16-17	Wittenbergplatz-Uhlandstrasse	Under construction
16-18-19	Wittenbergplatz-Kaiser Allee-Dahlem	Under construction
23-24-25	Seestrasse-Tempelhof	Construction begun Dec. 1, 1912
13-20	Hauptstrasse-Krankenhaus	Proposed
21-22	Klosterstrasse-Alexanderplatz-Frankfurter Allee	Proposed
12-26	Nollendorfplatz-Weissensee	Proposed
27-28	Moabit-Neuköln	Proposed
29-30	Gesundbrunnen-Neuköln	Proposed
2-16	Triangle-Kurfürstenstrasse-Wittenbergplatz	Proposed

RAPID TRANSIT IN NEW YORK

The original rapid transit lines of New York comprise the Second, Third, Sixth and Ninth Avenue lines in the old city of New York (Manhattan and Bronx Boroughs) and the Myrtle Avenue, Lexington Avenue, Fulton Street, Brighton Beach and Fifth Avenue lines of Brooklyn Borough. Portions of the Brighton Beach and Fifth Avenue lines were originally operated as steam railroads. The first piece of elevated railway in New York was completed in 1871 and the first piece in Brooklyn in 1885. The accompanying map shows the dates when each section was opened for operation or taken over as an extension of the city systems. The electrification of the New York and Brooklyn elevated systems began in 1902. The former comprise 118 miles of track or 37.68 miles of route, and the latter 105 miles of track or 40 miles of route.

The existing subway system, which is operated by the Interborough Rapid Transit Company, comprises 73 miles of track or 25.72 miles of route. The section under Contract No. 1, namely, City Hall, Manhattan, to 145th Street, was opened Oct. 27, 1904, and to the present terminals in the Bronx in 1906, 1907 and 1908. The section under Contract No. 2, City Hall south to the Battery and through tunnel to Brooklyn, was opened for traffic to South Ferry in 1905, and to Borough Hall and later to Atlantic Avenue, Brooklyn, in 1908. The longest 5-cent ride on the present Interborough system, Atlantic Avenue, Brooklyn, to 242d Street and Broadway, is 17.5 miles, but on the new Interborough lines the maximum 5-cent ride will be from 241st Street, White Plains, to New Lots Road, Brooklyn, a distance of 26 miles.

The accompanying Table II is a summary of the track and route mileage of the lines to be built by the city but operated by the Interborough Rapid Transit and Brooklyn Rapid Transit companies under the agreement made early in 1913 with the city of New York and the Public Service Commission, First District, State of New York. The sections indicated, as by numbers, will be found on the map. Of the lines named in the table, the Steinway tunnel and Center Street loop are ready for operation and the Fourth Avenue subway is almost completed. The Lexington Avenue and Broadway section of the Seventh Avenue subway is under construction.

This mileage will be supplemented by the construction of new lines as follows:

TABLE II—SUMMARY OF EXISTING NEW YORK LINES

	Track Mileage	Route Mileage
Interborough Rapid Transit System:		
Existing subway lines	73	25.7
Existing elevated lines	118	37.7
	191	63.4
Brooklyn Rapid Transit System:		
Existing elevated lines	105	40.0
Grand total	296	103 4

TABLE III—NEW LINES TO BE BUILT IN NEW YORK

	Track Mileage	Route Mileage
Lines for Operation by the Interborough Rapid Transit Company to Be Built Jointly by the City and the Company and Equipped by the Company		
1. Lexington Avenue line	20.6	5.2
2. River and Jerome Avenue line	18.2	6.2
3. Southern Boulevard and Westchester Avenue line	21.4	7.1
4. White Plains Road extension	13.7	4.9
5. Seventh Avenue line	15.2	4.2
6. Park Place, William and Clark Street line	4.5	2.3
7. Steinway tunnel	3.2	1.6
8. Steinway tunnel extension in Manhattan	0.8	0.4
9. Queens extension of Steinway tunnel to Queensboro Bridge Plaza	2.6	1.3
10. Astoria line	7.5	2.5
11. Corona and Woodside line	16.5	5.5
12. Eastern Parkway line	12.7	3.2
13. Nostrand Avenue line	12.7	3.2
14. Livonia Avenue line	5.1	2 6
Total	146.8	50.1
Elevated Railroad Extensions		
15. Putnam Bridge line	1.3	0.7
16. West Farms connection	3.1	0.8
17. White Plains Road connection	5.5	2.8
18. Queensboro Bridge line	0.5	0.2
Total of elevated extensions	10.4	4.5
Lines for Operation by the Brooklyn Rapid Transit Company to Be Constructed Jointly by the City and Company		
19. Broadway-Seventh Avenue subway	17.6	4.7
20. Fifty-ninth Street subway	4.5	2.2
21. Extension of Center Street loop lines subway	2.0	1.0
22. Canal Street connection	1 2	0.6
23. Connection with Brighton Beach line	2 4	1.2
24. Eastern District line	14.8	7.4
25. East River tunnel	4 0	2.0
26. Fourth Avenue subway extension	6.9	2.3
27. Fourth Avenue subway	17 0	3.9
28. Center Street loop subway	5.6	1.5
29. Connection Thirty-eighth Street, Fourth and Ninth Avenues, subway and open cut	1.9	0.9
30. New Utrecht Avenue, Thirty-ninth to Eighty-sixth Street, to Coney Island, elevated	16 5	5.5
31. Culver, Ninth Avenue to Coney Island, elevated	16.1	5.4
Total	110.41	38.6
To Be Constructed by Brooklyn Rapid Transit Company at Its Own Expense		
32. Jamaica lines	13.2	6.6
33. Myrtle Avenue (Lutheran Cemetery), Fresh Pond Road	2.0	1.0
34. Brighton Beach, open cut	2.0	1.0
35. Sea Beach, Sixty-fifth Street and Fourth Avenue to Coney Island, open cut and embankment	16.1	5.4
36. Eastern Parkway to Malbone Street, subway	1.8	0.9
37. Canal Street spur	0.24	0.1
Total	46.29	15.0

INFERIORITY OF ELECTRIC LOCOMOTIVES TO MOTOR CARS IN CITY AND SUBURBAN SERVICE

The desire of the Prussian government to electrify its Berlin city and suburban lines at the lowest first cost by using old steam trailers with electric locomotives instead of motor cars is stated to be short-sighted policy in a recent study in the *Elektrotechnische Zeitschrift* by E. C. Zehme, a well-known traction authority of Berlin. It is proposed to operate with pushing and pulling locomotives a maximum train of thirteen cars which would be split up into eight-car and five-car sections for the hours of lighter travel. The eight-car element would have two two-axle locomotives and the five-car element one three-axle locomotive. The current collectors, switching apparatus and motorman's cab are to be mounted in a car coupled behind the driving equipment. Mr. Zehme contends that the metropolitan traffic conditions of Berlin demand a system of propulsion which will give maximum capacity within the limits set by track conditions, station lengths, etc. The proposed division into eight-car and five-car trains would not give the economical flexibility of motor-car service where the number of units can be readily adjusted to service demands. Again, a locomotive train of permissible maximum length would seat only 592 passengers as compared with 662 passengers on a like motor-car train. Furthermore, the rate of acceleration of the locomotive train would be only 0.4 m per second per second (0.67 m.p.h.p.s.) compared with 0.7 m per second per second (1.53 m.p.h.p.s.) for motor cars. He points out that as the electrification does not involve any trunk-line runs, the only reason for using locomotives is the retention of the passenger cars, but this policy would defeat the very purpose of electrification, namely, maximum capacity. On the basis of superior acceleration and with due allowance for service delays the motor-car service will permit four to four and one-half trains more an hour, because the average station stops would be only 77.25 seconds instead of 86.75 seconds. Assuming forty-one maximum capacity trains per hour, the motor-car trains would carry 4500 passengers more in that time. On comparing weights, it is estimated that an empty thirteen-car train with single-phase locomotives would weigh 353 tons, whereas a single-phase motor-car train of five twin units of like capacity would weigh but 299 tons—a difference of 18 per cent. A similar motor-car train, if equipped with high-tension direct-current apparatus, would weigh 31 per cent less than the single-phase locomotive train. Mr. Zehme does not believe that the maintenance of motor cars would be higher than for the locomotives, basing this opinion on the fact that the gearless locomotives and multiple-unit cars of the New York Central & Hudson River Railroad show practically the same maintenance cost. In fact, he contends that the upkeep charge of the more complex jack-shaft locomotive is still an unknown quantity and in any event the proposed Berlin scheme of mounting the drive and control on separate vehicles would be sure to add to the cost. The great inertia of the large locomotive armatures is also a serious drawback in city service, with its frequent stops and necessarily high rate of retardation. Possibly the greatest disadvantage is that the shorter trains would depend on only one or two motors, and so be more liable to be crippled in case of motor failure.

Estimating Operating Expense and Cost of Construction

An Analytical Study of the Probable Operating Expense and Cost of Construction of a Proposed Electric Interurban Railway, as Deduced from Results Obtained from Typical Existing Lines

BY LOUIS E. FISCHER, CONSULTING ENGINEER, ST. LOUIS, MO.

In an article published in the ELECTRIC RAILWAY JOURNAL of Aug. 23, 1913, the subject of the determination of possible operating revenue for a new electric interurban railway was discussed in all its various aspects. A thorough analysis was made of the results obtained by typical existing lines, and the various principles governing the operating revenue of an electric interurban railway were deduced. It was realized, however, that to stop here would leave the subject less than half discussed, for the investor in a proposed electric railway needs information concerning two other very important points, the probable operating expense and the probable cost of construction of the line. Typical electric interurban railways can afford generalized information on these subjects as well as on that of operating revenue, and it is the purpose of this article to put such information in a form that can be easily assimilated by promoters and investors who are interested in such transportation projects.

OPERATING EXPENSE

Of the two topics mentioned above, operating expense and cost of construction, operating expense is the one that naturally in the sequence of thought follows operating revenue. The classification of this, as prescribed by the Interstate Commerce Commission in Section 20 of an act to regulate commerce, is as follows:

General accounts:

I. Way and structures.
II. Equipment.
III. Traffic.
IV. Conducting transportation.
V. General and miscellaneous.

Each of these headings is subdivided into many primary accounts, but for the sake of clearness each group of subdivisions will be taken up separately in the order of the general headings given above.

WAY AND STRUCTURES

The first general account, way and structures, is detailed by the Interstate Commerce Commission in the following manner:

Primary accounts:

(1) Superintendence of way and structures.
Maintenance of way:
Maintenance of roadway and track:
(2) Ballast.
(3) Ties.
(4) Rails.
(5) Rail fastenings and joints.
(6) Special work.
(7) Underground construction.
(8) Roadway and track labor.
(9) Paving.
(10) Miscellaneous roadway and track expenses.
(11) Cleaning and sanding tracks.
(12) Removal of snow, ice and sand.
Other maintenance of way:
(13) Tunnels.
(14) Elevated structures and foundations.
(15) Bridges, trestles and culverts.
(16) Crossings, fences, cattle guards and signs.
(17) Signal and interlocking systems.
(18) Telephone and telegraph systems.
(19) Other miscellaneous way expenses.
Maintenance of electric lines:
(20) Poles and fixtures.
(21) Underground conduits.
(22) Transmission system.
(23) Distribution system.
(24) Miscellaneous electric line expenses.
(25) Buildings and structures.
(26) Depreciation of way and structures.
(27) Other operations—Dr.
(28) Other operations—Cr.

STATISTICS OF ACTUAL OPERATING EXPENSE FOR WAY AND STRUCTURES ON TYPICAL ELECTRIC INTERURBAN RAILWAYS

Before several of these primary accounts are taken up in detail it may be interesting to ascertain whether any consistency exists in the operating expense for way and structures on various electric interurban lines. Table I has been compiled at random from typical roads now in operation:

TABLE I—SHOWING STATISTICS OF ACTUAL OPERATING EXPENSE FOR WAY AND STRUCTURES ON TEN TYPICAL ELECTRIC INTERURBAN RAILWAYS

Case	Miles of Track	Expense per Mile of Track per Annum
(1)	52	$999
(2)	128	558
(3)	83	794
(4)	180	430
(5)	45	774
(6)	170	474
(7)	222	519
(8)	67	760
(9)	122	426
(10)	46	661
Average in above cases		555
Average on 243,229 miles of steam road in 1911		1,519

The above statistics clearly bring out two points. In the first place, such a great variation in operating expense for way and structures as is shown by the typical roads cited is quite conclusive proof that we need look no farther for consistency in this item of expense. But the second point, one more surprising, is the very great comparative difference between the average expense per mile of track per annum on electric interurban railways and the similar expense on steam roads. While it is obvious that a steam-operated road, moving a great volume of heavy traffic, requires a greater expenditure of money to maintain its way and structures than does an electric road with its lighter equipment and a greatly reduced number of car-mile movements, still it does not seem logical that there should be so great a difference. The fact is that electric interurban railways are undoubtedly making less outlay than necessary for way and structures rather than that the railroads are making more than is necessary. The average age of the existing electric interurban lines is only about five or six years, and a sufficiently high standard of maintenance under such a condition has not been generally adopted. It is quite probable that even the minimum expenditure for way and structures on normal electric interurban railways under average conditions is considerably higher than the average amount in Table I.

MOST IMPORTANT PRIMARY ACCOUNTS UNDER WAY AND STRUCTURES

If it is true, as intimated in the preceding paragraph, that electric interurban railways on the average are paying less

than is advisable for way and structures, a closer examination into what ought to be the limits of expenditure under such a heading for average normal conditions would be of value at this point.

The various primary accounts outlined by the Interstate Commerce Commission under the general account, way and structures, do not all rank equally in importance so far as the aggregate amount of this account is concerned. The expenses of superintendence and depreciation are less than that of maintenance, and the items constituting the bulk of the total maintenance cost on average lines are as follows: ties; roadway and track labor; bridges, trestles and culverts, and sundry items constituting maintenance of electric lines.

It is obviously impossible to lay down the exact amounts for these several expenses, but as a result of careful study a statement of figures can be made that undoubtedly approximate the average for normal electric interurban railways serving normal territories.

The average road has 2600 ties per mile and the average life of these ties is ten years. Thus an average of 260 ties per mile of track per year must be renewed, which at an average of 70 cents per tie is equivalent to $182 per mile of track per year.

On an estimate, under average conditions, of two men and a foreman to a section of 6 miles, the least cost of roadway and track labor per mile of track per year is approximately $250.

The item of maintenance of bridges, trestles and culverts will naturally vary a great deal on different roads but will average at least $50 per mile of track per year.

Sundry items constituting maintenance of electric lines, including also the maintenance of telegraph and telephone lines, will average at least $100 per mile of track per year.

Although the allowance for depreciation is less than that for maintenance, still it forms an item of considerable size. If we proceed on the assumption that twenty years' use of rail will reduce its value from the cost of new rail to the cost of relayer, then one-twentieth of $10 per ton will represent the approximate amount to be set aside to cover the depreciation of the rail. The average electric road uses rail weighing approximately 100 tons to the mile, which then would be equivalent to a yearly depreciation of $50 per mile for rail only. If this is added to the probable depreciation of bridges and other structures, at least $100 per mile of track per year will be required for this expense.

The sum of the above estimated amounts is $682 per mile of track per year, which, as we said before, constitutes the bulk of the total cost of way and structures on the average electric interurban line. An estimate of $150 per mile of track for all other items not specifically enumerated above, including superintendence, is a very low minimum, which makes the least total cost logical and reasonable for way and structures $832 per mile of track per year.

The result of our examination, therefore, has indicated the fact that the average minimum expenditure for way and structures on normal electric interurban railways, approximately set at $832 per mile of track per year, is considerably above the average of $555 for the typical lines cited in Table I. Moreover, it is only about one-half of the similar expense on steam railroads. This estimate, be it understood, is by no means radical. It would seem, therefore, that, on the basis of the information in Table I and the above approximate figures, definite conclusions might be drawn in regard to the outlay for way and structures on electric interurban lines, and the two that appear to sum up the case best are these:

(1) That electric interurban railways are not now bearing the burden of operating costs under the heading of way and structures that they will ultimately have to bear; and

(2) That the actual expense of way and structures on the average electric road will vary between $800 and $1,000 per mile of track per year.

EQUIPMENT

The first general account for electric interurban railways under the Interstate Commerce Commission system, that of way and structures, having been disposed of, we may next turn our attention to the one following, or the equipment account. This is subdivided as follows:

Primary accounts:

(29) Superintendence of equipment.
Maintenance of power equipment:
(30) Power-plant equipment.
(31) Substation equipment.
Maintenance of cars and locomotives:
(32) Passenger and combination cars.
(33) Freight, express and mail cars.
(34) Locomotives.
(35) Service cars.
Maintenance of electric equipment of cars and locomotives:
(36) Electric equipment of cars.
(37) Electric equipment of locomotives.
Miscellaneous equipment expenses:
(38) Shop machinery and tools.
(39) Shop expenses.
(40) Horses and vehicles.
(41) Other miscellaneous equipment expenses:
(42) Depreciation of equipment.
(43) Other operations—Dr.
(44) Other operations—Cr.

STATISTICS OF ACTUAL OPERATING EXPENSE FOR EQUIPMENT ON TYPICAL ELECTRIC INTERURBAN RAILWAYS

The statistics in Table II have been prepared from ten cases indiscriminately selected from normal electric interurban railways serving normal territories:

TABLE II—GIVING ACTUAL OPERATING EXPENSE FOR EQIPMENT ON TEN TYPICAL ELECTRIC INTERURBAN RAILWAYS

Case	Car Miles Operated per Mile of Track per Year	Expense per Car Mile	Expense per Mile of Track per Year
(1)	33,756	$0.0210	$699
(2)	41,066	0.0193	790
(3)	25,478	0.0224	567
(4)	22,149	0.0233	471
(5)	20,527	0.0232	476
(6)	19,274	0.0209	402
(7)	15,856	0.0225	357
(8)	21,095	0.0203	428
(9)	18,593	0.0202	379
(10)	20,460	0.0285	582
Average	22,490	$0.0212	$482
Average on 243,229 miles of steam road in 1911			1,775

The statistics of the expense covered by the equipment account of steam roads, as indicated by the above table, are in no wise comparable to those of electric interurban railways, and the comparison serves only to show the approximate relation existing between them.

The statistics in regard to electric interurban lines indicate that 2 cents per car mile is the minimum expense for equipment and 3 cents per car mile is the maximum. The expense per car mile will, of course, depend wholly on the number of car mile movements. The ordinary electric interurban railway, rendering an hourly passenger service for the greater part of nineteen hours per day, with its additional movements in the way of trail cars, express, mail, freight and work cars, will operate between 15,000 and 20,000 car miles per mile of track per year. The result for roads rendering half-hourly service is approximately double that.

MAINTENANCE AND DEPRECIATION OF EQUIPMENT

The expenses for maintenance of way and structures and for maintenance of equipment on electric interurban railways vary considerably in amount. The maximum expense of maintaining equipment in operative condition is reached in a year or two after the equipment is put in service. Therefore well-managed lines are now bearing approximately the maximum burden of expense of maintaining equipment, while on the other hand, as stated before, a

high standard of maintenance of way and structures has not been widely adopted.

This is not the only difference that exists between the two general accounts, however, for the amount per mile of track that must be set aside for depreciation of equipment exceeds that necessary for depreciation of way and structures. The question of adequate depreciation for equipment, however, is at the present time receiving more serious consideration. In general a passenger motor car, costing approximately $10,000, will operate on an average about 50,000 miles a year. On the assumption that such a motor car after operating twenty years will have depreciated to one-third of its original value, then the annual depreciation will be approximately 3½ per cent, or $350 per year, which is equivalent to seven-tenths of a cent per car mile. When this amount of depreciation is considered in connection with the minimum expense of 2 cents per car mile derived from Table II, it is evident that we are safe in drawing this conclusion—that the average expense in connection with equipment, if proper provision is made for depreciation, is approximately 3 cents per car mile, which is equivalent in the case of the basic hourly service to from $450 to $600 per mile of track per year.

TRAFFIC

The schedule of primary accounts under the third general heading of traffic is as follows:

Traffic expenses:

(45) Superintendence and solicitation.
(46) Advertising.
(47) Miscellaneous traffic expenses.

STATISTICS FOR ACTUAL OPERATING EXPENSE FOR TRAFFIC ON TYPICAL ELECTRIC INTERUBRAN RAILWAYS

Table III has been compiled from ten cases indiscriminately selected from normal electric interurban roads serving normal territories:

Table III—Showing Actual Operating Expense for Traffic on Typical Electric Interurban Railways

Case	Cost per Mile of Track per Annum
(1)	$10
(2)	46
(3)	38
(4)	64
(5)	53
(6)	61
(7)	20
(8)	89
(9)	114
(10)	94
Average	48
Average on 243,229 miles of steam road in 1911	234

The above statistics indicate that as yet electric interurban railways have not employed extensive organizations for the purpose of developing traffic. As the electric interurban railway develops into a commercial electric railway the traffic expense will be increased. The question of the proper extent of such an organization, from an economic point of view, depends much on local conditions, but, speaking generally, we may say that electric interurban railways should maintain more extensive departments for the development of traffic than is now the practice.

In so far as it is possible to make deductions from the limited figures available in the traffic expense field, it seems that an electric interurban railway should expend from $50 to $150 per mile of track per year for the purpose of maintaining an active traffic organization to secure the available business as rapidly as possible.

CONDUCTING TRANSPORTATION

Continuing our analysis of the general accounts prescribed by the Interstate Commerce Commission for electric interurban railroads, we find that the fourth heading, that of conducting transportation, is subdivided as follows:

Primary accounts:

(48) Superintendence of transportation.

Group I—Power

(49) Power-plant employees.
(50) Substation employees.
(51) Fuel for power.

Other power supplies and expenses:

(52) Water for power.
(53) Lubricants for power.
(54) Miscellaneous power-plant supplies and expenses.
(55) Substation supplies and expenses.
(56) Power purchased.
(57) Power exchanged—balance.
(58) Other operations—Dr.
(59) Other operations—Cr.

Group II—Operation of Cars

Conductors, motormen and trainmen:

(60) Passenger conductors, motormen and trainmen.
(61) Freight and express conductors, motormen and trainmen.

Miscellaneous transportation expenses:

(62) Miscellaneous car service employees.
(63) Miscellaneous car service expenses.

Station employees and expenses:

(64) Station employees.
(65) Station expenses.

Carhouse employees and expenses:

(66) Carhouse employees.
(67) Carhouse expenses.

