Electric Railway Journal

A CONSOLIDATION OF

Street Railway Journal and Electric Railway Review

VOL. XXXIV. NEW YORK, SATURDAY, NOVEMBER 20, 1909 No. 20

PUBLISHED EVERY SATURDAY BY THE

McGraw Publishing Company

James H. McGraw, President. J. M. Wakeman, 1st Vice-president.
A. E. Clifford, 2d Vice-president. C. E. Whittlesey, Sec. and Treas.

Henry W. Blake, Editor.
L. E. Gould, Western Editor. Rodney Hitt, Associate Editor.
Frederic Nicholas, Associate Editor.

NEW YORK, 239 WEST THIRTY-NINTH STREET.

CHICAGO: Old Colony Building.
PHILADELPHIA: Real Estate Trust Building.
CLEVELAND: Schofield Building.
LONDON: Hastings House, Norfolk St., Strand.

Cable Address, Stryjourn, New York; Stryjourn, London—Lieber's Code.
Entered at the New York Post Office as Second Class Mail Matter.

TERMS OF SUBSCRIPTION

United States, Hawaii, Puerto Rico, Philippines, Cuba, Mexico and Canal Zone.

ELECTRIC RAILWAY JOURNAL (52 weekly issues and also special daily convention issues published from time to time in New York City or elsewhere), postage prepaid..$3.00 per annum

Single copies.....10 cents

Combination Rate, in connection with American Street Railway Investments (The "Red Book"—Published annually in May; regular price, $5.00 per copy).....$6.50 per annum

CANADA: extra postage.....$1.50 per annum

To All Countries Other Than Those Mentioned Above.

ELECTRIC RAILWAY JOURNAL (52 weekly issues and also daily editions as above), postage prepaid.....$6.00 per annum
25 shillings. 25 marks. 31 francs.

Single copies.....20 cents

Foreign subscribers may remit through our London office.

NOTICE TO SUBSCRIBERS.

CHANGE OF ADDRESS.—The old address should be given, as well as the new, and notice should be received a week in advance of the desired change.

BACK COPIES.—For back copies of the ELECTRIC RAILWAY JOURNAL, STREET RAILWAY JOURNAL and ELECTRIC RAILWAY REVIEW, applications should be addressed to the McGraw Publishing Company. No copies of issues of the STREET RAILWAY JOURNAL OR ELECTRIC RAILWAY REVIEW prior to January, 1908, are kept on sale except in bound volumes.

DATE ON WRAPPER shows the month at the end of which the subscription expires. The sending of remittances for renewal prior to that date will be much appreciated by the publishers.

Of this issue of the ELECTRIC RAILWAY JOURNAL *9000 copies are printed.*

The Great Northern Electrical Equipment

The speakers at the discussion of Dr. Hutchinson's interesting paper at the meeting of the American Institute of Electrical Engineers, last Friday, included members who described themselves as "single-phase advocates," as well as others who might perhaps be considered as direct-current partisans. Nevertheless, none criticised Dr. Hutchinson's selection of three-phase equipment for the Great Northern tunnel, although Mr. Katte qualified his statement by suggesting that if only the tunnel section had been considered, direct current might have been preferable. Undoubtedly, the conditions in the Cascade installation were particularly favorable for three-phase operation. The acceleration required was low and the total time spent in accelerating the train was small. Constant speed was not considered a drawback. The yards to be equipped with the double overhead system were simple and few in number, and while the conditions were such as to make regeneration unnecessary, it can be installed later if the system is extended. These facts do not necessarily mean that the three-phase system is the most desirable for pusher service. A careful review of all of the conditions in the case of the Central Pacific installation, cited by Mr. Sprague, for instance, may result in the recommendation of some other system. But the unanimity with which different engineers indorsed three-phase locomotives for this particular undertaking, after hearing Dr. Hutchinson's description of the conditions, suggests the benefit to the art which would follow a closer delimitation of the respective fields for which the different electrical systems are most fitted than has been the case up to this time. While the Great Northern installation is not the first application of three-phase locomotives to railway purposes in this country, as they were used a short time on the Miami & Erie Canal Railway, in Ohio, in 1903, it is their first application here to trunk line service, and so far as the locomotives themselves are concerned, the installation furnishes an example in this country comparable with those of the same type abroad.

Fresh Air Cars

The Erie Railroad has given over one car in some of its suburban trains to the commuters who object to the steam heat and stuffy atmosphere of the regular cars. The cars carry signs reading "Fresh Air," and are started out from the terminals with the doors, ventilators and alternate side windows wide open. Any person riding in these cars is privileged to close the window next to him, but has no right to insist on the closure of other ventilation openings. The will of the majority of those who ride in the cars will control the turning on of the steam heat, which may be wanted in very cold weather. Those who find the cars too cold can always move to other cars in the trains. This is a novel but sensible way of solving the vexatious problem of heating and ventilating cars in winter. In some cities there are ordinances requiring all cars to be heated to a certain degree when the temperature outside is below a certain amount, and a hearing to consider the reasonableness of such a requirement is now being conducted in New York City. Without considering the question as to whether

one degree of heat or another is most agreeable to a majority of passengers, it is safe to say that a considerable number of street railway patrons would like the privilege, now enjoyed on the Erie Railroad, of opening the windows and riding in unheated cars. For many years an ordinance in New York City has required street railway companies to operate a certain proportion of closed cars on each route during the summer months. Why cannot those who desire fresh air and little or no heat during the winter be granted equal privileges?

The Gas Engine as an Auxiliary

We have from time to time considered the application of the large gas engine to the purpose of producing auxiliary power for railway and other generating stations. Theoretically, the proposition is a most attractive one, for the efficiency of the gas engine from the thermal standpoint is notoriously great, being approximately double that of a first-class steam engine or turbine. Moreover, if there is some storage, a gas auxiliary plant can be put into operation on extremely short notice to tide over peak loads or an accident, while the efficiency, reckoned from the coal pile to the switchboard, is conspicuously good, better under favorable circumstances than with any form of steam engine yet produced. Further, the big gas engine, operated either by producer gas or by other cheap gas supply, has been for some years in successful use abroad, and has made a good name for itself. Nevertheless, in spite of this, when the proposition has actually been put to practice in this country, results, while sometimes satisfactory, have not been uniformly so, and there is considerable doubt among engineers as to the practical effectiveness of the scheme in spite of its theoretical advantages and undeniable successes under certain conditions.

It is pertinent to inquire somewhat into the causes of the difficulties encountered in so far as they have been determined. The gas or gasoline engine, when worked with relatively high-grade fuel, has proved itself over and over again both economical and reliable, and so far as one can judge from present information the chief trouble in auxiliary gas plants which have failed to give satisfaction has been connected with the supply of producer gas, and particularly with the performance of the producer itself. Producer gas is lean gas, as a rule running from 100 to 150 b.t.u. per cubic foot of gas. The first difficulty which one meets, then, is that such gas requires large engine capacity for the output required, much larger than with fuel of high thermal value. This in itself is a disadvantage at the start. And in spite of a great deal of ingenuity spent in the construction of simple and efficient gas producers, no form yet devised seems to be able to be operated by unskilled labor with good permanent results, at least so far as practice in this country is concerned. Very remarkable results have been sometimes reported from producer plants, even small ones, and under proper conditions there is no denying the fact that a producer can be operated with comparatively little attention and with good efficiency.

A recent bulletin of the United States Geological Survey, No. 393, on "Incidental Problems in Gas Producer Tests," throws at least some light on the