Signal, interlocking, telephone and telegraph systems:

(68) Operation of signal and interlocking systems.
(69) Operation of telephone and telegraph systems.
(70) Express and freight collections and delivery.
(71) Loss and damage.
(72) Other transportation expenses.

STATISTICS OF ACTUAL OPERATING EXPENSE FOR CONDUCTING TRANSPORTATION ON TYPICAL ELECTRIC INTERURBAN RAILWAYS.

Table IV, given herewith, has been compiled from statistics obtained from ten representative electric interurban railways on the subject of expense per car mile and per mile of track per year for conducting transportation:

Table IV—Giving Statistics of Actual Operating Expense for Conducting Transportation on Typical Interurban Railways

Case	Car Miles Operated per Mile of Track per Year	Expense per Car Mile	Expense per Mile of Track per Year
(1)	33,756	$0.0855	$2,672
(2)	41,060	0.0793	3,242
(3)	25,478	0.1011	2,564
(4)	22,149	0.0895	1,978
(5)	20,527	0.0841	1,702
(6)	19,274	0.0821	1,562
(7)	15,856	0.1057	1,676
(8)	21,095	0.0893	1,884
(9)	18,593	0.1059	1,977
(10)	20,460	0.0845	1,727
Average	22,490	$0.0907	$2,049
Average on 243,229 miles of steam road in 1911			3,887

The results per car mile shown by the above roads are surprisingly uniform. The expense per mile of track per year will naturally vary directly with the frequency of service.

PRINCIPAL PRIMARY ACCOUNTS FOR CONDUCTING TRANSPORTATION

The principal items making up the aggregate expense of conducting transportation are: First—All of Group I, or that composed of the various power expenses. This expense, with the improvement of the art of generating electricity and with the increase in the volume of power generated, has a downward tendency. Second—The wages of employees engaged in conducting transportation. This expense has a slow upward tendency, due to the gradual increase in wages, which possibly compensates the downward tendency in the expense of the power group. The higher expense for wages on steam roads is due to the fact that one of the greatest savings effected by electric operation over steam operation is in the lower wage paid the train crews

of electric trains as compared with train crews on steam trains. A motorman or conductor of an electric train gets approximately 1½ cents per train mile operated, while an engineer or conductor of a steam train gets about 3 cents per train mile operated.

The character of these principal items and, indeed, all the expenses of conducting transportation, and the fact that there is no depreciation charge, indicate that the operating lines are now carrying the approximate maximum burdens under this heading. It is evident from the statistics given above that the average expense of electric interurban lines for conducting transportation is about 9 cents a car mile, which is equivalent to from $1,350 to $1,800 per mile of track per year on roads maintaining a basic hourly schedule.

GENERAL AND MISCELLANEOUS

The last of the general headings designated by the Interstate Commerce Commission for electric interurban railway accounts is that of general and miscellaneous, the primary accounts under which are as follows:

Primary accounts:

General expenses.
Salaries and expenses of general officers and general office clerks.
(73) Salaries and expenses of general officers.
(74) Salaries and expenses of general office clerks.
(75) General office supplies and expenses.
(76) Law expenses.
(77) Relief department expenses.
(78) Pensions.
(79) Miscellaneous general expenses.
(80) Other operations—Dr.
(81) Other operations—Cr.
(82) Injuries and damages.
(83) Insurance.
(84) Stationery and printing.
Store and stable expenses.
(85) Store expenses.
(86) Stable expenses.
(87) Rent of tracks and terminals.
(88) Rent of equipment.

STATISTICS OF ACTUAL OPERATING EXPENSE FOR GENERAL AND MISCELLANEOUS ITEMS ON TYPICAL ELECTRIC INTERURBAN RAILWAYS

The expenses per car mile and per mile of track for general and miscellaneous items for ten typical electric interurban railways are as follows:

TABLE V—GIVING STATISTICS OF ACTUAL GENERAL AND MISCELLANEOUS OPERATING EXPENSES ON TEN ELECTRIC INTERURBAN RAILWAYS

Case	Car Miles Operated	Expense per Car Mile	Expense per Mile of Track per Year
(1)	33,756	0.0169	$561
(2)	41,066	0.0461	1,893
(3)	25,478	0.0403	1,022
(4)	22,149	0.0172	379
(5)	20,527	0.0479	887
(6)	19,274	0.0392	750
(7)	15,856	0.0199	315
(8)	21,095	0.0268	565
(9)	18,593	0.0393	718
(10)	20,460	0.0286	585
Average	22,490	0.0321	$730
Average on 243,229 miles of steam road in 1911			287

Reference to the individual items of the schedule of general and miscellaneous expenses will disclose the cause for much of the variation in this branch of operating expense in the above cases. The item of rental of tracks and terminals must of necessity introduce a very indeterminate quantity, and the other items are also readily seen to be subject to large variations. It will be noted that this general account is the only one under operating expense in which the electric roads exceed the steam roads. This condition is probably due to the fact that this account is divisible into much greater mileages on steam roads than on electric roads.

While no fixed costs can be determined as applicable to all electric interurban railways, yet from the above statistics it can be seen that an allowance of from 3 cents to 4 cents per car mile for general and miscellaneous operating expenses is adequate for the average electric road, which is equivalent to from $450 to $800 per mile of track per year for roads operating on a basis hourly schedule and using the tracks of other roads in entering terminals.

TOTAL OPERATING EXPENSE

We have now taken up one by one the five general operating expense accounts, ways and structures, equipment, traffic, conducting transportation and general and miscellaneous, and by means of an analysis of the primary accounts involved we have arrived at the decisive factors in the allowances necessary under these headings for a normal electric interurban railway serving normal territory. It would now be well to assemble these various results to obtain if possible a general deduction in regard to the total operating expense of such a line. The complete summary of the statistics for the cases already cited is given in Table VI:

TABLE VI—SHOWING A SUMMARY OF THE ACTUAL GENERAL OPERATING EXPENSES FOR THE TEN TYPICAL CASES BEFORE CITED

	Per Mile of Track per Year							
Case	Way and Structures	Equipment	Traffic	Conducting Transportation	General and Miscellaneous	Total	Car Miles Operated	Total Expense per Car Mile
(1)	$999	$699	$10	$2,672	$561	$4,950	33,756	$0.1495
(2)	558	790	46	3,242	1,893	6,521	41,066	0.1595
(3)	792	567	58	2,564	1,022	4,984	25,478	0.1965
(4)	430	471	64	1,978	379	3,322	22,149	0.1514
(5)	774	476	53	1,702	887	3,892	20,527	0.1892
(6)	474	402	61	1,562	750	3,249	19,274	0.1696
(7)	519	357	20	1,676	315	2,887	15,856	0.1821
(8)	760	428	89	1,884	565	3,726	21,095	0.1766
(9)	426	379	114	1,977	718	3,614	18,593	0.1949
(10)	661	582	94	1,727	585	3,649	20,460	0.1784
Average	$562	$482	$48	$2,049	$730	$3,872		$0.1702
Average on 243,229 miles of steam road in 1911						$7,957		

The above statistics indicate that the approximate average expense per mile of track per year for electric operation is one-half that for steam railroad operation. These statistics also show that the average expense of operating the roads represented by the above cases, under the system of accounting now in vogue, is approximately 17 cents per car mile.

GENERAL CONCLUSIONS CONCERNING THE COST OF OPERATING ELECTRIC INTERURBAN RAILWAYS

From the preceding discussion of the operating expense of existing electric interurban railways and the discussion of elements of the operating expense not now properly taken into account, the general summary of the approximate operating expense of a normal electric interurban railway shown in Table VII has been prepared:

TABLE VII—SHOWING THE ESTIMATED OPERATING EXPENSE UNDER THE GENERAL OPERATING EXPENSE ACCOUNTS FOR NORMAL ELECTRIC INTERURBAN RAILWAYS

Operating Account	Expense per Mile of Track per Year	
Way and structures	$806	$1,000
Equipment	450	600
Traffic	50	150
Conducting transportation	1,350	1,800
General and miscellaneous	450	800
Total	$3,100	$4,350

These figures of $3,100 to $4,350 for the operating expense of electric interurban railways apply to such as serve normal territories and operate a basic schedule of hourly service.

TAXES

One other important expense which an electric interurban railway has to meet and which is not included in the operating expense, that of taxes, may well be considered at this point. Taxes vary largely on different roads in different states, as illustrated by the statistics in Table VIII.

The variation in taxes per mile of road as indicated is largely due to the fact that the electric interurban railway is of modern date and no uniform valuation for the assessment of these properties has been established in the various states. The fact that the taxes on electric interurban railways are considerably below those on steam railway lines indicates that the former are likely to have a general upward tendency, until they approximately equal

Table VIII—Showing the Actual Taxes Assessed on Ten Typical Electric Interurban Railways

Case	State	Miles of Track	Total Taxes	Taxes per Mile of Track
(1)	Indiana	58.7	$11,729	$199
(2)	Indiana	32	3,870	121
(3)	Illinois	406	117,147	288
(4)	Illinois	160	51,000	318
(5)	Iowa	74	9,525	128
(6)	Ohio	222	41,312	186
(7)	Ohio	41	6,122	149
(8)	New York	180	29,289	162
(9)	Connecticut	21	7,511	357
(10)	Massachusetts	21	2,016	96
Average taxes per mile of track				$156
Average on 243,229 miles of steam road in 1911				448

those of the steam railways. As a general conclusion it may be stated that taxes on electric interurban railways will be increased, and that $250 per mile of track per year is the minimum amount that can be safely used for estimating this item.

Cost of Construction

Thus far in this article we have covered the salient points in connection with the operating expense of existing electric interurban railways and deduced the general principles underlying this operating feature for a proposed electric interurban railway. But the promoter and investor desire to know about more than operating expense, more even than the subject of the previous article, operating revenue. They are also highly concerned in the subject of cost of construction, and we shall now take up this other division of our subject and endeavor to give general estimates that may be of value to a proposed electric interurban line.

Classification of Construction Costs

Expenditures for the road and equipment of electric railways, as prescribed by the Interstate Commerce Commission in accordance with Section 20 of an act to regulate commerce, fall under three main heads:

General accounts:

I. Road.
II. Equipment.
III. General expenditures.

Each of these general headings is divided by the commission into detailed primary accounts, as follows:

Primary accounts:

I. Road:
(1) Engineering and superintendence.
(2) Right-of-way.
(3) Other land used in electric railway operation.
(4) Grading.
(5) Ballast.
(6) Ties.
(7) Rails, rail fastenings and joints.
(8) Special work.
(9) Underground construction.
(10) Paving.
(11) Track laying and surfacing.
(12) Roadway tools.
(13) Tunnels.
(14) Elevated structures and foundations.
(15) Bridges, trestles and culverts.
(16) Crossings, fences, cattle guards and signs.
(17) Interlocking and other signal apparatus.
(18) Telegraph and telephone lines.
(19) Poles and fixtures.
(20) Underground conduits.
(21) Transmission system.
(22) Distribution system.
(23) Dams, canals and pipe lines.
(24) Power-plant buildings.
(25) Substation buildings.
(26) General office buildings.
(27) Shops and carhouses.
(28) Stations, waiting rooms and miscellaneous buildings.
(29) Docks and wharves.
(30) Power-plant equipment.
(31) Substation equipment.
(32) Shop equipment.
(33) Park and resort property.
(34) Cost of road purchased.

II. Equipment:
(35) Cars.
(36) Locomotives.
(37) Electric equipment of cars.
(38) Other rail equipment.
(39) Miscellaneous equipment.

III. General expenditures:
(40) Law expenses.
(41) Interest.
(42) Injuries and damages.
(43) Taxes.
(44) Miscellaneous.

It is obvious that no fixed rule may be laid down for the amount of money to be expended by a proposed electric interurban railway for any of the above items, and they are so numerous and the outlays of the existing companies for them so varied that we shall not take the space here for the detail work leading up to our generalizations. Suffice it to say that as a result of careful study of the cost of construction of existing roads we have arrived at maximum and minimum expenditures for each item that fairly approximate the limits of outlay of a proposed electric interurban railway under average conditions. Taking up each primary account, therefore, under the number given it in the above classification, we shall state only what it covers and our estimated limits of expenditure for it.

Primary Accounts for Road Construction

What each primary account under the first main heading of road construction includes and what a promoter may figure on expending therefor is shown by the following:

(1) Engineering and superintendence:

This account covers expenditures for services of engineers, draftsmen, superintendents employed on preliminary and construction work and all expenses incidental to the work. This item will run approximately 5 per cent of the cost of the work and will vary between $1,000 and $2,000 per mile of single track.

(2) Right-of-way:

This includes the cost of land acquired for roadbed and all expenses incidental thereto, such as cost of condemnation proceedings, abutting property damages, etc. The cost of procuring right-of-way is entirely dependent on local conditions, and no set rule can be established. The right-of-way will measure 2 acres per mile for each rod in width, and a well-constructed line should be 4 to 5 rods in width, making a total of from 8 to 10 acres per mile. It may be roughly estimated that the acreage cost of right-of-way will be twice the prevailing acreage price of the adjacent land. On a line constructed through a farming country in which the land is worth $100 an acre, therefore, the right-of-way will probably cost $200 an acre, or $2,000 per mile, for 5 rods in width.

(3) Other land used in electric railway operations:

This covers the cost of land acquired for use in operating the road other than for roadbed purposes. In general, this item of cost is small and is made up almost wholly of the cost of the ground for power house and carhouse purposes. It may be roughly estimated at from $100 to $500 per mile of track.

(4) Grading:

The cost of grading the roadbed and all things incidental to the making of the roadbed, such as retaining walls, riprap, ditches for waterway, etc., comes under this heading. The amount of grading is entirely dependent upon the topography of the country traversed and the maximum gradient under which the line is built. For a well-constructed line it may be generally estimated that the grading will vary beween 10,000 cu. yd. and 20,000 cu. yd. per mile, at an average cost of from 25 cents to 30 cents per cubic yard, making the approximate limits $2,500 and $6,000 per mile of track.

(5) Ballast:

Ballast includes the cost of material used and the expenses of loading, hauling, transporting and unloading along the track. The ballast used will vary from 2000 cu. yd. to 3000 cu. yd. per mile, and the cost will vary, with the availability of the material, from 75 cents to $1.50 per cubic yard, making the approximate cost per mile of track vary between $1,500 and $4,500.

(6) Ties:

This heading includes the cost of cross, switch, bridge and other ties, and the cost of transportation, inspection, handling, and preservation, but not the final distribution. Ties will run approximately 2600 to the mile, and will vary in cost from 70 cents to $1, making the cost from $1,820 to $2,600 per mile.

(7) Rails, rail fastenings and joints:

This is similar to the above, covering the cost of rails, rail fastenings and joints, and transportation, inspection and handling, but not the final distribution. The quantity will vary with the weight of the rail used. An 80-lb. rail weighs 126 tons per mile, and a 70-lb. rail weighs 110 tons per mile. The price of the rail will be about $30 per ton. The cost of rail fastenings and joints will be about 11 per cent of the cost of the rail, so that the cost per mile for a 70-lb. rail, with fastenings and joints, will be approximately $3,700 and for an 80-lb. rail approximately $4,200.

(8) Special work:

By this is meant the cost of steam and street railway crossings, switches, turn-outs, etc., including transportation, inspection and handling, but not the final distribution. The special work expense will vary with local conditions but will usually be between $400 and $600 per mile of track.

(9) Underground construction:

This refers only to railways operated by underground electric contacts and therefore does not apply to electric interurban railways.

(10) Paving:

This embraces the cost of labor and material for paving between rails and the outside thereof, as may be required by city ordinances. As electric interurban railways generally operate over leased tracks into cities with paved streets, this item does not usually enter into the cost of constructing roads. If it does enter into the construction expense, the expense will vary in proportion to the amount of paving required.

(11) Track laying and surfacing:

The cost of distributing the track materials and of constructing the track, together with the cost of spreading the ballast and placing it under the track, are all included herein. This cost will vary from $800 to $1,200 per mile of track.

(12) Roadway tools:

This heading covers the cost of the first outfit of tools necessary to equip the maintenance of way and structures gangs for properly maintaining and repairing the property when it is opened for the handling of commercial traffic. It may be roughly estimated at $50 per mile.

(13) Tunnels:

The cost of tunneling, material used and labor expended in the construction of tunnels are factors in this account. As tunnels are rare on electric interurban railways, however, this item will not be further considered.

(14) Elevated structures and foundations:

This refers only to companies operating elevated railway systems and does not apply to electric interurban railways.

(15) Bridges, trestles and culverts:

These items include the cost of materials used and labor expended in the construction of bridges and trestles, both substructure and superstructure, erected to carry tracks over streams, ravines or the tracks of other railways, and of culverts. The expenditure here depends absolutely upon the local conditions and will show a great variation on different roads. For the general purpose of showing the approximate cost to electric interurban railways, it may be assumed to vary between $2,000 and $4,000 per mile of track.

(16) Crossings, fences, cattle guards and signs:

This account contains the cost of material used and labor expended in constructing street, road and farm crossings at grade, overhead bridges, viaducts, fences, cattle guards, etc. The cost may be roughly stated at varying between $500 and $1,000 per mile.

(17) Interlocking and other signal apparatus:

This heading covers the cost of material used and labor expended in constructing interlocking and other signal apparatus, complete. The outlay per mile will depend entirely upon the amount of signaling installed. As most roads have been constructed without the installation of any signal system, however, the cost may be said to vary from a nominal sum to $2,500 per mile.

(18) Telegraph and telephone lines:

By this heading is meant the cost of material used and labor expended in constructing telegraph and telephone lines, for use in dispatching and other business of the railway. This item will vary in cost from $100 to $500 per mile.

(19) Poles and fixtures:

This account contains the cost of poles, cross-arms, insulating pins, brackets and other pole fixtures, also other structures for supporting overhead transmission lines, and all labor expended in connection with the construction of pole lines or structures. These items will vary from $500 to $1,500 per mile in cost.

(20) Underground conduits:

This embraces the cost of material and labor expended in constructing conduits required for underground wires and cables. It does not usually enter into the construction of electric interurban railways and therefore will not be considered as a probable cost of construction.

(21) Transmission system:

The transmission system account is composed of the cost of the high-tension transmission system, including cables, wires, insulators and insulating material. The cost will vary between $500 and $1,200 per mile of track.

(22) Distribution system:

Here is included the cost of material used and labor expended in constructing the distributing system for transmission of low-tension power, including insulators and connections; track bonding and all labor incidental to the same; overhead trolley lines, including cost of trolley, guard, span, strain and other wires; the cost of the third rail and all materials used and labor expended incidental to laying the third rail. The expenditure in this case will vary from $1,500 per mile (in the case of overhead lines) to $5,000 per mile for the third rail.

(23) Dams, canals and pipe lines:

This has reference primarily to dams and canals, etc., for the utilization of water power, which, not being a usual feature in the construction of electric interurban railways, will not be further considered.

(24) Power-plant buildings:

This covers the cost of material used and labor expended in erecting buildings to be used for power generating plants, as well as the excavations, gas and water pipe connections, etc., incidental thereto. The cost here will vary between $15 and $20 per kilowatt of station capacity, which capacity

will range from 40 kw to 60 kw per mile of track, making the cost of the power house buildings from $600 to $1,200 per mile of track.

(25) Substation buildings:

This caption embraces the cost of material used and labor expended in erecting buildings for use as power substations. The cost will range between $300 and $500 per mile of track.

(26) General office buildings:

As it is unusual for electric interurban railways to own a general office building in fee, this cost will be eliminated from this discussion.

(27) Shops and carhouses:

The cost of material used and labor expended on buildings to be used as shops, sheds or carhouses, and on plants for furnishing power for heating and lighting, is included in this account, as well as the cost of construction of oil houses, sand houses and storehouses. This outlay will vary between $400 and $600 per mile of track.

(28) Stations, waiting rooms and miscellaneous buildings:

This covers the cost of material used and labor expended in the erection of stations, waiting rooms and other buildings not heretofore classified. It includes also the furniture and fixtures used to complete these buildings. This cost will run from $100 to $200 per mile of track.

(29) Docks and wharves:

As this item is not usual in electric interurban railway construction, it will not be considered further.

(30) Power-plant equipment:

By this heading is meant the cost of material and labor expended in equipping plants for generating power; the cost of engines, boilers, pumps, condensers and all equipment for generating electric current, and also the cost of foundations for any of the foregoing equipment, switchboards and all fixtures and appliances connected therewith. This item of cost will vary between $50 and $75 per kilowatt of capacity, and as the power requirements will vary from 40 kw to 60 kw per mile of track, the cost will be between $2,000 and $4,500 per mile of track.

(31) Substation equipment:

Here is embraced the cost of material used and labor expended in equipping power substations and the cost of storage batteries, transformers, rotary converters, switchboard and foundations therefor. The outlay will vary between $750 and $1,500 per mile of track.

(32) Shop equipment:

This includes the cost of machinery and tools used in shops and carhouses, including also boilers, engines, motors and all appliances and tools first necessary to equip the shops. The estimated expenditure for this account is from $150 to $300 per mile of track.

(33) Park and resort property:

The cost of property for amusement parks or resorts is herein provided for. As this is not an essential to the construction of an electric interurban railway, it will not be considered in this discussion.

(34) Cost of road purchased:

For obvious reasons this item will also be eliminated from this discussion.

PRIMARY ACCOUNTS FOR COST OF EQUIPMENT

Following out the same plan as given for the cost of road construction, we find that the information concerning the primary cost of equipment accounts may be classified as follows:

(35) Cars:

This account covers all expenditures for passenger, baggage, express, freight, mail and other cars, from the operation of which revenue is to be derived, and the car bodies, trucks, and all fixtures or appliances inside of, or attached to, the car bodies or trucks except the electric equipment of the cars. Electric interurban railways require from one car for every 5 miles operated to one car for every 3 miles operated. Cars will vary in cost from $4,000 to $8,000, and therefore the cost of this item will be between $800 a mile and $2,600 a mile.

(36) Locomotives:

This means all expenditures for locomotives, including all appurtenances, furniture, fixtures and electric equipment, necessary to fit them for service. As locomotives are not essential to the service rendered by an electric interurban railway, this item will not be considered as a necessary construction cost.

(37) Electric equipment of cars:

This includes all expenditures for electrical equipment and wiring of all cars of whatsoever nature. The outlay for this will vary from $3,000 to $5,000 per car and from $600 to $1,600 per mile of track.

(38) Other rail equipment:

Herein are grouped all expenditures for water cars, sprinkling cars, sand cars, salt cars, supply cars, and other work cars; also snow plows, sweepers and scrapers. This cost will vary between $200 and $500 per mile.

(39) Miscellaneous equipment:

This account contains all expenditures for horses, wagons, harness, automobiles and other road equipment. As the expenditures under this item are relatively small, the cost is considered negligible and is therefore eliminated.

PRIMARY ACCOUNTS FOR GENERAL CONSTRUCTION EXPENDITURES

The various primary accounts prescribed by the Interstate Commerce Commission for general expenditures in connection with construction are as follows, with our estimate of cost for each item:

(40) Law expenses:

By these are meant expenditures for counsel, solicitors and attorneys, their clerks and attendants and expenses of their offices, together with all incidental legal expenses during the construction of the road. This cost will run from $200 to $500 per mile of track.

(41) Interest:

This includes the interest on the moneys used incidental to, and during the period of, construction but does not include discounts and commissions on securities issued for construction purposes. This will vary from $1,000 to $2,000 per mile of track.

(42) Injuries and damages:

This account covers all expenses incidental to injuries to persons or damages to property caused directly in connection with the construction of the road and equipment. The expenditure necessitated here will lie between $100 and $200 per mile of track.

(43) Taxes:

This embraces all taxes and assessments levied and paid on the company's property while under construction. This outlay usually amounts to very little and is estimated at from $50 to $100 per mile of track.

(44) Miscellaneous:

Under this caption are grouped all organization expenses, including the payment of all organization fees, the cost of preparing certificates of stocks and bonds, the payment of trustees' fees, expenses incurred in the disposal of securities, salaries and expenses of executive and general officers of a road under construction and general office clerks, rent of office space, and all items of special and incidental nature which cannot properly be charged to any other account in this classification. The cost here will vary from $500 to $1,000 per mile of track.

SUMMARY OF CONSTRUCTION COSTS

In the above discussion we have taken up one by one the primary road, equipment and miscellaneous construction accounts and given for each one what we deemed to be fair maximum and minimum limits of expenditure for a proposed electric interurban railway under average conditions. It might be to the reader's advantage now briefly to summarize these estimates in table form, in order that he may see

at a glance their sum total and relative weights. This information is accordingly presented in Table IX.

TABLE IX—SHOWING A SUMMARY OF THE PRIMARY CONSTRUCTION COSTS PREVIOUSLY CITED FOR A PROPOSED ELECTRIC INTERURBAN RAILWAY

	Accounts	Cost per Mile of Track Minimum	Maximum
(1)	Engineering and superintendence	$1,000	$2,000
(2)	Right-of-way	2,000	4,000
(3)	Other land used in electric railway operations	100	500
(4)	Grading	2,500	6,000
(5)	Ballast	1,500	4,500
(6)	Ties	1,820	2,600
(7)	Rails, rail fastenings and joints	3,700	4,200
(8)	Special work	400	600
(9)	Underground construction	...	...
(10)	Paving	...	...
(11)	Track laying and surfacing	800	1,200
(12)	Roadway tools	50	50
(13)	Tunnels	...	...
(14)	Elevated structures and foundations	...	...
(15)	Bridges, trestles and culverts	2,000	4,000
(16)	Crossings, fences, cattle guards and signs	500	1,000
(17)	Interlocking and other signal apparatus	...	2,500
(18)	Telegraph and telephone lines	100	500
(19)	Poles and fixtures	500	1,500
(20)	Underground conduits	...	...
(21)	Transmission system	500	1,200
(22)	Distribution system	1,500	5,000
(23)	Dams, canals and pipe lines	...	...
(24)	Power-plant buildings	600	1,200
(25)	Substation buildings	300	500
(26)	General office buildings	...	...
(27)	Shops and carhouses	400	600
(28)	Stations, waiting rooms and miscellaneous buildings	100	200
(29)	Docks and wharves	...	...
(30)	Power plant equipment	2,000	4,500
(31)	Substation equipment	750	1,500
(32)	Shop equipment	150	300
(33)	Park and resort property	...	...
(34)	Cost of road purchased	...	...
(35)	Cars	800	2,600
(36)	Locomotives	...	...
(37)	Electric equipment of cars	600	1,600
(38)	Other mail equipment	200	500
(39)	Miscellaneous equipment	...	...
(40)	Law expenses	200	500
(41)	Interest	1,000	2,000
(42)	Injuries and damages	100	200
(43)	Taxes	50	100
(44)	Miscellaneous	500	1,000
	Total	$26,720	$58,650

GENERAL CONCLUSIONS CONCERNING COST OF CONSTRUCTION

The summary in the above table shows that the probable limits of cost for the construction of electric interurban railways are $26,720 and $38,650. These figures clearly indicate the possible wide variation of such expenditures. The approximate average cost of constructing existing electric interurban railways that are in the category of what are herein called normal electric interurban railways was about $35,000 per mile. It is true, on the other hand, that there are a number of roads, also qualifying as normal roads, which cost less than the minimum shown in the summary in Table IX, due perhaps to the lack of sufficient car equipment, of power plant buildings or equipment, or of any other elements of construction. Such a low construction cost might also be caused by the company having been subsidized by monetary subscriptions, free right-of-way or other benefits. At any rate, the figures for the average case are those given above, and they should prove enlightening to those who are laboring under the erroneous impression that electric interurban railways can be built for insignificant amounts.

We have endeavored thus far to obtain by a study of existing electric interurban railways general figures for construction costs that will be of value to the layman interested in such projects. These figures are not definite, however; they cannot be, for it is difficult to give even an approximate statement with regard to the cost of building a proposed line unless a full knowledge has been obtained of the constructional elements entering therein and of the requirements for power and car equipment. As in the case of determining operating revenue, it would be best to leave it to a competent expert, of good judgment, to estimate this cost of construction, yet we believe that if the layman makes a proper study of conditions surrounding the projected enterprise, he will be aided in judging its worth by a reference to Table IX to find out the maximum and minimum limits for normal roads fully equipped with the necessary power stations and cars and operating in normal territory. He must distinctly bear in mind, however, that none of these conclusions refers to abnormal lines serving abnormal territory. In fact, many short electric roads have been constructed with light rail and equipment for astonishingly low costs, but usually the advantage of the low cost of construction has been offset by the high cost of operation.

FURTHER DISCUSSION

In this and the preceding article we have been discussing proposed electric interurban railways from the three general standpoints of operating revenue, operating expense and cost of construction, and from the experience of existing lines we have carefully compiled statistics in regard to these subjects that should be of value to both promoter and investor. The time has now come for us to get a bird's-eye view of all these factors combined. The last article, therefore, will bring this about by stating the general economic relations that exist between these three topics previously discussed and by means of a hypothetical case will show the application of the principles and figures heretofore deduced.

MAINTENANCE ON THE PACIFIC ELECTRIC

Through the courtesy of the Pacific Electric Railway, Los Angeles, the following statistics are published of cost of maintenance of car equipment on that system. Data are also published upon the monthly averages of car failures, the cost of lubricating all cars and wheel mileage.

TABLE I, SHOWING AVERAGE COST OF MAINTENANCE OF EQUIPMENT PER CAR MILE, ETC.

	1907 Cents	1908 Cents	1909 Cents	1910 Cents	1911 Cents
Average cost of power for operating cars, per ton mile	0.1196	0.1420	0.1208	0.1125	0.1096
Average cost of maintenance of passenger cars, other than electrical equipment, per car mile	2.22	2.30	2.12	1.69	1.51
Average cost of maintenance of electrical equipment for all cars, per car mile	1.46	1.57	1.21	1.28	.92
Average cost of maintenance of electrical equipment for motor cars only, per car mile	1.60	1.64	1.33	1.52	1.03

TABLE II, SHOWING MONTHLY AVERAGES OF CAR FAILURES

	Cars Operated		Failures		Mileage	
Year	Total	Per Failure	Total	Per Cent of Cars Operated	Total	Per Failure
1907	9,948	31	314	3.15	1,246,580	3,970
1908	9,431	86	109	1.15	1,166,409	10,701
1909	9,367	123	76	0.81	1,203,232	15,832
1910	9,943	192	52	0.52	1,356,056	26,078
1911	9,994	158	63	0.63	1,665,783	26,441
1912	15,282	163	94	0.62	2,077,118	22,097

TABLE III, SHOWING COST OF LUBRICATING ALL CARS

Year	Total Mileage, All Cars	Cost Material Total	Cost Material Per 1000 Car Miles, Cents	Cost Labor Total	Cost Labor Per 1000 Car Miles, Cents	Cost of Labor and Material Total	Cost of Labor and Material Per 1000 Car Miles, Cents
1907	.....	...	1.4054	....	1.0061	.....	2.4115
1908	10,467,391	$6,475	0.6186	$8,108	0.7746	$14,583	1.3932
1909	11,976,222	7,256	0.6059	7,910	0.6605	15,166	1.2664
1910	14,316,722	6,110	0.4267	7,036	0.4915	13,146	0.9182
1911	19,699,081	7,607	0.3862	7,593	0.3855	15,200	0.7717
1912	29,892,269	12,946	0.3996	10,639	0.3559	23,586	0.7555

Note.—Averages for 1907 based on statistics for last six months of year, no figures being available preceding July, 1907.

TABLE IV, SHOWING MONTHLY AVERAGES OF CAR WHEELS SCRAPED AND MILEAGE MADE BY THEM

Make and Description	1909 No.	1909 Average Mileage	1910 No.	1910 Average Mileage	1911 No.	1911 Average Mileage	1912 No.	1912 Average Mileage
Manufacturer "A":								
30-in. single-plate	53.1	40,998	37.5	46,904	6.3	23,518	1.1	32,074
30-in. double-plate	52.7	41,118	40.7	45,447	57.6	44,914	40.9	56,051
33-in. double-plate	81.4	37,830	41.1	44,389	25.3	36,896	23.3	48,904
Manufacturer "B":								
33-in. double-plate	23 0	37.685	74.4	41.104	38.7	45,910	.3	22,819
30-in. double-plate	2.4	35,214	10.7	52,515	6.8	72,138	4.4	68,129
30-in. single-plate	1.2	35,339	6.2	45,780	...	.....	9.7	53,842
33-in. double-plate	...	.....	...	.....	...	.....	2.4	43,275
Total	213.8	38,031	210.6	46,023	134.7	43,257	82.1	53,615
Wheels with incomplete mileage record	15.6	.....	43.0	.....	74.5	.....	90.4	.....
Total number wheels scraped	229.3	.....	253.6	.....	210.5	.....	172.7	.....

Program for A. E. R. A. Convention

The Program for the Meetings of the American Electric Railway Association and Its Affiliated Organizations Has Been Made Public, and This Is Presented in Full

The annual convention of the American Electric Railway Association and its affiliated organizations will be held at Young's Pier in Atlantic City, N. J., Oct. 13-17, 1913. The meetings of the several associations will take place in accordance with the following program, the meeting place for each association being included with its individual program. All sessions of the American Association are without exception to be open to persons interested in the proceedings. The programs as published are, of course, subject to minor revisions, and in some cases they are incomplete. Any changes or additions which may be made will therefore be announced in later issues of the Electric Railway Journal.

Program of American Association

Meetings will be held in the Greek Temple, Convention Pier.

Tuesday, Oct. 14

9:30 a. m. to 12:30 p. m.

Registration and distribution of badges at booth, entrance to Young's Million-Dollar Pier.

2 p. m. to 5 p. m.

Annual address of president.
Annual report of executive committee.
Annual report of secretary-treasurer.
Announcements.
New business.
Reports of committees:
- (a) Subjects—James D. Mortimer, chairman, Milwaukee Electric Railway & Light Company.
- (b) Membership (Company)—Richard McCulloch, chairman, United Railways of St. Louis.
- (c) Membership (Individual)—John L. O'Toole, chairman, Public Service Railway.
- (d) Education—Prof. H. H. Norris, chairman.

Addresses on "Valuation."
- (a) "Physical Valuation." Speaker to be announced later.
- (b) "Franchise Values," Frank Bergen, Public Service Corporation of New Jersey.
- (c) "Other Elements of Value," C. M. Rosecrantz, Milwaukee Electric Railway & Light Company. University of Michigan."

Wednesday, Oct. 15

2 p. m. to 5 p. m.

Appointment of nominating committee.
Reports of committees:
- (a) Insurance—H. J. Davies, chairman, Cleveland Railway.
- (b) Public Relations—Thomas N. McCarter, chairman, Public Service Railway.
- (c) *Aera* Advisory—C. Loomis Allen, chairman, Newport News & Old Point Railway & Electric Company.

Address, "Publicity Work in Detroit," by A. B. Van Zandt, Detroit United Railway.
- (d) Welfare of Employees—J. J. Burleigh, chairman, Public Service Railway.

Addresses on "Profit Sharing with Employees"—
- (a) W. F. Ham, Washington Railway & Electric Company.
- (b) David W. Ross, Interborough Rapid Transit Company.

Reports of special committees:
- (a) Electrolysis—Calvert Townley, chairman, Lackawanna & Wyoming Valley Rapid Transit Company.
- (b) Company Sections—C. N. Duffy, chairman, Milwaukee Electric Railway & Light Company.
- (c) Gold Medal—E. C. Foster, chairman, Manchester Traction, Light, Heat & Power Company.
- (d) Constitution and By-laws—C. L. Henry, chairman, Indianapolis & Cincinnati Traction Company.
- (e) Relations with Sectional Associations—C. L. Henry, chairman, Indianapolis & Cincinnati Traction Company.

Address on "The Relations of Carriers to the Development of the Territory They Serve," by Paul Shoup, Pacific Electric Railway.
Address on "The Relief of City Congestion by the Construction of Subways and Viaducts," by C. S. Sergeant, Boston Elevated Railway.

Thursday, Oct. 16

2 p. m. to 5 p. m.

Reports of committees:
- (a) Compensation for Carrying United States Mail—T. H. Tutwiler, chairman (resigned), Memphis Street Railway.
- (b) Taxation Matters—C. L. S. Tingley, chairman, American Railways Company.
- (c) Federal Relations—Arthur W. Brady, chairman, Union Traction Company of Indiana.
- (d) Joint Use of Poles—W. J. Harvie, chairman, Hagerstown & Frederick Railway.
- (e) Cost of Passenger Transportation Service—James D. Mortimer, chairman, Milwaukee Electric Railway & Light Company.

Address, "Electric Railway Securities from the Investor's Viewpoint," by C. W. Beall, Harris, Forbes & Company, New York.

Addresses on "Present Tendency of Public Utility Laws and Regulations"—
- (a) Frank Hedley, Interborough Rapid Transit Company.
- (b) C. L. S. Tingley, American Railways Company.
- (c) Richard McCulloch, United Railways Company of St. Louis.

Report of the committee on nominations.
Election of officers.
Installation of officers.
Resolutions.
Unfinished business.
Adjournment.

Program of Accountants' Association

Regular meetings will be held in Accountants' Hall, on second floor of Convention Pier.
Joint meetings with Engineering Association will be held in Engineers' Hall, Convention Pier.
Joint meetings with Transportation & Traffic Association will be held in Greek Temple, Convention Pier.

Monday, Oct. 13

2 p. m. to 5 p. m.

Registration and distribution of badges at booth, entrance to Young's Million-Dollar Pier.

Tuesday, Oct. 14

9:30 a. m. to 12:30 p. m.

Annual address of president.
Annual report of executive committee.
Annual report of secretary-treasurer.
Reports of committees:
- (a) Education—F. J. Pryor, Jr., chairman, American Railways Company.

(b) Destruction of Records—H. S. Swift, chairman, Toledo Railways & Light Company.

Paper, "Sinking Funds," by W. H. Forse, Jr., Union Traction Company of Indiana.

(c) Standard Classification of Accounts—H. L. Wilson, chairman, Boston Elevated Railway Company.

(d) To Represent Association at Convention of Railway Commissioners—W. F. Ham, chairman, Washington Railway & Electric Company.

Appointment of committees:

(a) Resolutions.

(b) Nominating.

New business.

1 p. m.

"Get Together" Luncheon, Marlborough-Blenheim Hotel.

Wednesday, Oct. 15

9:30 a. m. to 12:30 p. m.

Joint session with the Transportation & Traffic Association.

Reports of committees:

(a) Prepayment car operation (Accountants' Association), M. R. Boylan, Public Service Railway; and Fares and Transfers (Transportation & Traffic Association), F. T. Wood, chairman, New York Railways.

(b) Express and Freight Traffic—F. D. Norviel, chairman, Union Traction Company of Indiana.

(c) Express and Freight Accounting—Walter Shroyer, Union Traction Company of Indiana, and J. K. Choate, J. G. White Management Corporation, co-chairmen.

(d) Statistical Unit for Car Operation—C. H. Lahr, Northern Ohio Traction Company, and C. B. Buchanan, Virginia Railway & Power Company, co-chairmen.

(e) Best Methods of Collecting and Accounting for Variable Rates of Fare (acting with the Committee on Determining the Cost Passenger Transportation Service), M. R. Boylan, chairman, Public Service Railway.

Address, "Factors Affecting the Cost of Passenger Service," by Edwin Gruhl, Milwaukee Electric Railway & Light Company.

Thursday, Oct. 16

9:30 a. m. to 12:30 p. m.

Joint session with Engineering Association.

Reports of joint committees:

(a) Engineering Accounting—F. B. Lasher, Republic Railway & Light Company, and J. H. Hanna, Capitol Traction Company, co-chairmen.

Address, "Engineering Accounting." Speaker to be announced later.

(b) Life of Railway Physical Property—R. N. Wallis, Fitchburg & Leominster Street Railway, and Martin Schreiber, Public Service Railway, co-chairmen.

Address, "Life of Railway Physical Property." Speaker to be announced later.

Friday, Oct. 17

9:30 a. m. to 12:30 p. m.

Reports of committees:

(a) Interline Accounting—L. T. Hixson, chairman, Terre Haute, Indianapolis & Eastern Traction Company.

Paper, "A Unit Cost Work Order System," by G. W. Kalweit, Milwaukee Electric Railway & Light Company.

Paper, "Accounting Department Conferences," by F. B. Lasher, Republic Railway & Light Company.

(b) Co-operating with the United States Bureau of the Census—A. L. Linn, Jr., chairman, Harrison Williams, New York.

Address, "The Census of Electric Railways," by William M. Steuart, United States Bureau of the Census.

(c) Overhead Charges—P. S. Young, chairman, Public Service Railway.

Address "Overhead Charges," by Henry Floy, New York.

Report of committee on resolutions.

Report of nominating committee.

Election of officers.

Installation of officers.

Adjournment.

PROGRAM OF ENGINEERING ASSOCIATION

As in 1911 and 1912, there are to be no afternoon sessions, except on Monday, and the large amount of work to come before the convention will, therefore, require all meetings to be started promptly at scheduled hour. The afternoons of Tuesday, Wednesday, Thursday and Friday will be available for the inspection of exhibits.

All regular and joint sessions will be held in Engineers' Hall, Convention Pier.

Monday, Oct. 13

9:30 a. m. to 12:30 p. m.

Registration and distribution of badges at booth, entrance to Young's Million-Dollar Pier.

2 p. m. to 5:30 p. m.

Annual address of president.

Annual report of executive committee.

Annual report of secretary-treasurer.

Appointment of convention committees.

Reports of committees:

(a) Standards, Section A, covering matters relative to changes in procedure for the adoption of standards and preparation of the engineering manual, Paul Winsor, chairman, Boston Elevated Railway Company.

(b) Power Distribution—G. W. Palmer, Jr., chairman, Bay State Street Railway Company.

(c) Standards. (On recommendations contained in above report.)

(d) Electrolysis—Prof. A. S. Richey, chairman.

Tuesday, Oct. 14

9:30 a. m. to 11 a. m.

Joint session with Transportation & Traffic Association

Reports of committees:

(a) Block Signals—J. M. Waldron, chairman, Interborough Rapid Transit Company, and C. D. Emmons, vice-chairman, Chicago, South Bend & Northern Indiana Traction Company.

(b) Joint Sub-committee of Committee on Block Signals and Rules—J. M. Waldron and F. A. Boutelle, co-chairmen.

(c) Train Operation (City)—H. H. Adams, Chicago Railways Company, and W. H. Sawyer, Ford, Bacon & Davis, co-chairmen.

(d) Train Operation (Interurban)—E. C. Faber, chairman, Aurora, Elgin & Chicago Railroad Company.

Wednesday, Oct. 15

9:30 a. m. to 1:30 p. m.

Appointment of committee on nominations.

Reports of committees:

(a) Buildings and Structures—R. H. Pinkley, chairman, Milwaukee Electric Railway & Light Company.

(b) Standards. (On recommendations contained in above report.)

(c) Heavy Electric Traction—E. R. Hill, chairman; consulting engineer, New York.

(d) Power Generation—B. F. Wood, chairman, Pennsylvania Railroad.

Thursday, Oct. 16

9:30 a. m. to 1:30 p. m.

In part a joint session with Accountants' Association—See program of Accountants' Association

At conclusion of joint session—

Reports of committees:

(a) Way Matters—J. M. Larned, chairman, Pittsburgh Railways.

(b) Standards. (On recommendations contained in above report.)

Friday, Oct. 17

9:30 a. m. to 1:30 p. m.

Reports of committees:

(a) Equipment—F. R. Phillips, chairman, Pittsburgh Railways.

(b) Standards. (On recommendations contained in above report.)

(c) Education—William Roberts, representative, Northern Ohio Traction & Light Company.

General business.

Report of the committee on nominations.

Election of officers.

Installation of officers.

Adjournment.

PROGRAM OF CLAIMS ASSOCIATION

Meetings will be held on the second floor of Entrance Hall

Monday, Oct. 13

9:30 a. m. to 12:30 p. m.

Registration and distribution of badges at booth, Young's Million-Dollar Pier.

2:30 p. m. to 5:30 p. m.

Annual address of president.

Annual report of executive committee.

Annual report of secretary-treasurer.

Reports of special committees.

Appointment of convention committees.

Paper, "Mechanical Devices for Preventing Accidents," by John J. Reynolds and M. P. Spillane, Boston Elevated Railway.

General discussion.

Paper, "The Investigation of Street Railway Accident Cases," by W. P. Christiansen, Chicago Railway Company.

Tuesday, Oct. 14

9:30 a. m. to 1 p. m.

Paper, "The Prevention of Accidents," by H. V. Drown, Public Service Railway.

Written discussion:

(a) P. C. Nickel, New York Railways.

(b) E. H. Odell, Pacific Coast Claim Agents' Association.

Paper, "The Value of Safety Committees," by George Carson, Puget Sound Traction, Light & Power Company.

Written discussion:

(a) R. E. MacDougall, New York State Railways.

(b) H. K. Bennett, Fitchburg & Leominster Street Railway.

Wednesday, Oct. 15

9:30 a. m. to 12:30 p. m.

Paper, "Motor Vehicles," by M. B. Bracken, United Railways of St. Louis.

Written discussion:

(a) C. G. Rice, Pittsburgh Railways.

(b) W. F. Weh, Cleveland Railway.

(c) James R. Pratt, United Railways & Electric Company, Baltimore, Md.

Paper, "Adjustment of Accident Claims," by F. D. Edmunds, Interborough Rapid Transit Company.

General discussion.

General business.

Reports of convention committees.

Reports of nominating committees.

Election of officers.

Installation of officers.

Adjournment.

PROGRAM OF TRANSPORTATION & TRAFFIC ASSOCIATION

Regular sessions will be held in the Greek Temple, Convention Pier.

Joint sessions with Accountants' and Claims Associations in the Greek Temple, Convention Pier.

Joint sessions with Engineering Association in Engineers' Hall, Convention Pier.

Monday, Oct. 13.

9:30 a. m. to 12:30 p. m.

Registration and distribution of badges at booth, entrance to Young's Pier.

2:30 p. m. to 5:30 p. m.

Annual report of the executive committee.

Annual report of the secretary-treasurer.

Resolutions.

Appointment of convention committees.

Reports of special committees.

Reports of regular committees.

(a) Individual Membership—L. C. Bradley, chairman; Stone & Webster Companies, Texas District.

(b) Uniform Definitions—M. C. Brush, chairman, Boston Elevated Railway.

(c) Rules (Consolidated), excepting that portion relative to block signal rules, which will be presented at joint session of Tuesday—F. A. Boutelle, chairman.

Tuesday, Oct. 14.

9:30 a. m. to 12:30 p. m.

Joint session with Engineering Association—See program of Engineering Association.

Wednesday, Oct. 15.

9:30 a. m. to 12:30 p. m.

Joint session with Accountants' Association—See program of Accountants' Association.

Appointment of committee on nominations.

Thursday, Oct. 16.

9:30 a. m. to 12:30 p. m.

Reports of committees:

(a) Construction of Schedules and Timetables—J. E. Duffy, chairman, New York State Railways.

(b) Training of Transportation Employees—C. B. Wells, chairman, Denver City Tramway.

(c) Passenger Traffic—J. E. Gibson, chairman, Kansas City Railway & Light Company.

Address, "Regulations on Sanitation, as Relating to Public Carriers." Speaker will be announced later.

General business.

Report of nominating committee.

Election of officers.

Installation of officers.

Adjournment.

Secretary McConnaughy of the American Electric Railway Manufacturers' Association is making arrangements for a stereopticon in the main building of the entrance to the pier. This will be used for bulletin purposes, for making announcements when papers and reports will be read, and for paging people. Any manufacturer who has moving picture films may make arrangements to run them during certain parts of the day.

The method of registration is being carefully studied with a view to improvement, and it is expected that the secretary's office shortly will send out a definite announcement regarding a new and simple method of registration. No doubt the registration will begin on Friday, Oct. 10, and will be carried through Saturday and Sunday prior to the opening of the convention. This, it is expected, will materially reduce the congestion which is likely to occur on Sunday and Monday.

COMMUNICATION

A QUESTION OF NAMES

SAN FRANCISCO, Aug. 28, 1913.

To the Editors:

With reference to the last paragraph of Mr. Murray's communication dated Aug. 16, in your issue of Aug. 23, I am perfectly willing to be classed in agreement with Mr. Murray, provided he and other single-phase enthusiasts do not lose sight of the essentials. Those who have found themselves reluctantly obliged to report adversely on the use of single-phase railway apparatus have been unanimous, so far as I have ever been able to ascertain, in their opinions as to the almost ideal simplicity of its distribution system. They have not been able, however, to shut their eyes to some very expensive disadvantages of the single-phase railway motor, by which is now meant a motor of the type in use on the locomotives of the New Haven railroad for example, namely, the single-phase commutator motor—a motor that will run as well, if not better, on direct current than it does on the single-phase current furnished it in normal operation.

Those of us who have been privileged to study the performance of locomotives equipped with polyphase induction motors—and by performance I mean their economic results as well as their technical performances—have been equally unanimous, I think, in approval thereof and have recognized that the great drawback to such installations, particularly in mountain electrification, has been the necessity for a double contact-wire system.

I have not yet heard of anyone who has not been enthusiastic when told of the possibilities now being realized, so far as I know for the first time, in the Norfolk & Western electrification, namely, a system that combines the advantages and eliminates the main disadvantages of both the single-phase and the polyphase systems of propulsion. Whatever our enthusiasm may be, we shall not be at all disposed to sit back quietly if in the future such installations as the last named are held up as demonstrations of the success of what has been known for some years as the "single-phase system" *of propulsion*. Easily, by inference, the hybrid, if not correctly named, can be claimed as the system to which certain advocates of the "single-phase system" have loyally and enthusiastically and consistently given their support, and equally by implication it can be made to reflect on the professional judgment of those who just as honestly and consistently and earnestly have opposed the use of the "single-phase system," so-called. By all means, let us unite in acknowledging the good points of all systems and in taking advantage of their combined possibilities, but let us be decent enough to call things by their right names, if not for the sake of our own reputations, in justice to those from whom we have differed honestly. And the surest way to "start something," as Mr. Murray says, is to appear to be unfair in an engineering discussion, where facts and facts only are legitimately employed.

After all, is not this a case for the standards committee of the American Institute of Electrical Engineers, where reason and logic rather than personal feelings will rule?

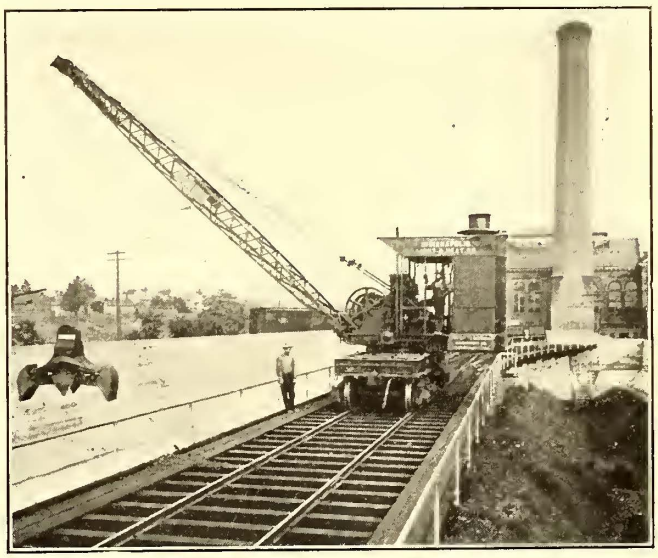
A. H. BABCOCK.

By replacing the 110-volt d.c. inclosed arc lamps with 250-watt Mazda lamps, the shops of the Memphis (Tenn.) Street Railway have been able to show a saving of 50 per cent in current consumption and at the same time are obtaining a more satisfactory general illumination. There is a marked absence of the shadows and flickering which characterized the illumination of the former light and which were a detriment in shop work. Each Mazda lamp is provided with a Holophane metal shade, the whole being mounted on the bracket formerly used for the arc lamps.

SUBMERGED COAL STORAGE IN CONCRETE PIT

A submerged type of coal-storage plant has recently been erected by the Indianapolis (Ind.) Light & Heat Company to prevent spontaneous combustion. The storage capacity of 30,000 tons is ample to provide against coal storage due to strikes, car shortage, etc. The plant consists of a large concrete pit, as shown in the accompanying illustration, 300 ft. long by 100 ft. wide and 28 ft. deep. It is 18 ft. below ground level, having a 10-ft. wall rising above the ground. Below the ground the wall slopes at an angle of 45 deg., in order to reduce the cost of construction. This slope makes the pit 72 ft. wide by 272 ft. long on the bottom. The concrete is from 12 in. to 18 in. thick and is reinforced throughout with twisted ½-sq. in. rods to withstand any pressure from water that may rise in the gravel around the pit.

A row of concrete piers placed on 15-ft. centers extends lengthwise through the middle of the pit. These piers support a trestle with a standard-gage track. A 15-ton Brownhoist locomotive crane travels back and forth on this trestle and handles the coal on both sides with a Brownhoist 2-yd. coal grab-bucket, suspended on a 40-ft. boom. The crane and bucket are operated by one man from his



Locomotive Crane with Coal Grab-Bucket at Storage Pit

stand in the cab. As the crane is self-propelled and equipped with M. C. B. trucks, couplers and steam brake, it does the switching of the cars off and on the trestle. The coal cars are run out on the trestle with the crane and dumped, and when the coal is required in the power house it is loaded into cars by the crane and is then carried to the boilers.

Forty-pound rails are embedded in the bottom of the pit, on 18-in. centers, with ½ in. of the head standing above the surface of the concrete. When the grab-bucket is working on the bottom of the pit the rails prevent the bucket from striking the concrete. When the pit is filled with water up to the ground level 13,000 tons of coal are covered. The water is pumped from the power house supply well into the pit by a 4-in. centrifugal pump and enters the pit at the ground level. A trough 12 ft. wide and 1ft. deep through the center of the pit and beneath the trestle is fitted with a drain pipe which carries the water to either of two manholes, one at each end of the pit. The outlet openings are protected by grating to prevent any coal from entering the drain pipe.

The pit was designed by Thomas A. Wynne, vice-president of the company, and was built under his supervision. The locomotive crane and bucket were furnished by the Brown Hoisting Machinery Company, Cleveland, Ohio.

LONDON LETTER

(From Our Regular Correspondent)

The select committee appointed by the House of Commons to inquire into London traffic dangers has issued its report. The committee recommends the creation of a new traffic branch of the Board of Trade to be the chief traffic authority for London, which authority would combine the duties hitherto undertaken by the Home Office, the Board of Trade and the Local Government Board and would advise Parliament in all metropolitan traffic matters. It recommends also that the veto of borough councils in regard to tramway schemes be replaced by a full hearing before the new Traffic Board, which shall report to Parliament; that the county councils have the widest possible powers of making by-laws, subject to confirmation by the new department; that public motor vehicles be brought under closer control; that the licensing of motor cabs and omnibuses be transferred to the county and county borough councils, subject to a right of appeal to the new board; that special speed limits for omnibuses and other heavy traffic be imposed; that closer control of traffic be exercised by the police; that means be taken to relieve the congestion caused by tramways with dead-end terminals, and that measures be taken to warn school children and their parents about street dangers. It is suggested that the traffic board consist of a small number of specially qualified persons not necessarily government officials. The committee also recommends that the traffic board retain expert advisers and that the board be empowered to fix special speed limits for motor omnibuses and all motor traffic. The committee points out the necessity for a uniform system of signals between drivers. It suggests that the use of horns be restricted and that dazzling headlamps be prohibited in lighted streets. It suggests that the London County Council be empowered to run omnibuses to link up its tramways. As many streets would probably require widening, it is suggested that subways be constructed to contain tramways. The number of fatal street accidents in London has steadily increased from 155 in 1904 to 537 in 1912.

The report of the select committee has not met with the approval of the London omnibus companies, the officers of which feel that their rights are jeopardized by the recommendations contained in the report. The chairman of the New Central Omnibus Company is reported to have stated that little else could be expected from a committee which consisted of an ex-chairman of the London County Council, an ex-chairman of the tramway committee of the London County Council, an ex-chairman of the tramway committee of the Manchester Town Council, and other county councilors. He is even reported as having charged that the members of the committee are municipal traders who desire the tramways to have a monopoly. The report is also being criticised by the members of the borough councils, who claim that the recommendations which have been made are impracticable. The report states that the system of paying drivers of motor buses by mileage tends to induce drivers to make speed regardless of traffic conditions. It is suggested that the men be paid by the day.

In the annual report of the Aberdeen tramways department reference is made to the pay-as-you-enter system which has been in service on ten cars for some months. It is stated that the public has become accustomed to the cars, that there is no congestion or delay through the prepayment of fares, and that there have been no rear platform accidents. The receipts have increased steadly, owing undoubtedly to the prepayment of fares.

The report of the Wolverhampton Corporation Tramways, the only tramways in England which are operated by the Lorain surface contact system, has just been issued. The profit amounted to more than £12,000 on a capital expenditure of about £278,000, enabling the committee to hand over 2½d. in the pound to the relief of rates and to bring the renewals fund up to £50,000. The length of track is 21½ miles, and the number of passengers carried was nearly 12,000,000. The operating cost per mile was 6.272d.

At the height of the tourist and holiday season tramwaymen of Edinburgh to the number of about 700 were on strike for a period of about ten days. The dispute arose regarding wages. The men asked for an increase of a halfpenny per hour. The company which operates the tramways offered a farthing per hour increase. The men refused this offer. During the strike men were imported from Manchester, Glasgow and elsewhere, and after a few days' delay a partial service was established. The strike was settled by the men accepting the farthing per hour increase. The directors conceded the men one week's holiday a year with pay. A conference is to be held later to discuss any matters in dispute.

The tramway committee of the Reading Corporation has recommended the installation of trolley buses at a cost of about £24,000 for the proposed extension to connect Reading with the added areas of Caversham and Tilehurst. In recommending the trolley buses instead of the motor buses, the committee states that should the traffic eventually warrant the construction of tramway lines the poles and wires can be used for the tramcars on those routes.

The House of Lords has decided that a tramway is not a railway and must pay rates on its full net annual value, not on one-fourth as in the case of railways. Lord Moulton read the judgment of the House of Lords, in which the Lord Chancellor and Lord Shaw concurred. Lord Moulton said that a tramway was not in the same position as a railway, as the street provided the base for the rails and that the loading and unloading platforms were the streets along the whole of the tramway route. The company also reaped the advantage of the great municipal expenditure on lighting, cleaning and keeping the streets in order. In his opinion, the contention that a tramway was a railway because the cars ran on rails was of no moment in this matter. It was his view that the term railway was not meant by the legislature to cover tramways.

A bill is being prepared for presentation to Parliament next session for the construction of a tube railway from the Strand to the Crystal Palace on a system differing from that of the existing underground railways. The project, the cost of which is placed at £3,000,000, is being advanced by E. W. Chalmers Kearney, the Australian inventor of the high-speed railway system, in which the cars run on a single rail with a guide rail overhead. The scheme, as explained by Mr. Kearney, provides for a "tube" for the 4½ miles to Herne Hill, whence the remainder of the line would be above ground, except for the final 500 yd., which would be in a cut-and-cover tunnel. The six stations—Westminster Bridge, the Oval, Brixton, Herne Hill and the two terminals—would be immediately below the street level and reached by short stairways, except that at Herne Hill, which it is proposed should be on the level of the street.

R. W. Blackwell & Company, who carried out the electrification of the South London circle of the Brighton Railway and the subsequent extension to the Crystal Palace, have begun the extension of the electrification from Balham to Croydon via Norbury and Thornton Heath. Later on the electrified suburban system will be carried as far as Epsom.

The London County Council has posted notices in all its tramcars intimating its intention of at once availing itself of the power conferred by the act of Parliament, passed during the past session, to allow straphangers on the lower deck of the tramcars during inclement weather, and on various holidays and special days, to the extent of one-third of the licensed accommodation. It was during the miners' strike of 1911 that the Board of Trade first allowed straphanging in the London County Council tramcars, when, owing to a shortage in the supply of coal, a curtailed service had to be used. Again, in March last, when the Greenwich generating station broke down and the number of cars running had to be reduced, the Board of Trade granted temporary permission for passengers to stand in the cars.

A report has been prepared on the working of the Dublin & Blessington Light Railway, which is at present run by steam. It is stated that the cost per train mile is no less than 19.6d., and this is compared with a similar cost of 3.9d. for the electrically worked Lucan tramway as an argument in favor of electric traction.

A. C. S.

News of Electric Railways

New Officers Elected by the United Railroads of San Francisco

Jesse W. Lilienthal was formally elected president of the United Railroads of San Francisco by a vote of the stockholders of that corporation at a meeting held on Aug. 28. Other officers elected were: vice-president, Charles N. Black; secretary, George B. Willcutt; treasurer, A. M. Dahler. The following directors were named: John A. Buck, president Honolulu Plantation Company and vice-president of the National Ice Company; J. C. McKinstry, law partner of President Lilienthal; Albert H. Payson, president of the Northwestern Pacific Railroad; Charles N. Black, vice-president of the United Railroads under Mr. Calhoun; George B. Willcut, secretary of the United Railroads; Washington Dodge, vice-president of the Anglo & London-Paris National Bank, and former city and county assessor of San Francisco; A. W. Foster, capitalist and former president of the Northwestern Pacific Railroad; Henry T. Scott, president of the Mercantile National Bank and of the Pacific Telephone & Telegraph Company; Leander Sherman, president of Sherman, Clay & Company; B. S. Guinness, New York, representing the banking house of Ladenburg, Thalmann & Company. Mr. Lilienthal is ex officio a member of the board of directors.

Following his election, Mr. Lilienthal gave out the following statement:

"I have accepted the presidency of the United Railroads of San Francisco only because of my ambition to improve the relations between the company on the one hand and the public and public officials on the other. The people may be assured that it will be my aim to confine the activities of the company strictly to the operation of street railroads, and in a manner that will give full recognition to the duties of a public utility. There will be no interference in political controversies, and if any attempt ever is made to influence public opinion, it will be done openly and in the name of the company.

"I have no fault to find with those who favor municipal ownership, but I believe that if such ownership should obtain, the actual operation of the properties can, with the greatest good and with the greatest profit to the public, be best intrusted to private management under public regulation.

"I shall always be ready to listen to any grievance, either on the part of the public or of any citizens, and the public may be assured that my endeavor will be to operate the roads in such a way as to give the people of San Francisco the most efficient service practicable. Finally, I cordially invite the co-operation of all good citizens to the end that the duties imposed upon the company may be adequately performed."

Progress on Boston Subways

Rapid progress is being made on the subway extensions and new lines now under construction by the Boston Transit Commission. The Boylston Street subway, through the Back Bay district, is walled in and roofed over from Kenmore Street, the western portal of the tube, to the vicinity of Berkeley Street, with the exception of the station locations at Massachusetts Avenue and Copley Square. Contracts will shortly be let for the construction of the remainder of the tunnel from Kenmore Street to a temporary connection with the Tremont Street subway near the Public Garden, the total distance between these points being 7950 ft. The Boston Transit Commission is to report to the next Legislature upon the desirable location of the easterly terminus of the subway, the choice being between Park Street and Post Office Square. A new incline will be built under the Public Garden in connection with the work.

Work on the Dorchester tunnel, which is an extension of the Cambridge subway eastward to the South Station and thence southward to the large centers of population lying between the harbor and the Dover-Dudley Street-Fields Corner district in a general way, is being pushed chiefly on the Winter and Summer Street sections of the route. The tunnel begins under the Park Street station of the Tremont Street subway, 40 ft. below the street surface, and has now been completed between Tremont and Washington Streets, being under construction at present between Washington and Arch Streets, where a station will be built with passages leading to the Summer and Winter stations of the Washington Street tunnel. Stations will be located on this line at Washington Street, Dewey Square, a point near Broadway and Dorchester Avenue, for South Boston service, and at the Andrew Square terminus. The total length of the subway is 11,000 ft., between Park Street and Andrew Square, the total length of underground line between Harvard Square and Andrew Square being about 5 miles as now planned. At Dewey Square the tunnel will be carried low enough to enable a projected railroad tunnel to be built between the North and South Stations, and the line will be 50 ft. below the street at some points.

The extension of the East Boston tunnel from Scollay Square toward an outlet on the surface in the West End district is now practically completed between Hanover and Stoddard Streets. A station is to be built on this route at Bowdoin Square, with a loop permitting various cars to be turned back to East Boston, while others proceed to Cambridge. About one-tenth of the total extension of 2500 ft. is now completed. The subway extensions and new construction now in progress at Boston will cost approximately $15,000,000 when finished.

Committee Appointed to Draw Traffic Rules for Cities

A committee upon traffic and public safety has been appointed by the governors of the International Travel Club, New York. At the last meeting of the board expression was unanimous that the club should proceed at once to perform some effective work in the interest of users of the public highways, especially in view of the need of uniformity in traffic regulations in the larger cities. The committee on traffic and public safety will meet in the near future for the purpose of organizing and will consider a new code of traffic regulations to be submitted to the proper authorities in at least fifteen of the principal cities in this country and abroad for criticism and suggestions. The new rules and regulations when finally adopted by the committee will be known as the Standard Code of Traffic Regulations and will be sent with recommendations for adoption to the municipal authorities in all of the larger cities throughout the world. The committee is composed of the following: Charles Jerome Edwards, chairman; William Phelps Eno, vice-chairman; Howard Elliott, Julius P. Meyer, Edward G. Connette, David Beecroft, Charles Henry Davis, Samuel Walter Taylor, Carl H. Page, Albert S. Callan, Burns Lyman Smith, Robert Lee Morrell and Frederick H. Elliott, secretary of the Travel Club.

Charles Jerome Edwards, chairman of the committee, is a well-known traveler and has been an executive officer of many clubs, societies and associations, and is at present vice-chairman of the Aero Club of America. William Phelps Eno is the author of the present traffic regulations now in use in several cities in the United States, as well as in London and Paris. Mr. Smith is an extensive traveler. Mr. Taylor is editor of the *Rider and Driver*. Mr. Davis is president of the National Highways Association, which is conducting an extensive campaign in behalf of the good roads movement. Mr. Beecroft is directing editor of the *Automobile, Motor Age* and *Commercial Vehicle*. Mr. Morrell has been prominently identified with automobiling and good roads affairs for many years, and has only recently been selected as chairman of the law and ordinance committee of the Manhattan Automobile Club. Mr. Page is well known as a pioneer automobile distributer and is at the head of the large and successful corporation bearing his name. Mr. Callan is a former member of the New York State Assembly and is the author of the present Callan motor vehicle law of New York State. Howard Elliott is president of the New York, New Haven & Hartford Railroad. Mr. Meyer

is director of the Hamburg-American Line, and Mr. Connette, formerly chief engineer of the Public Service Commission, First District, State of New York, is president of the International Railway, Buffalo.

In drawing up its plans the committee will take into consideration various suggestions which have been received by the club bearing on the safeguarding of travelers in every mode of travel. Consideration is to be given to plans for safeguarding vessels at sea as well as regulations for railroad and electric railway traffic. Some of these suggestions will be forwarded for consideration to the Interstate Commerce Commission.

Development Plans of Glasgow Corporation

The Corporation of Glasgow has before it a large number of schemes of an engineering or semi-engineering character, all of which will be embodied in a bill which is to be submitted to Parliament. Power will be asked for the construction of a bridge across the River Kelvin at the Botanic Gardens and a new road across that bridge for the purpose of carrying tramway lines; for the better regulation of street traffic, and for the provision of motor omnibuses on city and suburban routes where the traffic is not yet sufficiently developed to warrant the laying of tramway lines. There are also proposals for the construction of a new bridge across the Clyde and the laying of tramways leading to and from that bridge, but these will not take definite form until the conclusion of the investigations which are at present being made by James Dalrymple, manager of the Glasgow Corporation Tramways, and Thomas Nisbet, who are in America. The Corporation already has power "to provide and run a service of omnibuses in prolongation of existing tramway routes, or for testing the amount of traffic along any route, subject to the consent of the local authority"; but it wishes more than this. The members have noted that the Corporation of Edinburgh has obtained general powers for the running of omnibuses in that city, and they wish to have similar powers, so that they may test traffic on any city route or supplement the tramway service temporarily or permanently in any district within their area of service.

Representatives of the County Councils of Lanark, Renfrew and Dumbarton are to meet to consider the proposed extension of the Glasgow Corporation car lines into their territory. In view of the interference with the roads the county authorities deem it advisable that united action should be taken to protect their interests.

There is a motion on the agenda of Glasgow Corporation for the appointment of a special committee to consider and report on the question of establishing a system of underground electric railways between the east and west ends of the city district. It is urged that such a system would help to solve the problem of street congestion and would facilitate the further expansion of the city.

Losses on Southern Pacific Suburban Lines

Even though it is operating 877 suburban trains daily out of the Oakland and Alameda moles and has carried in the last year about 19,000,000 passengers, the Southern Pacific Company is losing approximately $3,250,000 annually on the suburban electric service in Alameda County, according to figures received from authoritative sources. It is said that the total passenger revenue for the twelve months ended June 30, 1913, was $1,365,707, while the total expense was $4,613,262, leaving a deficit to the company of $3,247,555.

In the hearing before the California State Railroad commission on Aug. 7, C. W. Durbrow, an attorney for the railroad, testified that, without interest on $46,000,000 invested in the properties and without the taxes, amounting to $54,000, the loss on direct operating expenses alone was $364,000 for the year. With the interest, taxes and other fixed charges added to this amount, the figures given above are obtained.

The statement is made by the company that in these computations 90 per cent of the items are those exclusively for electric trains and not for steam trains. On the remaining 10 per cent, only that proportion is included which can properly be allotted to suburban service. For every mile the Southern Pacific Company carried a passenger on its ferries and trains on suburban trips it received less than 1 cent, while the cost of the same service was three times as great, or something like 3 1/6 cents. That is to say, on all of the 19,000,000 travelers the company lost 2 1/5 cents for every mile it transported each one of them. Again, each passenger, on the average, paid about 7 1/5 cents, regardless of distance, and yet it cost the carrier over 24 cents to serve him. On every one of the 19,000,000 passengers the loss to the company was over 17 cents. According to the company these statistics are taken from the actual records of the railroad and from the same reports as are submitted by the company to the state and federal commissions.

The property investment of $46,000,000 is in accordance with a detailed exhibit already filed with the State Railroad Commission. Interest on it at 6 per cent would be $2,772,000. It would thus seem that the passenger earnings are actually only one-half of the interest charges alone, to say nothing of the cost of managing the business and of paying the state taxes. Six per cent is taken as the interest rate in order to be on a conservative basis. Were 7 per cent to be taken, the loss on the Alameda County lines would be $462,000 a year greater. It is pointed out, further, that the equipment of the company at the present time is new, and that, therefore, the charges for maintenance are less than they will be when the equipment is older.

Reaching the Public Through the Newspapers

In the issue of Aug. 25, 1913, the New York *Times Annalist* published an article, "The Straight Story," in which it dealt with the subject of corporations reaching the public through the newspapers. Referring to the instinct of the newspaper reader for fair play and to the method which should be adopted to place a matter of importance before the newspaper reader properly, the *Times Annalist* said in part:

"People have a true instinct for fair play. To reach it the corporations have only to tell a straight story, tell it directly, and tell it explicitly. Told in that way it is bound to be interesting. People will read it, partly because it is interesting and partly, if they have the time, because they are always willing to hear the other side. That is the corporation manager's undeveloped opportunity. If he will talk to the public as he talks to his friends at the club, he will be amazed, and the more he trusts the public the more it will respond. Instead, he hires a publicity agent, whose business it is to get disguised advertising matter into the newspapers and periodicals. So basically is this the publicity agent's work that a secret is sometimes made of his official connection with the corporation, so that he may the more easily procure his stuff to be printed under misrepresentation of its purpose. When he can the publicity agent buys up reading columns and prints his matter therein as if it were the editorial product of the publication whose space is dishonestly let. It is not so much to be said that this kind of work is disingenuous as that it is wasteful and ineffective. It ought to be the publicity agent's work to write the case as the corporation manager can talk it, and then to bring it straight to the public, under plain, unmistakable legends.

"The railroads of the East are conducting a campaign for higher freight rates. They have a case; it may not be perfect, but it is a strong case. They are telling it in every way but the one effective way. The public does not understand statistics and percentages and would disbelieve them if it did; the railroads are telling their story through numerous publicity agents, whose work, for the reason stated, is futile; they are telling it in the form of speeches to chambers of commerce and boards of trade. The right way would be to take thirty or forty pages of newspaper space every morning and evening in all the territory involved and say, simply: 'This is our story. We buy this space to tell it and we tell it as we please, unbeholden to the favor of editors, without fear of politicians and unhampered by traditions of advertising.' And then in that space to tell the story of the railroads as any railroad president can tell it when he sits down with a few friends to talk shop from his heart. Keep figures out; tell the truth; tell secrets; visualize railroad service in its physical terms—and it is irresistible."

Attempted Strike at Indianapolis Fails

The attempted strike of the employees of the interurban railways operating into Indianapolis, Ind., called on Aug. 23, has failed. Some fifty or sixty men, principally from the lines of the Indianapolis & Cincinnati Traction Company, Indianapolis, Columbus & Southern Traction Company, the Martinsville Division of the Terre Haute, Indianapolis & Eastern Traction Company, and the Logansport Division of the Union Traction Company of Indiana, failed to report when the strike order was issued, and for several days only partial service was operated on these lines. The main interurban trunk lines of the Terre Haute, Indianapolis & Eastern Traction Company and Union Traction Company were operated on regular schedules without difficulty. Following the notices posted by C. L. Henry, president of the Indianapolis & Cincinnati Traction Company, on Aug. 25 to the effect that men must return to work the following morning at 5 o'clock if they expected to continue in the employ of the company, the men promptly reported, and both the Greensburg and Connersville divisions commenced operating under full schedules. The men in the employ of the Union Traction Company at Logansport who had gone out received a similar ultimatum and went back to work Aug. 25. On Aug. 27 the rest of the men on the Martinsville and Crawfordsville divisions of the Terre Haute, Indianapolis & Eastern Traction Company capitulated and as individuals requested that they might be allowed to go back to work and abandon all connection with the union. Full service was restored on these divisions, which had been operating only about two-thirds of the regular schedules. The men on the Indianapolis, Columbus & Southern Traction Company and other lines who did not report at the time stated in the notices posted by the several companies were given to understand that their employment with the company had ceased. Men who returned to work were reinstated at their old rate of pay, but were not allowed to take their old runs.

City of Seattle Scored by Court in Railway Case

On the issues involved in the petition of the city of Seattle, Wash., for a court order on the receivers of the Seattle, Renton & Southern Railway to fill the right-of-way on Rainier Avenue between Atlantic and Bay View Streets, Judge A. W. Frater on Aug. 24 filed a memorandum decision, criticising the city officials severely for imposing annoyances on the railway, and charged that it was the action of the City Council in seeking to annul the franchise which resulted in throwing the railway into the hands of receivers. In his ruling the judge calls attention to the fact that the city in December, 1910, passed an ordinance purporting to revoke the franchise, that it was afterward restrained by the federal court from carrying out the plan and that since then it has made no attempt to try the case in the United States court and determine the rights of the parties. He says in part:

"The city has been planning street improvements in the Rainier Valley for several years, knowing all the time that the issues in the federal court case would have to be determined before the company could be compelled to pay for its share of the improvements under the terms of its franchise. This matter resolves itself purely to one of common honesty and fair dealing. The city has paralyzed the railway's property by declaring its franchise forfeited as well as in many other petty ways, and yet asks the court to compel its receivers to carry out this one provision of its franchise which requires the company to pay its share of street improvements. This is so clearly unjust that no court should be expected to lend itself to the carrying out of any such program."

Judge Frater declares that all the courts and the receivers are trying to do is to bring all concerned together in a quick and fair transaction for the sale of the property of the company to the city on a basis acceptable to those who have invested their money in the property, and as desired by the people of Seattle, especially by the residents of the Rainier Valley.

The developments in the negotiations for the sale of the property of the company to the city have been followed in the ELECTRIC RAILWAY JOURNAL.

Details of Routes and Costs of New San Francisco Municipal Lines

The following details of routes and costs show how the proceeds of the issue of $3,000,000 of bonds voted in San Francisco on Aug. 26 will be used in extending the municipal railway system:

Van Ness Avenue Line.—Cost, $479,200; double-track road from Market Street to Fort Mason, 2.07 miles; will carry most of the traffic from south of Market Street to the Exposition site, the transfer traffic from Geary Street and some from Union Street.

Potrero Avenue Line.—Cost, $348,800; from Potrero and Twenty-fifth Streets, over Mariposa, Florida and Twelfth Streets to Market, thence one block to connect with Van Ness line; distance, 2.2 miles.

Union Street Line.—Estimated cost, rails and equipment, after franchise reverts to city, $779,400; 3.78 miles long.

North Point Line.—Cost, $235,600; out Columbus Avenue, from Union Street and Columbus to North Point Street, thence to foot of Van Ness Avenue; distance, 1.05 miles.

Steiner Street Line.—Cost, $119,700; extension of Union Street line from Union to Greenwich, thence to Scott Street and Chestnut.

Stockton Street Line.—Cost, $229,200; through the tunnel from Market, 1 mile, to junction with Union Street line at Columbus Avenue; shortest line to Exposition.

Chestnut Street Line.—Cost, $225,100; Van Ness Avenue to Devisadero Street, 1 mile, forming loop with Steiner and Union Street lines.

Church Street Line.—Cost, $500,000; out Market Street from Twelfth to Church, thence to Thirtieth Street, 2.45 miles.

California Street Line.—Cost, $500,000; connections with the Geary Street line probably will be built on some street near Arguello Boulevard and at Thirty-third Avenue, as the franchise for the present line has expired between First and Thirty-third Avenues.

Report on Toronto Valuations Expected Soon.—Mayor Hocken, of Toronto, Ont., expects that the experts' report on the valuation of the property of the Toronto Railway and the Toronto Electric Light Company will be ready by Sept. 6.

Omnibus Application in New York.—The Board of Estimate of New York has under consideration the application of George W. Loft and others for a franchise to operate a large number of motor omnibuses in the borough of Manhattan.

Fare Charged on St. Louis Municipal Waterworks Railway.—On Aug. 18 the city of St. Louis inaugurated the policy of carrying passengers on the Municipal Waterworks Railway for a 5-cent cash fare. Eight tickets are sold for 25 cents. Tickets good for children under twelve years old are sold eight for 25 cents. The city has been carrying passengers free by issuing individual and annual passes. The line is a very short one and was built primarily to accommodate the employees of the waterworks.

Fares on Toronto Civic Lines.—A 2-cent fare, with six tickets for 10 cents, for the St. Clair Avenue Civic Line, Toronto, Ont., was determined on recently by the Board of Control, in the absence of Works Commissioner Harris, who had recommended a 5-cent fare. There was some discussion as to the advisability of making the rate 2 cents flat, but the Mayor thought that it would be awkward for the public and conductors alike. Regret was expressed that the 2-cent fare had been established on the Gerrard Street line. The opinion prevailed, however, that a uniform rate for all civic lines would be most satisfactory.

Valuing the Properties at Seattle.—The Public Service Commission of the State of Washington has announced that the physical valuation of interurban railroad property in the vicinity of Seattle is now being made by the department's engineering force and that like valuations are already planned for the lines operating in Seattle which are affected by the recent federal court ruling against the Seattle city ordinance requiring the sale of 4-cent tickets on the cars as beyond the jurisdiction of the city. Just how soon the matter will be reached by the commission could not be an-

nounced, though it is expected to be taken up at an early date, comparatively.

University Chair for Public Utility Valuation.—The establishment of a chair in the University of Missouri to give instruction to young men on the subject of physical valuation and appraisement of public utilities of every character is to be recommended to the curators of the university by John M. Atkinson, chairman of the State Public Service Commission. The underlying motive for this step is the desire to have such a course operated in connection with the economic and engineering departments, the graduates from which might be taken into the employment of the commission.

Detroit Arbitration Hearings Adjourned.—At the request of W. D. Mahon, the board of arbitration which has been holding hearings in regard to the terms of service of the employees of the Detroit (Mich.) United Railway adjourned its hearings on Aug. 27 until after the annual convention of the Amalgamated Association of Street & Electric Railway Employees to be held at Salt Lake City. It is probable that Chairman Naylon will call no further meetings until about Sept. 16. No formal work was done by the board on Aug. 27, although some of the points in dispute were discussed by W. D. Mahon and F. W. Brooks, general manager of the company.

Action Postponed on Steinway Tunnel Proposal.—The Board of Estimate and Apportionment of New York has postponed action on the proposition submitted by the Public Service Commission of the First District in July for the reconstruction of the Steinway tunnel for temporary operation by the Interborough Rapid Transit Company. The Interborough Rapid Transit Company is willing to reconstruct the tunnel at cost plus 15 per cent, but in July the Public Service Commission adopted a resolution cutting down the extra allowance to 10 per cent. The company insists upon receiving 15 per cent. The Board of Estimate and Apportionment will refer the proposed contract back to the commission.

Chicago Terminal Plans.—A number of public-spirited citizens of Chicago, Ill., have organized and provided funds for the purpose of securing comprehensive information and expert and disinterested conclusions with respect to the best and most practicable solution of Chicago's railway terminal problem, which has been made pressing by the desire of the Pennsylvania depot group of roads to improve their facilities. The movement is in no sense antagonistic to the efforts of the City Council to arrive at the desired solution through the employment of John F. Wallace. It is simply more comprehensive. The city could give Mr. Wallace only $10,000 with which to start. The citizens' terminal plan committee proposes to raise $100,000 and has $65,000 already pledged. It has retained Bion J. Arnold to direct the investigation.

Ohio Public Utilities Commission Organizes.—The Ohio Public Utilities Commission organized on Aug. 22 with Judge Oliver H. Hughes as chairman. Judge W. L. Dechant, Middletown, was ill at Battle Creek, Mich., and was not able to meet Judge Hughes and E. W. Doty, the other two members. C. A. Radcliffe, secretary of the old commission, will be secretary of the new commission, and O. P. Gothlin, of the former commission, will be superintendent of the bureau of rates and service. J. C. Sullivan, the third member of the old commission, who was slated as head of a department in the new organization, will enter private business in Columbus. Charles C. Marshall, who was special counsel of the Public Service Commission in the Attorney-General's office, will continue in the same capacity with the new commission. Mr. Dechant has since died.

Municipal Line Suggested for Swope Park, Kansas City.—Members of the park board of Kansas City, Mo., have suggested that the city build an electric railway in Swope Park, extending from the entrance to the zoo, lagoon, lake and other points of interest. A fare of 5 cents would be charged on this line. The proposal was advanced at one of the recent conferences in regard to the new franchise for the Metropolitan Street Railway. Mayor Jost said he feared the plan to have the Metropolitan Street Railway build the line would not fit in with the scheme of the proposed franchise, which does not contemplate any more extensions than are absolutely necessary. He suggested that the park board issue bonds and construct a line through the park, and that an arrangement be entered into with the Metropolitan Street Railway to sell the city power and rent it the necessary cars.

Progress of Electrification at Portland.—It is expected that the Portland, Eugene & Eastern Railway, Portland, Ore., will be ready about Dec. 1, 1913, to run electric trains on Fourth Street, Portland, into the Willamette Valley along the west side of the river. Outside the city limits the work of electrification is going on steadily. The new loop lines at Hillsboro, Forest Grove and Newberg, together with new substations at each of these cities, have been completed and the bonding of the rails is all finished as far as McMinnville. Ninety per cent of the overhead work, poles, high-tension and feeder wires is completed to the same point. Power will be supplied by the Portland Railway, Light & Power Company, which will deliver current at 60,000 volts at the substation of the Portland, Eugene & Eastern Railway at Oswego. There it will be transformed into 13,200 volts and supplied to the feeders at 1500 volts. This current will serve the line as far as Independence, a contract with a Eugene power company providing for energy on the south half of the line when completed.

PROGRAMS OF ASSOCIATION MEETINGS

New York Railroad Club

The next regular meeting of the New York Railroad Club will be held at the building of the United Engineering Societies in New York on Friday evening, Sept. 19, 1913, at 8 o'clock. William Walter Wheatley will present a paper, "Railway Economy versus Political Economy."

Keystone Railway Club

The seventh meeting of the Keystone Railway Club will be held in the pavilion on Mount Penn, Reading, Pa., on Sept. 16. A special car will leave Fifth and Penn Streets, Reading, at 9 a. m. to take members to Mount Penn station. The entertainment committee has arranged for music and flowers and for a chicken and waffle dinner, which will be served at $1.25 a plate at the hotel near the pavilion. The program of papers which are to be presented at the meeting follows:

Paper, "The Prevention of Accidents," by W. B. Rockwell, manager of the Eastern Pennsylvania Railway, Pottsville, Pa.

Paper, "Air-Brake Maintenance," by W. G. Kaylor, of the Westinghouse Traction Brake Company, New York, N. Y.

Among the questions prepared for the question box discussion are the following:

Is a lined or solid journal considered best for city service?

Why has the Pennsylvania Railroad for the past few months been placing four-hole plates on new track work as against six-hole plates?

What is the proper method to record the consumption of current for motorman's record—time clock, ampere-hour or watt-hour meter?

What percentage of drop should be allowed on motor fields before they are condemned?

What should be the maximum and minimum weight of a scrap brake shoe?

Which brake shoe wears steel wheels the most—hard or soft?

Which is better for car cleaning—soap water or car-cleaning compound?

Has the hardened steel bushing and pin been a success for brake and beam levers?

What mileage should a car make before being overhauled and inspected?

Which is the best method of testing motor fields and armatures—transformer, drop volt or telephonic?

How often should armature and axle bearings of modern type motors be oiled and inspected?

Would it be better to change the design of the association standard brake-shoe heads or use a more durable material to overcome excessive wear?

Financial and Corporate

Stock and Money Markets

Sept. 3, 1913.

The selling movement which set in on Sept. 2 on the New York Stock Exchange continued at the opening of business on the exchange to-day. Stocks worked still lower in the second hour of business and in the early afternoon brokers reported continued liquidation. On the decline the market showed an increased volume of dealings. In the last hour fractional recoveries occurred from the extreme low point. Rates in the money market to-day were: Call, 2½ @ 3 per cent; sixty days, 3¾ @ 4 per cent; ninety days, 4½ per cent; four, five and six months, 4¾ @ 5 per cent.

The Philadelphia market was irregular to-day. The trading was broad, but the volume of transactions was small.

The dealings on the Chicago market covered a wide range of issues with a considerable volume of transactions. The bulk of the bond transactions was in Chicago Railways 5's, Series B.

The Boston market was weaker to-day, although there was a slight recovery in the specialties near the close.

A steady tone was displayed on the Stock Exchange in Baltimore to-day. The demand for bonds lessened, the sales to-day totaling only $9,500.

Quotations of traction and manufacturing securities as compared with last week follow:

	Aug. 27	Sept. 3
American Brake Shoe & Foundry (common)	91	91
American Brake Shoe & Foundry (preferred)	132¼	132¼
American Cities Company (common)	36½	33¼
American Cities Company (preferred)	64½	63½
American Light & Traction Company (common)	347	350
American Light & Traction Company (preferred)	104	104
American Railways Company	38¼	38⅜
Aurora, Elgin & Chicago Railroad (common)	40½	41
Aurora, Elgin & Chicago Railroad (preferred)	82	a83
Boston Elevated Railway	88	89
Boston Suburban Electric Companies (common)	7½	7
Boston Suburban Electric Companies (preferred)	55	56½
Boston & Worcester Electric Companies (common)	*8	a10
Boston & Worcester Electric Companies (preferred)	42	40
Brooklyn Rapid Transit Company	89	89⅜
Capital Traction Company, Washington	115	115½
Chicago City Railway	*170	*170
Chicago Elevated Railways (common)	*25	*25
Chicago Elevated Railways (preferred)	*70	*70
Chicago Railways, ptcptg., ctf. 1	94	95
Chicago Railways, ptcptg., ctf. 2	30⅞	32
Chicago Railways, ptcptg., ctf. 3	8	8¾
Chicago Railways, ptcptg., ctf. 4	3	3
Cincinnati Street Railway	102½	a110
Cleveland Railway	103½	103¾
Cleveland, Southwestern & Columbus Ry. (common)	*5½	*5½
Cleveland, Southwestern & Columbus Ry. (preferred)	*30	*30
Columbus Railway & Light Company	18	18
Columbus Railway (common)	69½	a69½
Columbus Railway (preferred)	88	88
Denver & Northwestern Railway	*104	*104
Detroit United Railway	a80	a80
General Electric Company	145¼	145
Georgia Railway & Electric Company (common)	114½	114⅝
Georgia Railway & Electric Company (preferred)	83	83
Interborough Metropolitan Company (common)	16¼	15⅛
Interborough Metropolitan Company (preferred)	62½	62
International Traction Company (common)	*30	*30
International Traction Company (preferred)	*95	*95
Kansas City Railway & Light Company (common)	*18	*18
Kansas City Railway & Light Company (preferred)	*37	*37
Lake Shore Electric Railway (common)	*5	*5
Lake Shore Electric Railway (1st preferred)	*92	*92
Lake Shore Electric Railway (2d preferred)	*26	*26
Manhattan Railway	128	131
Massachusetts Electric Companies (common)	14	14
Massachusetts Electric Companies (preferred)	*71½	70
Milwaukee Electric Railway & Light Co. (preferred)	95	*95
Norfolk Railway & Light Company	25	25
North American Company	71¼	71½
Northern Ohio Light & Traction Company (common)	60¾	60¾
Northern Ohio Light & Traction Company (preferred)	a100	100
Philadelphia Company, Pittsburgh (common)	43⅛	43½
Philadelphia Company, Pittsburgh (preferred)	40	40
Philadelphia Rapid Transit Company	23	22½
Portland Railway, Light & Power Company	55	55
Public Service Corporation	109	109
Third Avenue Railway, New York	37¾	37
Toledo Traction, Light & Power Company (common)	..	a30
Toledo Traction, Light & Power Company (preferred)	..	a80
Twin City Rapid Transit Co., Minneapolis (common)	105⅜	106
Union Traction Company of Indiana (common)	*5	*5
Union Traction Company of Indiana (1st preferred)	*80	*80
Union Traction Company of Indiana (2d preferred)	*20	*20
United Rys. & Electric Company (Baltimore)	27⅛	27
United Rys. Inv. Company (common)	21	21
United Rys. Inv. Company (preferred)	39½	41
Virginia Railway & Power Company (common)	52	52
Virginia Railway & Power Company (preferred)	91	92
Washington Ry. & Electric Company (common)	89½	89½
Washington Ry. & Electric Company (preferred)	88	87⅞
West End Street Railway, Boston (common)	72	72
West End Street Railway, Boston (preferred)	88	88
Westinghouse Elec. & Mfg. Company	72½	71½
Westinghouse Elec. & Mfg. Company (1st preferred)	114	114

*Last sale. a Asked.

ANNUAL REPORTS

Easton Consolidated Electric Company

The comparative consolidated statement of income, profit and loss of the Easton (Pa.) Consolidated Electric Company for the years ended Dec. 31, 1911 and 1912, is as follows:

	1912	1911
Gross revenue—railway lines	$427,536	$401,736
Operating expenses, including provision for depreciation and payment of damage claims	277,298	258,759
Earnings from operation	$150,238	$142,977
Deduct:		
Interest on bonds, taxes, etc.	53,239	51,913
Deficit—Eastern Amusement Company	2,663	3,585
Total company deductions	$55,902	$55,498
Net earnings from operation of railway lines	$94,336	$87,479
Edison Illuminating Company:		
Rentals, less taxes and expenses	24,719	27,792
Interest received	64	95
Total earnings	$119,119	$115,366
Deduct charges of Eastern Consolidated Electric Company:		
Interest on collateral trust bonds	61,850	61,850
Expenses and taxes	7,835	7,842
Net earnings	$49,434	$45,674
Less:		
Taxes paid applying to prior years	3,884	.....
Loss on carrousel sold	2,170	.....
Dividends paid	30,000	15,000
Total deductions	$36,054	$15,000
Surplus	$13,380	$30,674

Joseph S. Lovering, president of the company, says in part in his report to the stockholders:

"There has been no material change in the mileage of railway during the year. Your company owns or controls 53,847 miles of railway extending from Easton to Bethlehem, South Bethlehem, Nazareth and the town of Phillipsburg, N. J.

"The car equipment consists of fifty-five passenger cars fully equipped, ten service cars and thirty-six open car bodies.

"Gross revenue from the railway lines for the year ended Dec. 31, 1912, increased $25,799, 6.42 per cent. The increase in the number of passengers carried was 6.31 per cent. Passenger receipts increased 6.4 per cent and car mileage 1.28 per cent. The operating expenses for 1912 were 64.85 per cent of the revenue, an increase of 0.44 per cent.

"Net earnings from the operation of railway lines amount to $94,336; net receipts from the Edison Illuminating Company, $24,783; total, $119,119, or an increase of 3.25 per cent. The fixed charges of the Easton Consolidated Electric Company and its expenses, amounting to $69,685, are deducted, leaving net earnings for the year of $49,434 (6.59 per cent on the paid-up capital stock), out of which dividends of 4 per cent, or $30,000, were paid, and also $3,884 for taxes due in 1910-11 not paid, pending litigation. The surplus for the year of $13,380 transferred to the general surplus account increased the credit in that account at Dec. 31, 1912, to $141,964.

"Current assets have increased over $35,000 and the bonded debt of the Easton & South Bethlehem Transit Company has been reduced $5,000. The reserves have increased approximately $25,000."

Glasgow Corporation Tramway

The nineteenth annual report of the tramways committee of the Corporation of Glasgow contains an exhaustive résumé of the financial condition and operations of the Glasgow Municipal Tramways during the year ended May 31, 1913. Besides the usual revenue, expense and capital accounts the report contains tables of weekly and yearly traffic revenue, the valuations of various component lines, a list of all sections of the permanent way and tables of routes, stages and fares.

The gross revenue for the year shows an increase of £29,327 as compared with that of the preceding year, and the average traffic revenue per car mile has been decreased from 10.561d. to 10.364d. The working expenses increased £36,706, or 0.137d. per car mile, this increase being mainly due to higher wages, extra expenditure incurred in permanent way maintenance, Pinkston fuel and the larger amount

paid in local taxation. As a result of the increased working expenses the net revenue was only £392,196, against £408,435 the previous year, largely owing to the increase in distance granted to halfpenny fares. Including interest on investments and rental, the total net revenue was £450,827, of which £417,824 was required to pay interest and provide for sinking fund payments and amounts carried to depreciation and permanent way renewal, leaving a net balance of £33,003, which was paid over to the common good. Last year the sum so paid over was £52,067.

The net amount of borrowing powers of the company as of May 31, 1913, was £2,640,089, the amount borrowed £2,479,408 and the balance of unexhausted borrowing powers £160,681.

The increase in capital expenditure during the year was £161,407, making a total of £3,694,143 on May 31. After adding £215,756 out of current revenue to the depreciation fund and deducting £48,721 for track renewals, etc., the balance in the depreciation and permanent way renewals fund on May 31 was £1,873,247. Through an addition of £96 realized from sales of obsolete plant in excess of book value, and a subtraction of £8,848 for alterations to cars, road widenings, etc., the general reserve fund was £39,362 at the end of the fiscal year.

The total length of tramways owned by the Corporation of Glasgow is over 196 miles, of which over 148 are in the city itself. The Corporation has decided to ask power to vote extensions to the tramways of more than 15 miles.

Detailed statistics in the report show that the average fare paid by a passenger was .776d. and that the average working expenses per passenger were .477d., so that each of the 311,000,000 passengers yielded a net profit of three-tenths of a penny. The halfpenny fare now yields 39 per cent of the receipts, while the penny fare yields only 36 per cent, nearly two out of every three passengers taking halfpenny fares.

The capital liabilities amount to £3,553,584. To meet these the department has a sinking fund, a depreciation and permanent way renewals fund, and a small general reserve fund, amounting in all to £3,153,822. The net capital liabilities on the undertaking are therefore only £399,762.

Great Berlin Street Railway

The report of the Grosse Berliner Strassenbahn (Great Berlin Street Railway) for the calendar year 1912 has been made public. The number of passengers carried in 1912 was 463,300,000, as compared with 447,000,000 in 1911; the gross earnings from all sources in 1912 were $11,395,993, as compared with $10,871,014 in 1911; the car miles in 1912 were 64,846,991, as compared with 62,919,500 in 1911. The total expenses per car mile in 1912 were 16.88 cents, as compared with 16.81 cents in 1911, and the ratio of operating expenses to gross earnings in 1912 was 56.66, as compared with 54.99 per cent in 1911. Salaries and wages in 1912 were $3,923,534, as compared with $3,611,688 in 1911. The company also spent $235,756 in 1912 for welfare work, as compared with $238,602 in 1911. The sum of $878,228 was required in 1912 for the maintenance of rolling stock, as compared with $778,942 in 1911; $60,605 was spent in 1912 for office and carhouse maintenance, as compared with $48,695 in 1911; $1,340,411 was spent in 1912 for the purchase of electrical energy, as compared with $1,272,700 in 1911; $333,594 was spent in 1912 for maintenance of way, including feeder system, as compared with $227,609 in 1911; $218,339 was spent in 1912 for damages and injuries, of which $113,782 was put aside for reserve.

The total trackage of the system in 1912 was 353, compared with 338 miles in 1911. The number of motor cars is 1757 and of trailers 1091. After setting aside the usual amounts for the various depreciation, amortization and sinking funds, etc., and paying to the municipalities $826,656, the directors declared a dividend of 8½ per cent on the stock capitalization of $25,020,600.

The company reports 12,107 employees. The pension society, of which 8797 employees were members, has a fund of $2,765,850, from which 568 incapacitated employees and 163 widows received allowances. The membership of the sick benefit fund numbered 12,406 in 1912, as compared with 11,707 in 1911.

The number of car miles for 1912 was 64,826,991, of which approximately 79 per cent was motor car mileage. This mileage was 3.03 per cent greater than the preceding year. The average number of passengers carried daily in 1912 was 1,265,847, as compared with 1,224,658 in 1911, equivalent to 3584 passengers per mile of track. The greatest number of passengers carried any one day was 1,412,538. During the year eighteen people were killed, 146 were severely injured, and 943 were slightly injured through their own negligence; six were killed, twenty-six severely injured and 289 slightly injured through the negligence of others. In addition, four people were severely injured and thirty-eight were slightly injured through causes unknown.

Vienna Municipal Tramways

The report of the Vienna Municipal Tramways for the fiscal year 1912 shows that the company operated 159,539 car miles daily on 149 miles of single track and carried an average of 845,585 passengers a day. The average daily revenue was $26,938. The railway has 1254 cars and1442 trailers, which are operated at an average schedule speed of 7.3 m.p.h. The latest rolling stock of the company comprises vestibuled cars with separate platform aisles for exit and entrance. These cars are also furnished with commutating pole motors. An experimental double-deck car has also been constructed. The total seating capacity of the rolling stock is 57,375 and the permissible standing room, 49,473. The maximum traffic day was Nov. 1, 1912, when 965,000 passengers were carried in 1191 motor cars and 1386 trailers for a total distance of 194,049 miles, using the services of 6700 platform men. A popular traffic innovation was the introduction of "winter sport" cars on which the passengers were permitted to carry snowshoes, skis, etc.

The electric lines carried 309,484,129 passengers for a total of 30,375,660 car miles. Of this mileage 52 per cent was performed by motor cars and 48 per cent by trailers. The average earnings per car mile were 16.77 cents.

The total number of injuries was 310, of which 205 were slight, ninety-nine severe and six mortal. Only 16 per cent of the accidents were due to crossing the tracks.

The undertaking employed 11,738 people, including the 2246 motormen and 4638 conductors. The total expenditures for employees, including welfare purposes and uniforms, was equivalent to more than one-half of the gross earnings. The report of the sick benefit fund shows an average of ten and one-tenth sick days per member for the year. The ratio of operating expenses, including welfare work, to gross earnings was 70.3 per cent and, exclusive of welfare work, 64.3 per cent. The total earnings for the year were $9,863,076.

Questions and Answers Under Uniform System of Accounts

Another series of tentative answers to questions raised in connection with the uniform system of accounts established by the Interstate Commerce Commission is published below. Agreement on these answers, as on those published previously in the Electric Railway Journal, has been reached by members of the committee on a standard classification of accounts of the American Electric Railway Accountants' Association and representatives of the commission. As these answers have not yet received the formal approval of the commission, however, it should be understood that the decisions do not represent its final conclusions and that they are subject to such revision as may be thought proper before final promulgation in the accounting bulletins of the commission.

Q. To what account should an electric railway company charge the loss resulting from a fire which destroyed a station building not covered by insurance?

A. If the building is not to be replaced, its cost should be credited to Road and Equipment Account No. 28, "Stations, Waiting Rooms and Miscellaneous Buildings," and charged to profit and loss. If it is to be replaced, the cost should be charged to operating expenses and not to profit and loss.

Q. Is it permissible to make an apportionment of rent paid for the use of land occupied by a building used in part as a carhouse, in part as a repair shop and in part as a storeroom?

A. The rent may be apportioned on an equitable basis among Accounts No. 67, "Carhouse Expenses," No. 39, "Shop Expenses," and No. 85, "Store Expenses," in the classification of Operating Expenses of Electric Railways.

Q. What account should be charged with the cost of repairs to a transformer located on a pole outside of a station building for the purpose of stepping down high-tension current in order to furnish electric light for the station?

A. Operating Expense Account No. 65, "Station Expenses."

Q. To what account should an electric railway company charge the cost of labor and material required for repairs to transformers and meters and wiring used in connection with the sale of power to some patrons along the line?

A. Operating Expense Account No. 23, "Distribution System."

Q. An electric railway company sells current for lighting and power directly from the trolley line. What account should be charged with the first cost of meters installed in connection with this business and the cost of reading the meters?

A. The cost of installing meters for the purpose described should be charged to Road and Equipment Account No. 22, "Distribution System." No charge should be made for the wages of an employee who reads the meters if the work is incidental to his ordinary duties.

Q. What account should be credited with the amount of a trainman's deposit not called for on his leaving the service of the company?

A. If the company chooses to close the liability account for such a deposit, the amount should be credited to profit and loss.

Q. A company operates a coal mine as a co-ordinate department, the railway department furnishing cars to haul material for both maintenance and construction in the coal-mining department and rendering bills for the cost of power used, the cost of maintaining the cars and the wages of the train crews. To what account should the railway department credit amounts so received?

A. The amounts received for power and the maintenance of the cars should be credited to the "Other Operations—Cr." accounts, No. 44 and No. 59 respectively, while the amounts received for wages of the train crews should be credited to the accounts to which the wages were originally charged.

Q. To what account should the cost of tracing cloth and blueprint paper used by the engineering department be charged?

A. Operating Expense Account No. 84, "Stationery and Printing."

Q. What accounts should be charged with the cost of constructing and maintaining a line of railway on right-of-way held under perpetual lease?

A. The cost of construction should be charged to the appropriate accounts in the classification of Expenditures for Road Equipment, and the cost of maintenance to operating expenses.

Q. To what account should be charged the wages paid to flagmen employed to facilitate car movement during renewals of track?

A. Operating Expense Account No. 62, "Miscellaneous Car-Service Employees."

Acquisition of American Cities Company's Common Stock by United Gas & Electric Corporation

Reasonable assurance has been received that the United Gas & Electric Corporation, New York, N. Y., will acquire a majority of the $16,264,700 of the common stock of the American Cities Company by the issue in payment therefor of $75 of graduated second preferred stock and $25 of common stock for each $100 common share of the American Cities Company, according to the plan mentioned in the ELECTRIC RAILWAY JOURNAL of Aug. 30, 1913.

George Bullock, president of the United Gas & Electric Corporation, has issued the following statement:

"Through this contemplated purchase the preferred stock of the corporation will have placed behind it the common stock of the American Cities Company to be acquired without cost to such preferred stock, thereby largely increasing the equity behind it and the earnings applicable to it. The common stock of the corporation will have the benefit of such acquisition to the extent that the profits derived therefrom exceed the dividends accruing on its second preferred stock and, furthermore, will enjoy the constantly increasing value of the equities of the subsidiary companies of the American Cities Company. A thorough examination of the present earnings of the subsidiary companies of the American Cities Company and a careful estimate of their earnings for the future has been made by the president and other officers of the corporation, and we are convinced that through the acquisition of the common stock of the American Cities Company and the resulting earnings and economies in the purchasing and operating department of both companies there will be a decided increase in the net profits applicable to the common stock of the corporation, including the increase of its common stock which would result from the completion of the purchase. The board unanimously recommends the purchase."

Buffalo & Lake Erie Traction Company, Buffalo, N. Y.—The minority holders of the Buffalo & Lake Erie Traction Company's first refunding thirty-year gold bonds will organize a committee to represent them at a hearing before the Public Service Commission of the Second District of New York on Sept. 12. This hearing is another postponement, the original hearing having been adjourned from Aug. 1 to Aug. 22 for the benefit of the minority bondholders, as noted in the ELECTRIC RAILWAY JOURNAL for Aug. 8, 1913. The minority bondholders claim that their interests will be seriously affected by the proposed plan of reorganization of the Buffalo & Lake Erie Traction Company and the acquisition by the reorganized company of the capital stock of the Buffalo, Lockport & Rochester Railway and the Canadian American Power Corporation, which latter company was recently incorporated in Albany to import 46,000 hp to supply the Niagara Frontier Electric Railway and the reorganized lines with electricity.

Denver & Northwestern Railway, Denver, Col.—Clark, Dodge & Company, New York, N. Y., have announced that the time for receiving deposits of Denver & Northwestern Railway 5 per cent bonds for exchange under the terms of the offer of the Denver City Tramway, which was to have expired on Aug. 25, has been extended to Sept. 25.

Halifax (N. S.) Electric Tramway.—A meeting of the stockholders of the Halifax Electric Tramway was set for Aug. 30, 1913, to vote on increasing the capital stock from $1,400,000 to $2,000,000. This is the limit up to which stock may be issued under the company's charter as extended at the last session of the Legislature. The proceeds of the new issue, in case both the stockholders and the Public Utilities Commission approve, are to be used for extensions and improvements.

Hudson & Manhattan Railroad, New York, N. Y.—The first statement of the earnings of the Hudson & Manhattan Railroad since the reorganization of its finances, as noted in the ELECTRIC RAILWAY JOURNAL of Jan. 18, 1913, July 5, 1913, and several included dates, was published on Aug. 28, showing increased gross earnings for the five months ended June 30, 1913, and decreased net earnings for the same period. Gross earnings for the five months were $2,296,659, as compared with $2,220,199 for the corresponding period last year. Operating expenses and taxes increased from $949,564 last year in the five months operated to $1,063,171 this year. Operating revenue was reduced from $1,270,652 last year to $1,233,488 this year. After income deductions other than bond interest of $124,755, against $92,217 last year, the net income applicable to bond interest was $1,108,732, against $1,178,435 last year. After deduction of interest on the first mortgage bonds there remained for the payment of interest on the adjustment bonds $296,941. The interest declared amounts to $279,390, which leaves a surplus of $17,551. The percentage of operating expense as compared with operating revenue was 38.53, against 35.91 last year. This statement of earnings for five months was accompanied by a declaration of interest at the rate of 2 per cent per annum on the 5 per cent adjustment income bonds, payable Oct. 1, 1913. The declaration was $8.34 per $1,000 bond for the five months from Feb. 1 to June 30, 1913. Holders of the certificates of deposit representing 4½ per cent mortgage

bonds, preferred and common stock, and voting trust certificates have been notified by the company that the new securities to which they are entitled under the reorganization plan are ready for delivery in temporary form, together with $22.50 for every one-thousand-dollar bond deposited.

New York (N. Y.) Railways.—The New York Railways will pay on Oct. 31 to the adjustment mortgage income bondholders the sum of $16.36 per $1,000 bond for the first six months of the present calendar year, as compared with $7.70 in the corresponding period last year, an increase of 112 per cent.

Oakland (Cal.) Railways.—On Aug. 20 interest on the $1,100,000 of the Oakland Terminal Company's note issue was paid. The principal due on the same day may be extended.

Shore Line Electric Railway, Saybrook, Conn.—The Public Service Commission of the Second District of New York has issued an order authorizing the New York, New Haven & Hartford Railroad to acquire and Charles L. Livingston to assign all his right, title, and interest to receive from the Shore Line Electric Railroad so much of the capital stock of the last-named company as may be hereafter authorized by the commission.

South Shore Traction Company, New York, N. Y.—It is stated that the lines of the South Shore Traction Company between West Sayville and Blue Point, which were recently sold at public auction on an order from Judge Chatfield in the United States District Court at Brooklyn, have been transferred to the Suffolk Traction Company, and that the lines will soon be put in operation by the latter company. The South Shore Traction Company's line was constructed several years ago, but has never been operated between Blue Point and Sayville, owing to injunctions, although the tracks are laid ready for use, except for a few hundred feet on Railroad Avenue, Bayport, which the Suffolk Traction Company will construct at once in order to reach Bayport over the newly acquired line.

United Properties Company, Oakland, Cal.—The F. M. Smith advisory committee on Aug. 18 made public the following statement regarding the option giving to R. G. Hanford until Jan. 1, 1914, the right to sell Mr. Smith's holdings in the United Properties Company to a British syndicate, as noted in the Electric Railway Journal of Aug. 30, 1913: "The option secured by R. G. Hanford was given to the committee composed of James K. Moffitt, William A. Bissell, Vanderlyn Stow, W. I. Brobeck and Gavin V. McNabb, known as the United Properties Committee, which has been handling the affairs of that company and its constituent companies under an agreement made by F. M. Smith, William S. Tevis and R. G. Hanford under date of Jan. 25, 1913. That committee controls the holdings of Mr. Smith in the United Properties Company only, and the option which the committee gave to Mr. Hanford was upon Mr. Smith's holdings in this property alone. The United Properties Company has no interest whatever in the stock of the Realty Syndicate, Pacific Coast Borax Company or any of the borax companies or any of the Smith companies, except the railroads, of which it indirectly owns about 30 per cent of the preferred 'A' stock and a majority of the common stock. The committee in charge of the principal properties of Mr. Smith is composed of F. B. Anderson, W. W. Garthwaite and C. O. G. Miller, and this committee has not given any option to Mr. Hanford. Its plans or work will not be halted or affected in any manner by the option given by the other committee, nor will the powers of the United Properties Company be interfered with by the option, because it is provided therein that the committee's powers shall not be limited or restrained in any way by the outstanding option unless and until the properties shall be purchased thereunder."

Washington Water Power Company, Spokane, Wash.—In a circular dated July 20 the Washington Water Power Company has offered its shareholders the right to subscribe to an issue of about $500,000 of 7 per cent notes due Feb. 2, 1914, payable at the office of the Farmers' Loan & Trust Company, New York, N. Y., par $5,000 or multiples thereof. These notes have been already fully subscribed. The company also expects to put out an issue of six weeks' notes next December. As of Feb. 1, 1914, there will be outstanding about $2,000,000 of notes, and to provide for those due Feb. 1, 1914, the company will probably issue 10 per cent new stock on April 1, 1914, offering the same to shareholders with the privilege of prepayment on Feb. 2, 1914.

West Penn Traction Company, Pittsburgh, Pa.—The West Penn Traction Company, which is controlled by the West Penn Traction & Water Power Company, showed a gross gain of $170,851, or slightly over 10 per cent, for the first six months of 1913, while net receipts from operations increased $98,485, or 15 per cent. The actual gross gain for all the light and power companies and the electric railways of the controlling company for the six months was $291,624. The declaration of a quarterly dividend of 1½ per cent on the preferred stock of the West Penn Traction & Water Power Company, payable Sept. 15, means that none of the underlying companies of the American Water Works & Guarantee Company will default in its dividends on securities held by the public. Interest was paid Sept. 1 on outstanding bonds of several of these companies.

Dividends Declared

American Railways, Philadelphia, Pa., quarterly, 75 cents, common.

Brooklyn (N. Y.) Rapid Transit Company, quarterly, 1½ per cent.

California Railway & Power Company, San Francisco, Cal., quarterly, 1¾ per cent, prior preferred.

Chicago (Ill.) Elevated Railways, quarterly, 1½ per cent, preferred participating certificates.

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

Elmira Water, Light & Railroad Company, Elmira, N. Y., 2½ per cent, preferred.

Louisville (Ky.) Traction Company, 2½ per cent, preferred; quarterly, 1 per cent, common.

Northern Ohio Traction & Light Company, Akron, Ohio, quarterly, 1¼ per cent, common.

West Penn Traction & Water Power Company, Connellsville, Pa., quarterly, 1½ per cent, preferred.

ELECTRIC RAILWAY MONTHLY EARNINGS

BATON ROUGE (LA.) ELECTRIC COMPANY

Period			Gross Earnings	Operating Expenses	Net Earnings	Fixed Charges	Net Surplus
1m.,	June,	'13	$12,299	*$7,311	$4,989	$2,076	$2,913
1 "	"	'12	12,420	*8,418	4,002	1,734	2,268
12 "	"	'13	150,215	*91,150	59,065	22,505	36,560
12 "	"	'12	134,811	*81,551	53,260	20,758	32,501

BROCKTON & PLYMOUTH STREET RAILWAY, PLYMOUTH, MASS.

1m.,	June,	'13	$12,102	*$8,980	$3,122	$1,116	$2,006
1 "	"	'12	11,766	*8,271	3,494	1,051	2,444
12 "	"	'13	122,103	*94,892	27,211	12,871	14,340
12 "	"	'12	120,056	*89,300	30,755	12,605	18,150

CAPE BRETON ELECTRIC COMPANY, SYDNEY, N. S.

1m.,	June,	'13	$30,645	*$17,913	$12,732	$6,082	$6,650
1 "	"	'12	29,448	*16,792	12,657	5,703	6,954
12 "	"	'13	373,788	*200,743	173,045	70,311	102,734
12 "	"	'12	246,438	*191,445	154,993	67,930	87,063

DALLAS (TEX.) ELECTRIC CORPORATION

1m.,	June,	'13	$168,592	*$100,490	$68,101	$24,692	$43,409
1 "	"	'12	142,342	*87,607	54,735	24,666	30,069
12 "	"	'13	2,008,282	*1,174,350	833,931	295,771	538,170
12 "	"	'12	1,709,020	*1,105,418	603,602	259,852	343,750

GALVESTON-HOUSTON ELECTRIC COMPANY, GALVESTON, TEX.

1m.,	June,	'13	$206,916	*$111,908	$95,008	$34,755	$60,253
1 "	"	'12	171,085	*94,493	76,592	33,860	42,731
12 "	"	'13	2,216,830	*1,273,960	942,860	410,586	532,284
12 "	"	'12	1,733,952	*1,059,623	674,329	318,100	356,229

HOUGHTON COUNTY (MICH.) TRACTION COMPANY

1m.,	June,	'13	$26,163	*$14,467	$11,696	$5,630	$6,067
1 "	"	'12	27,379	*14,672	12,707	5,707	7,000
12 "	"	'13	311,526	*177,861	133,665	67,980	65,685
12 "	"	'12	301,107	*180,176	120,931	64,470	56,461

JACKSONVILLE (FLA.) TRACTION COMPANY

1m.,	June,	'13	$56,702	*$36,363	$20,340	$10,513	$9,827
1 "	"	'12	50,174	*33,356	16,817	9,821	6,996
12 "	"	'13	593,015	*399,550	193,464	126,995	66,469
12 "	"	'12	579,363	*361,799	217,563	112,811	104,752

NORTHERN TEXAS ELECTRIC COMPANY, FORT WORTH, TEX.

1m.,	June,	'13	$174,568	*$93,577	$80,990	$18,994	$47,826
1 "	"	'12	144,975	*76,303	68,670	20,846	47,825
12 "	"	'13	2,004,713	*1,066,081	938,632	283,153	655,479
12 "	"	'12	1,643,215	*894,029	749,185	251,765	497,420

*Includes taxes.

Traffic and Transportation

Officers of Peninsular Railway Co-operate with Automobilists to Reduce Accidents

At the regular monthly meeting of the joint safety committee of the Peninsular Railway and San José Railroads, San José, Cal., held on Aug. 16, 1913, it was noted that the number of collisions between automobiles and cars had diminished considerably, and members of the committee expressed the opinion that this was largely due to the work done by the newspapers of Santa Clara County in calling attention to the danger arising from careless and reckless operation of autos. At the preceding meeting of the committee, George B. Polhemus, president, and John R. Chace, secretary of the San José & Santa Clara County Automobile Association, were present on invitation, with a view to devising ways and means of securing greater care in the operation of automobiles. As a result of the meeting, the matter was brought to the attention of the newspapers, reports of the meeting received a generous publicity, and in addition, several papers published editorials on the subject. The view was expressed that there can be no question that the concerted action of the press has had good effect and has impressed upon the drivers of automobiles the great responsibility that rests with them. It would seem, according to the expression of members of the committee, as if recourse to special legislation would not now be needed to require automobilists to exercise greater care in running their cars.

F. E. Chapin, general manager of the Peninsular Railway and the San José Railroads, states that he is not asking the officials of the automobile association to meet with the safety committee of the companies every month, but he hopes to secure their presence at every quarterly meeting, as he considers the co-operation of responsible motorists of the utmost importance to the safety movement. At these quarterly meetings reports of collisions of autos and cars will receive special consideration.

Another point brought out at the meeting on Aug. 16 was the difficulty experienced by conductors in preventing passengers from alighting from the car before it comes to a stop.

Large Increase in Freight Business of Louisville Road.—An unusual feature of the business done by the Louisville & Interurban Railroad, Louisville, Ky., is that freight traffic is running ahead of passenger business, relatively. The receipts of the freight department for the fiscal year ended June 30 were in excess of $100,000, showing an increase of nearly 15 per cent over the preceding year, while the gain in passenger earnings was not nearly so great.

Increase in Freight Rates Urged by Publisher.—E. W. Beedle, president of the company which publishes the *Inland Printer*, has a signed article in the September issue of that paper urging other publishers and members of the printing trade to advocate an increase in steam railroad freight rates. He bases his argument upon the economic necessity to the steam railroads of such an increase and upon the theory that prosperity in all lines of trade is dependent to a large extent upon the prosperity of the steam railroads.

Free Transportation Curtailed in Detroit.—The Detroit (Mich.) United Railway announces that owing to the large reduction made in fares within the city the fare to the State Fair Grounds will upon all occasions, including the Michigan State Fair, be a city fare plus the township fare. In the past the company has carried passengers to the fair grounds for the annual State fair at a city fare. The company also says: "The seven-for-a-quarter ticket agreement between the city and the company has so decreased earnings that the company is obliged to withdraw all free transportation and transportation at reduced rates heretofore granted charitable and quasi-public institutions."

Safety League in Denver.—It has been the purpose of the Denver (Col.) City Tramway for some time to establish among employees and officials an organization to be known as the Tramway Safety League. A very handsome enameled button has been prepared, which will be worn by members of this league. Owing to lack of time the company has not as yet perfected the organization and prepared a constitution and by-laws, but this will be done later. Numerous requests for permission to wear the safety league button have been received from employees and the company sent a supply to each division superintendent, in order that all of the trainmen might be provided with one during the Knights Templar Conclave.

Rhode Island Company Answers Fare Complaint.—The Rhode Island Company has filed with the Public Utilities Commission of Rhode Island an answer to the petition of the East Providence Town Council, in which it avers that the reduction in fare which has been asked on its line between the Union Station and Riverside would create unjust discrimination. The answer denies that the company would not be materially affected by the proposed change of the zone limit and asserts that such a change would result in an undue preference in favor of Riverside passengers as against patrons of other stations on the line. The adoption of the change in the zone, the answer reads, "would disturb existing logical and equitable conditions and create unjust discrimination."

Heavy Traffic on Louisville & Interurban Railroad.—The Louisville & Interurban Railroad handled a tremendous volume of passenger business during the Shelbyville fair, which was held Aug. 26-29. Three-car and four-car trains were run out of Louisville and six-car and seven-car trains were run from the fair grounds, these being the largest trains ever run over the road. It was especially difficult to handle the traffic on account of the fact that large numbers were returning east to Shelbyville and others were boarding westbound trains for Louisville. R. H. Wyatt, general freight and passenger agent of the company, issued a special bulletin of appreciation to the employees of the operating department, complimenting them on the record which they made.

Bulletin on Co-operative Buying in Philadelphia.—The Philadelphia (Pa.) Rapid Transit Company has issued a bulletin of twenty-four pages on co-operative buying. The publication reviews briefly the plan devised by which the employees secure the benefits of co-operative buying and contains a complete list of the merchants authorized to accept coupons, this list arranged by dealers, and a list of names arranged by districts. In regard to the possibilities of the plan the company says: "Purchases exceeding $4,000,000 per annum are made by the families of the members of the association. It now only remains for this membership to demonstrate its combined purchasing power by the greatest possible use of these cash coupons. This should insure that not only larger discounts may be obtained on new contracts, but that a still greater number of representative dealers in foodstuffs and merchandise throughout the city may be added to the list of those accepting these coupons—this with the result that the price at which the beneficial association can sell the coupon books to its members may be correspondingly reduced."

Howard Elliott on the Outlook for the New Haven Railroad.—Howard Elliott has succeeded Charles S. Mellen as president of the New York, New Haven & Hartford Railroad, but Mr. Mellen will remain with the company in an advisory capacity. On Aug. 29 Mr. Elliott was quoted as follows: "It is a matter of common knowledge that the margin between income and outgo on the American railroads is very narrow and too small for the best interests of the country, which needs the very best of transportation facilities. The results on the New York, New Haven & Hartford Railroad for the year ended June 30, 1913, as published in the newspapers, show that the road failed to earn the dividends paid by $4,630,000. The decision about dividends rests, of course, with the directors. I do not know their views, but it seems obvious that dividends cannot long be paid unless earned. I have faith in the future growth of all kinds of business in the United States and in New England, but if earnings decrease to a greater extent than it is possible to reduce expenses it would seem to be better to face the issue and consider the ultimate welfare of the property, even at the cost of temporary loss and inconvenience."

Personal Mention

Mr. Frank Pratt has succeeded Mr. Philip Palm as roadmaster of the Burlington (Vt.) Traction Company.

Mr. H. T. Jones has been appointed acting general superintendent of the United Railroads of San Francisco to succeed the late E. D. Hibbs. Mr. Jones was formerly division superintendent of the Fillmore and Turk Street lines of the company.

Mr. E. B. Nance has been appointed chief accountant of the Idaho Railway, Light & Power Company, Boise, Idaho. The Idaho company has five power plants and more than 100 miles of interurban lines and supplies numerous towns with electrical energy.

Mr. James Dalrymple, general manager of the Glasgow Corporation Tramways, who is on a visit to the United States, was in Chicago from Aug. 29 to Sept. 2. Mr. Dalrymple expects to attend the convention of the American Electric Railway Association in Atlantic City in October and to sail from New York for Glasgow on Oct. 18.

Mr. J. W. Hancock, general manager of the Roanoke Railway & Electric Company, Roanoke, Va., has had his jurisdiction extended to include the property of the Lynchburg Traction & Light Company, Lynchburg, Va. Mr. Hancock retains his connection with the Roanoke Railway & Electric Company and will manage both properties, dividing his time between them.

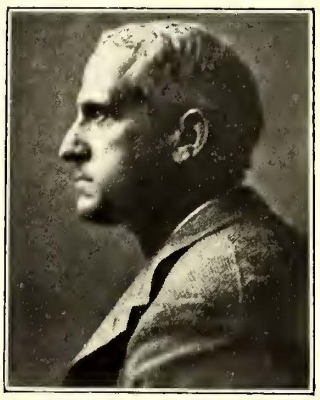
Mr. Charles S. Mellen, who has been president of the New York, New Haven & Hartford Railroad for the past ten years, relinquished his duties to Mr. Howard Elliott on Aug. 30. It was announced that Mr. Mellen had agreed to place at the disposal of the president and directors such information as he acquired from his long connection with the property, and to give advice from time to time as requested.

Mr. F. H. Hill, operating engineer of the United Gas & Electric Corporation, New York, N. Y., has been appointed acting general manager of the Elmira Water, Light & Railroad Company, Elmira, N. Y. For a number of years Mr. Hill was with the Mellen banking interests on interurban electric railway work. Later he was with the Pennsylvania Railroad on construction and maintenance of way work. At the time of his appointment to the Elmira Water, Light & Railroad Company he was the operating engineer of the United Gas & Electric Corporation.

Mr. Patrick F. Sullivan, president of the Bay State Street Railway, Boston, Mass., was the guest of the members of the Fall River branch of the union of employees of the company in the Y. M. C. A. building in Fall River on Aug. 27, 1913, and at the conclusion of the address which he made Mr. Sullivan was presented with a silver loving cup by the men of the branch as a token of esteem. Mr. Sullivan impressed upon the men the necessity of complying with the rules and regulations as laid down and complimented the men of the branch on the fine record which they have made.

Mr. Patrick Calhoun, who has been succeeded as president of the United Railroads of San Francisco, Cal., by Mr. Jesse W. Lilienthal, has been in executive charge of the United Railroads since 1903. He was born at Fort Hill, S. C., on March 21, 1856, and is a grandson of John C. Calhoun, who was Vice-president of the United States. Mr. Patrick Calhoun was admitted to the Georgia bar in 1875 and to the Missouri bar in 1875 and practised law at Atlanta, Ga., from 1878 to 1894, his chief clients being corporations and railroads. He was interested in consolidating the Central Railroad of Georgia, the Richmond & Danville Railroad and the Richmond & West Point Terminal Railway & Warehouse Company, for all of which he was counsel from 1889 to 1892. Since then he has devoted himself chiefly to consolidating and developing electric railway properties and took an active part in the consolidations of the railway systems in Pittsburgh, St. Louis, Baltimore and San Francisco. He is a director of the Philadelphia Company, the Pittsburgh Railways of Pittsburgh, United Railroads of San Francisco, United Railways Investment Company and a number of industrial and manufacturing companies. The United Railroads of San Francisco had just been brought under Mr. Calhoun to a fair earning and physical basis when the earthquake destroyed a considerable part of the company's property. Almost immediately after the fire one of the most disastrous strikes of its kind in the history of American cities followed. The victory which the company won in this conflict was the first of its kind over union labor in the history of San Francisco. Mr. Calhoun's interests outside of San Francisco have for some time been making a more constant demand on him and he decided to retire from the company so as to devote himself more largely to his other interests. Last year Mr. Calhoun made eleven trips between New York and San Francisco in the interests of the property in the latter city. It is understood that he will retain his financial interest in the property. Mr. Calhoun has long been interested in the affairs of the American Electric Railway Association and was a speaker at the midyear banquet of the association held on Jan. 27, 1911. His subject was "Intelligent Popular Government and Public Utilities." He also addressed the members of the association at the midyear conference on Jan. 26, 1912, on "Lessons of the San Francisco Strike." He also spoke at the 1910 annual convention of the American Electric Railway Association at Atlantic City.

Mr. Jesse W. Lilienthal, who has been elected president of the United Railroads of San Francisco to succeed Mr. Patrick Calhoun, was born in New York in 1855. At an early age his family moved to Cincinnati, where he received his primary education. He studied at the University of Cincinnati and later at the Harvard Law School, from which he was graduated in 1876. For fourteen years thereafter he practised law in New York. On account of the ill health of his wife Mr. Lilienthal in 1894 removed to San Francisco, where his law offices are located. He has been exceedingly successful in his profession and is identified as a director with numerous Western corporations, among them the Anglo & London-Paris National Bank, the Anglo California Trust Company, the Marin County Water Company, the La Grange Gold Dredging Company, the Sierra & San Francisco Power Company, the Western Meat Company and a number of incorporated enterprises in South San Francisco. He is also senior vice-president of the San Francisco Bar Association. Mr. Lilienthal is known and respected in San Francisco as a philanthropist of high ideals. He is president of the Recreation League, the Tuberculosis Association and the Society for the Study of the Exceptional Child. He is a member of the probation committee of the juvenile court, the members of which are appointed by the judges of the Superior Court, and is a director of the Boys and Girls' Association and the Remedial Loan Association.



J. W. Lilienthal

OBITUARY

Almon S. Balsden, chief electrician for the London & Lake Erie Railway & Transportation Company, St. Thomas, Ont., and formerly manager of the St. Thomas (Ont.) Municipal Railway, was almost instantly killed on Aug. 28, when he came in contact with a transmission wire of the Hydroelectric Power Commission of Ontario.

F. H. Daniels, chairman of the board of engineers of the United States Steel Corporation, chief engineer of the American Steel & Wire Company, president of the Washburn & Moen Company, and a member of the board of directors of the Massachusetts Employees' Insurance Association, died at his home in Worcester, Mass., on Aug. 31 after an illness of about a year. He was sixty years of age.

Clarence Buckingham, formerly president of the Northwestern Elevated Railroad, Chicago, Ill., is dead. Mr.

Buckingham was born at Zanesville, Ohio, on Nov. 2, 1854, and moved with his parents to Chicago when a boy. He became associated with the J. & E. Buckingham Company, dealer in grain, later absorbed by the Illinois Central Railroad. He then became a broker and was elected to the directorate of the Corn Exchange National Bank and the Illinois Trust & Savings Company. He was fifty-eight years old.

C. E. Newman, chief clerk of the Peninsula Railway and the San José Railroads, San José, Cal., is dead. Mr. Newman was private secretary to Mayor Ellert of San Francisco during the latter's entire administration, and served one term as license collector of San Francisco. He was connected with the United Railroads, San Francisco, for some time, and since 1904 had charge of the accounting department of the Southern Pacific Company's electric lines at San José. He was a native of California, aged fifty-seven years, and a bachelor.

Elwood D. Hibbs, general superintendent of the United Railroads of San Francisco, is dead. Mr. Hibbs was born in Bristol, Pa., Oct. 27, 1859. He began his railroad career with the Pennsylvania Railroad at its executive offices in Philadelphia. In 1896 he was appointed general auditor of the Consolidated Traction Company, Newark, N. J., afterward the North New Jersey Street Railway, and later the Public Service Corporation of New Jersey, remaining with the last-mentioned company until 1904, when he went to San Francisco as general superintendent of the United Railroads.

Henry L. Harris, superintendent of the railway department of the Southwestern Gas & Electric Company, Texarkana, Ark., is dead. Mr. Harris was born at Hickory, N. C., on March 17, 1873. He removed to Texarkana from Dallas more than two years ago, to become connected with the Southwestern Gas & Electric Company. Before becoming connected with the company at Texarkana Mr. Harris was with one of the electric railways in Dallas, and was connected for a number of years previous to that with the New Orleans Railway & Light Company, New Orleans, La.

S. Crozier Fox, who was killed in the accident on the New York, New Haven & Hartford Railroad on Sept. 2, 1913, was connected with the Philadelphia banking house of George S. Fox & Sons. Mr. Fox was graduated from the University of Pennsylvania, and besides being a member of the banking firm he was an officer and a director of a number of the constituent companies of the Philadelphia Rapid Transit Company, a director of the Midvale Steel Company, the Keystone Watch Case Company, the Pennsylvania Railroad Company and several banks and trust companies.

Thomas Langan White, formerly connected with several electric railways in Allegheny County, Pa., is dead. Mr. White was born in McKeesport, Pa. He practised medicine there for some time, but subsequently abandoned his profession on account of his many business interests. He was president of the White Electric Traction Company, which was taken over by the West Penn Traction Company. He was also at one time president of the McKeesport Light Company and the McKeesport & Duquesne Bridge Company. At the time of his death Mr. White owned the White Theater and the White Hotel and was president of the Skelley Dry Goods Company, McKeesport.

Howard F. Martin, for twenty years general sales manager of the Pennsylvania Steel Company, was killed in the accident on the New York, New Haven & Hartford Railroad on Sept. 2, 1913. At the time of his death Mr. Martin was general sales manager of the Eveland Engineering Company, Philadelphia, having resigned from the Pennsylvania Steel Company about a year ago. For many years he was prominent in the rail and the electric railway industries, and as a member of the executive committee of the American Electric Railway Manufacturers' Association he had a wide acquaintance and gained many friends. Personally Mr. Martin was kindly, modest and unassuming and at all times evidenced his readiness to assist the industry in a broad and generous way. He was fifty-six years old. At the time of the accident he was returning from Maine with Mrs. Martin, who also was killed in the collision. Mr. and Mrs. Martin lived at Bryn Mawr. They had no children.

Construction News

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

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

RECENT INCORPORATIONS

***Los Angeles & San Joaquin Valley Railroad, Los Angeles, Cal.**—Application for a charter has been made by this company in California to build an electric railway between Los Angeles, Olig and Tejon Pass. Capital stock, $3,000,000. Incorporators: W. C. Sheldon, J. E. Stephens, J. E. Shelton and J. R. Colburn, Jr.

Miami & South Florida Railway, Miami, Fla.—Application for a charter has been made by this company in Florida to build a 100-mile railway from Detroit, Fla., to West Palm Beach, with several branches. Capital stock, $500,000. Incorporators: H. C. Roome, Nathan A. Cole, J. M. Cobb and A. A. Boggs, Miami, and R. E. McDonald, Fulford, Fla. [E. R. J., May 10, '13.]

***Henryetta (Okla.) Interurban Railway.**—Incorporated in Oklahoma to build an electric railway from Henryetta to Muskogee and another from Henryetta to Shawnee, the entire length of the line being 100 miles. Capital stock, $50,000. Incorporators: C. H. Kellogg, W. M. Brink, John Kincaid and C. J. Harrison.

***Minneapolis & Northwestern Traction Company, Pierre, S. D.**—Incorporated in South Dakota to build an interurban railway from Minneapolis, Minn., to Brainerd, but the exact route is not yet decided upon. Capital stock, $1,000,000. Incorporators: D. Woodbury and A. E. Woodbury, Theodore A. Chadwick, Achille D. Soulite, Eugene C. Garwood, William E. Ellis, August Schaugen, Edward Houlit and G. M. Lawrence.

***Elkhorn Valley Traction Company, North Fork, W. Va.**—Chartered in West Virginia to build an electric railway in Clark County. Capital stock, $50,000. Incorporators: L. E. Tierney, Powhatan; L. H. Clark, Kyle; W. E. Stuart, Keyser; C. C. Cale, Keystone; A. Katzen, North Fork.

FRANCHISES

***Selma, Ala.**—Ernest Lamar and associates have received a franchise to build an electric railway in Selma.

Little Rock, Ark.—The Little Rock, Pine Bluff & Eastern Traction Company has received a franchise over the free bridge and along Main Street to Markham Street in Little Rock.

Tulare, Cal.—The Big Four Electric Railway will ask the Council for an extension of its franchise in Tulare. This line will connect Porterville, Tulare, Visalia and Poplar. [E. R. J., Aug. 30, '13.]

***Sarasota, Fla.**—E. O. Burns and C. B. Fish have asked the Council for a franchise to build an electric railway in Sarasota.

Macon, Ga.—The Macon Railway & Light Company has asked the Council for a franchise to double-track Spring Street from Ocmulgee Street to Spring Street bridge in Macon.

Carrollton, La.—The New Orleans Railway & Light Company will bid on franchises that will permit the construction of new lines in Carrollton.

Northampton, Mass.—The Northampton Street Railway has asked the Council for a franchise to extend its lines in Northampton.

Winchester, Mass.—The Bay State Street Railway has asked the Council for a franchise to extend its line in Winchester near the Medford line and to relocate the tracks on Clark Street and Main Street in Winchester.

Corunna, Mich.—The Michigan United Traction Company has received a franchise from the Council in Corunna.

Brainerd, Minn.—The Minnesota Central Railway has received a franchise from the Council in Brainerd. This line will connect Minneapolis, St. Cloud, Brainerd and Cuyuna E. G. Potter, Minneapolis, president. [E. R. J., Aug. 9, '13.]

West Orange, N. J.—The Public Service Railway, Newark, has asked the Council for a franchise to double-track

Central Avenue in West Orange. It is planned to extend the line through private property to the South Orange and Maplewood line.

Cleveland, Ohio.—The Cleveland Railway has asked the Council for a franchise to extend its St. Clair Avenue line from its present terminus to d'Ile Road in Cleveland.

Portland, Ore.—The United Railways, Portland, has asked the Council for a twenty-five-year franchise to extend its lines in Portland.

Jackson, Tenn.—The Jackson Railway & Light Company has asked the Council for an extension of time on its franchise to build the line into West Jackson.

***Cleburne, Tex.**—E. P. Turner and associates have received an electric railway franchise with the privilege of two routes in Cleburne.

Westhampton, Va.—The Virginia Railway & Power Company has received a franchise from the Henrico Board of Supervisors to construct a loop around the Richmond College grounds at Westhampton.

Kenosha, Wis.—The Milwaukee Electric Light, Heat & Traction Company has asked the Council for a franchise for several extensions in Kenosha.

TRACK AND ROADWAY

Birmingham-Tuscaloosa Railroad & Utilities Corporation, Birmingham, Ala.—This company has succeeded in locating a low-grade route between Tuscaloosa and Bessemer, the maximum grade being seven-tenths of 1 per cent and the maximum curvature 4½ deg., while 70 per cent of the line will be tangent. This 47-mile line will connect Birmingham, Tuscaloosa and Bessemer. It will connect with the Tuscaloosa Belt Line, which is owned by the company. At Bessemer it will connect with the Birmingham, Ensley & Bessemer Railway, which is owned by the same interests. Through the latter connection will be made with all the steam railroads in the Birmingham district. F. E. Calkins, New York, N. Y., president. [E. R. J., May 31, '13.]

Edmonton (Alta.) Interurban Railway.—It is understood that the first section of this railway, which will extend from Edmonton to St. Albert, will be in operation within the next few weeks. Gasoline-electric cars will be operated.

Oakland, Antioch & Eastern Railway, Oakland, Cal.—This company has placed in operation its line between Oakland and Sacramento.

Geary Street Municipal Railway, San Francisco, Cal.—This company has been voted bonds in the sum of $3,500,000 for the extension of its lines in San Francisco. The proposed line will converge toward the site of the Panama-Pacific Exposition and will be operated in conjunction with the ocean-to-bay railway recently opened to traffic by the municipality.

Arcadia, Fla.—Preliminary arrangements are being made to build a gasoline interurban railway to connect Arcadia, Hall City, Christian Colony and Lake Okeechobee and intermediate points. E. Prouty, Arcadia, is interested. [E. R. J., Aug. 23, '13.]

Chicago (Ill.) Elevated Railways.—Work will be begun at once by this company extending the platforms on its lines in Chicago. The principal extensions will be at Clark Street and Lake Street, Randolph Avenue and Fifth Avenue, and Wabash Avenue and Adams Avenue. Overhead bridges are to be built at a few places so as to expedite the movement of passengers who desire to transfer from one line to another. The new work is being done in connection with the plan to establish through routes on some of the elevated lines in Chicago.

Illinois Traction System, Peoria, Ill.—This company is asked to consider plans to build a line north and south through Saybrook; that is, south to Bellflower and thence south and west to Clinton and north from Saybrook to Anchor and then to Fairbury and on to Kankakee.

Union Traction Company of Indiana, Anderson, Ind.—This company has completed its new line from Newcastle to Muncie.

Indianapolis & Delphi Traction Company, Indianapolis, Ind.—Officials of this company were in Hamilton County recently in company with representatives of a Montreal syndicate of capitalists going over the proposed route of this railway with a view of placing bonds for the construction of the lines. The survey has been made, and if the project is financed soon it is said to be the intention of the company to build the line from Carmel north through Westfield and Hortonville to Sheridan by the first of the year. Next season it may be continued to Frankfort and Delphi. The plan at present is to connect with the Union Traction Company's line at Carmel and enter Indianapolis on the old line. [E. R. J., May 10, '13.]

New Albany & French Lick Valley Traction Company, New Albany, Ind.—This company is being organized in New Albany to build an electric line from New Albany to West Baden Springs and French Lick Springs, Ind., a distance of 60 miles. The route will be via Mooreville, Greenville, Palmyra, Hardingsburg and Paoli. It is intended to construct a 4-mile branch from Mooreville to Corydon by way of Georgetown and Lanesville. A survey has been completed and an estimate of the cost arrived at, the total cost of construction being placed at $1,399,563. It is intended to sell $400,000 of stock to residents along the route of the proposed line and to bond the company for the remainder of the necessary amount. Charles W. Schindler, New Albany, is attorney for those who are planning the construction of the railway, their identity not yet having been announced.

Clinton (Ia.) Street Railway.—Several extensions are being built in Clinton by this company. When the extensions are completed work will be begun on the reconstruction of the Eagle Point Park line and of portions of the lines in Bluff Road and in Comanche Avenue in Clinton.

Union Electric Company, Dubuque, Ia.—Rapid progress is being made by this company on the construction of its new West Locust Street extension in Dubuque.

Louisville & Interurban Railway, Louisville, Ky.—This company, which is considering the extension of its Orell line to Kosmosdale, is making arrangements to use a right-of-way over private property instead of over the Lincoln Way.

North Louisiana Electric Railway, Shreveport, La.—This company plans to build a 100-mile electric railway from Shreveport to Monroe via Homer, Minden and Arizona. The property owners of Ward 7 of Claiborne parish, including the towns of Homer and Arizona, have voted a bonus of $50,000 to the company. A. B. Blevins, Jefferson, president. [E. R. J., March 15, '13.]

Bangor Railway & Electric Company, Bangor, Maine.—Construction has been begun by this company on its 1-mile extension from Hampden toward Winterport.

Detroit (Mich.) United Railway.—On the evening of Aug. 26 the Council adopted a resolution providing for the construction of a crosstown line on Junction Avenue between West Jefferson and Michigan Avenues and from Michigan Avenue over other streets to a connection with the Grand River Avenue line. Another resolution provides for the extension of the Kercheval Avenue line.

Electric Short Line Railroad, Minneapolis, Minn.—Work on this company's line to Wayzata and Long Lake is nearing completion, and plans are being considered to build extensions west and south to Redwood Falls, Marshall, Vesta and Bird Island.

Luce Electric Short Line Company, Minneapolis, Minn.—Financial arrangements are being made by this company to build an electric railway between Minneapolis and Redwood Falls. [E. R. J., Aug. 2, '13.]

Laurel & Ellisville Interurban Railway, Laurel, Miss.—This company has placed in operation its line between Laurel and Ellisville.

***Hollister, Mo.**—Preliminary surveys are being made to build an electric railway to connect Hollister, Power Site and Branson. It is proposed to organize a company with a capitalization of $500,000 to build the proposed line. W. J. Campbell, St. Louis, is interested.

***Kansas City, Mo.**—Plans are being considered to have a municipally owned electric railway in Swope Park, to extend from the entrance to the zoo, lagoon, lake and other points of interest.

Jamestown (N. Y.) Street Railway.—Work has been begun by this company on its Willard Street extension in Jamestown.

Lake Erie & Youngstown Railway, Youngstown, Ohio.—This company has awarded the contract for the construction of its line from Conneaut to Youngstown to the Caldwell Construction Company, Columbus, Ind.

***Henryetta (Okla.) Interurban Railway.**—This company, the incorporation of which is noted elsewhere in this issue, will begin the surveys at once for its proposed 100-mile electric railway to connect Henryetta with the various coal mines and oil fields within a radius of 10 miles. One line will be built from Henryetta to Muskogee and the other from Henryetta to Shawnee. This line will connect with the Rock Island Railroad and the Santa Fé Railroad at Shawnee, with the Fort Smith & Western Railroad near Okemah and with the Missouri, Oklahoma & Gulf Railroad at Henryetta. C. H. Kellogg is interested.

Dunnville, Wellandport & Beamsville Electric Railway, Wellandport, Ont.—It is announced that work on this railway, which has been projected for several years, will be begun within the next ten days. The line will connect with the Hamilton, Grimsby & Beamsville Railroad at Beamsville, Ont., and from Beamsville to St. Catharines a connecting line will be built to connect with the Niagara, St. Catharines & Toronto Railway for Niagara Falls. At Niagara Falls this line will connect with the Canadian Northern Railroad for Toronto and points east and also with the proposed line of the Frontier Electric Railway to Buffalo. [E. R. J., June 21, '13.]

Sandwich, Windsor & Amherstburg Railway, Windsor, Ont.—Double tracks are being laid by this company on Wyandotte Street from Ouellette Avenue to Mercer Street in Windsor.

Portland & Oregon City Railway, Portland, Ore.—Grading will be begun at once by this company, which is a subsidiary of the Clackamas Southern Railroad, about 4 miles south of Milwaukee, on the 6-mile stretch between Milwaukee and Gladstone.

Monongahela, Ellsworth & Washington Railway, Washington, Pa.—About 90 per cent of the right-of-way between Monongahela and Voorhis has been secured by this company. Grading is being carried along rapidly and it is planned to have this section of the line in operation by Oct. 1. James Bryant, Pittsburgh, engineer. [E. R. J., May 24, '13.]

Montreal & Southern Counties Railway, Montreal, Que.—This company has completed its extension to Marieville, 4 miles beyond Richelieu and 22 miles from Montreal. The greater part of the roadbed on the line to St. Césaire is also completed.

Quebec (Que.) Rapid Transit Company.—This company states that it will not begin construction of its system of radial lines to connect Quebec, Charlesbourg, Loretteville, Cap Rouge, Ste. Foye and the Island of Orleans until the spring of 1914. Capital stock authorized, $1,000,000. All communications should be addressed to A. Taschereau, Quebec. [E. R. J., Aug. 9, '13.]

Bryan & Central Texas Interurban Railroad, Bryan, Tex.—This company has completed its extension to the Brazos section.

Puget Sound Electric Railway, Tacoma, Wash.—Numerous improvements to interurban line between Seattle and Tacoma will be made at once by this company. It will also begin the installation at once of a block signal system.

Morgantown & Wheeling Railway, Wheeling, W. Va.—Plans are being made by this company to build a 14-mile line from Cassville to Blacksville. J. A. Martin, Morgantown, general manager. [E. R. J., Jan. 25, '13.]

Chicago & Wisconsin Valley Railroad, Madison, Wis.—This company, which was recently reorganized and recapitalized, has obtained the necessary franchises from various cities and counties on condition that within sixty days the company shows proof that $300,000 has been set aside to start construction work and pay debts contracted previous to the reorganization. The first line will be built from Madison to Portage, including city systems. About 250 miles of electric railway will ultimately be built, radiating from Madison and will connect Portage, Prairie du Sac, Merrill, Madison, Janesville, Friendship and Easton. J. E. Jones, Portage, is the general manager of the company. [E. R. J., Aug 2, '13.]

SHOPS AND BUILDINGS

Southern Pacific Company, San Francisco, Cal.—Plans are being made by this company to construct a new Arcade depot in Los Angeles.

Freeport Railway & Light Company, Freeport, Ill.—Plans are being considered by this company to build a new passenger station in Freeport.

New Orleans Railway & Light Company, New Orleans, La.—Plans are being considered by this company to build a new depot at West End in New Orleans.

New York State Railways, Rochester, N. Y.—This company plans to build a new carhouse on Lake Avenue Boulevard in Rochester. The structure will be of steel and concrete construction, 65 ft. x 205 ft., and 21 ft. high. There will be two buildings, one in front to be used as an administration building and one in the rear for housing cars. Three tracks will enter the latter building, which will be capable of holding between seventy-five and 100 cars. The buildings will be made so that they can be extended and doubled to hold more cars, if necessary. There will be room for a machine department, a storeroom, boiler room, and sand and hard-coal storage rooms.

Piedmont & Northern Railway, Charlotte, N. C.—The new carhouses and repair shop of this company at Greenville, S. C., are nearly completed. The machine shop is 160 ft. x 75 ft. and is built of white pressed brick with a steel roof. The machinery is now being installed. A stock room, 120 ft. x 20 ft., is in the main building, the supplies for the Greenville, Spartanburg & Anderson Railway to be kept there. The carhouse is 200 ft. x 65 ft., is constructed of pressed brick and has a steel truss roof. Four tracks extend the entire length of the building, making a total of 400 ft. of storage trackage within the carhouse. About 2 miles of storage track have been laid on the 20 acres which have been set apart for freight yards.

Jefferson County Traction Company, Beaumont, Tex.—This company has purchased two lots and a three-story brick building on Bonham Street in Beaumont. The building will be remodeled and transformed into a depot and office building for the Jefferson County Traction Company and the Beaumont Traction Company.

Wisconsin Traction, Light, Heat & Power Company, Appleton, Wis.—This company has recently bought the lot just north of its present carhouse property in North Third Street in Appleton to prepare for future extensions to its carhouses and power plant. The additions will not be built this year.

POWER HOUSES AND SUBSTATIONS

Pacific Electric Railway, Los Angeles, Cal.—This company plans to move its power plant, now at the corner of Fifth and Lacy Streets, to North Main Street in or near Santiago Creek in Santa Ana. The company proposes to sell the property on which the present power house is located.

Benton Harbor, St. Joe Railway & Light Company, Benton Harbor, Mich.—This company will equip one of its substations with a 300-kw rotary converter which was recently ordered from the General Electric Company.

Piedmont Railway & Electric Company, Burlington, N. C.—This company will install at its substation at Mebane three 100-kva transformers, switchboard and accessories which were recently purchased from the General Electric Company.

Northern Ohio Traction & Light Company, Akron, Ohio.—This company will add to its power-station equipment three 1000-kva transformers. The order has been placed with the General Electric Company.

Columbus, Delaware & Marion Railway, Columbus, Ohio.—Arrangements have been made by this company to place in operation in its power station a 750-kw Curtis turbo-generator, switchboard and accessories. The apparatus has been ordered from the General Electric Company.

Manufactures and Supplies

ROLLING STOCK

Philadelphia (Pa.) Rapid Transit Company is in the market for new elevated cars.

Frankfort, Tacony & Holmesburg Street Railway, Tacony, Pa., is in the market for two double-truck cars.

Harrisburg (Pa.) Railways is reported to be considering the purchase of five additional double-truck passenger cars.

Hershey (Pa.) Transit Company is in the market for two double-truck passenger cars and one double-truck milk car.

Ohio Electric Railway, Cincinnati, Ohio, has ordered three freight cars and six freight trail cars from the Cincinnati Car Company.

Conestoga Traction Company, Lancaster, Pa., is preparing specifications for six double-truck closed cars, six double-truck open cars and six single-truck cars.

Cumberland & Westernport Electric Railway, Cumberland, Md., has ordered four double-truck cars from The J. G. Brill Company. National air-brake equipments are specified.

Lehigh Valley Transit Company, Allentown, Pa., is building in its shops two flat cars, which are sample cars. When completed it is intended to build four or six additional cars of the same type.

TRADE NOTES

D. W. Smith, formerly with the Westinghouse Electric & Manufacturing Company, has been appointed manager of motor sales of the Robbins & Myers Company, Springfield, Ohio.

Dossert & Company, New York, N. Y., have received orders for connectors from the Havana Electric Railway, Light & Power Company, Havana, Cuba, and the Fort Dodge, Des Moines & Southern Railroad.

Automatic Ventilator Company, New York, N. Y., has received an order to equip the twelve new cars now being built by the Wason Manufacturing Company for the Maryland Electric Railways with automatic ventilators.

Best Pipe Engineering & Supply Company, Pittsburgh, Pa., has been recently organized by George Best and his son, George H. Best. George Best, formerly president of the Best Manufacturing Company, has severed his connection with that concern in order to form the new company.

J. R. McKee has resigned as a vice-president of the General Electric Company in order to devote all of his time to personal affairs. Mr. McKee joined the Thomson-Vanderpoel Electric Mining Company as president at the time of its organization and was also manager of the Thomson-Houston Motor Company. In 1893 he was made manager of the newly organized power and mining department of the General Electric Company. Mr. McKee was appointed chairman of the sales committee in 1908 and in 1912 was elected a vice-president of the company.

General Electric Company, Schenectady, N. Y., is receiving incoming business at a rate equal to the capacity of the plants, or about $110,000,000 a year. This is a considerable falling off from the first six months of the year, which, however, set a new record on orders, at a rate of $15,000,000 or more above current business. Unfilled orders at the beginning of this year were so large and the excess of orders in the first six months above capacity was so great that the company has business enough in sight to carry it through the rest of the year. The total value of orders received last year was practically $103,000,000. The company has received orders for four-motor car equipments from the following companies: Portland, Eugene & Eastern Railway, Portland, Ore.; Pittsburgh & Butler Street Railway, Pittsburgh, Pa.; Charleston (W. Va.) Interurban Railroad; United Railways & Electric Company, Baltimore, Md.

Smith-Serrell Company, New York, N. Y., announces that the Francke flexible coupling is being used by the Public Service Railway of New Jersey, the New York Edison Company and the Interborough Rapid Transit Company of New York. The Rochester Railway & Light Company is one of the most recent purchasers. This all-metal coupling is adaptable to a wide range of service. With the growing popularity of the direct-connected turbo-generator set has come an increasing demand for the coupling from the leading manufacturers of such units, and the General Electric Company is furnishing it with the new 1000-kw set recently placed on the market and operating at 3600 r.p.m. The couplings are made for all shaft sizes from ¾ in. up to 20 in.

E. R. Mason, New York, N. Y., has resigned from the Electric Service Supplies Company and has organized the E. R. Mason Company, Inc., with offices at Room No. 2038 Grand Central Terminal, where his company will act as manufacturers' representatives and as dealers in electric railway specialties. Mr. Mason has been manager of the New York office of the Electric Service Supplies Company for nearly five years, previous to which he represented the same company in the Central Western territory with headquarters in Chicago. Before the formation of the Electric Service Supplies Company he was vice-president of Porter & Berg, Inc., Chicago, Ill. His earlier activities were with McGill & Pomeroy and his father, W. R. Mason, in and about Chicago. Mr. Mason's entire business career has been confined to the electric railway supply field. He is well posted and has a large circle of friends throughout the country. The new company will represent in New York and the Middle Atlantic States the following manufacturers: the Johnson Fare Box Company, the Hunter Illuminated Car Sign Company, the Kerwin Machine Company, the Speer Carbon Company and the Esterline Company, and also will handle a complete line of overhead material and manufactured mica products.

ADVERTISING LITERATURE

The J. G. Brill Company, Philadelphia, Pa., has issued an illustrated catalog describing its "Radiax" or special swing-link radial-axle truck.

Pyrene Manufacturing Company, New York, N. Y., has issued the *Pyrene Bulletin* for August, 1913, describing recent instances in which fires were put out by use of its extinguishers.

Trigger-Lock Reversible Controller Finger, Niagara Falls, N. Y., has issued a folder describing its controller fingers, which are equipped with easily removable and interchangeable tips.

Delta-Star Electric Company, Chicago, Ill., has issued a new bulletin devoted to high-tension outdoor substation and protective equipment for use in selling power along transmission lines.

National Quality Lamp Division of the General Electric Company, Cleveland, Ohio, has issued a bulletin describing and illustrating the application of its Mazda lamps in cars, carhouses and subways.

Barrett Manufacturing Company, New York, N. Y., has issued a catalog containing illustrations of the Grand Central Terminal as it will appear when the yards are entirely completed. It describes the application of Barrett Specification pitch and tarred felt as waterproofing materials for the viaducts, subway walls and roofs of the various office buildings.

NEW PUBLICATION

The Trolley Wayfinder. 1913. New England Street Railway Club, Boston, Mass. Paper, 10 cents.

The 1913 edition of the *Trolley Wayfinder*, the official publication of the New England Street Railway Club, has recently been published. The book has an attractive gray paper cover, printed in red and black, being filled with the cut of a car whose center headlight throws a white cone across the bottom of the page. The book contains an alphabetical list of cities and towns reached by trolley, either a statement regarding distance, fare and time or else a reference to some table being given under each name. In preparing the book the club has endeavored to answer the questions "Where shall I go?" and "How can I get there by trolley?" in a simple and comprehensive manner, and what little information is not obtainable in the book the tourists can easily secure from conductors while en route.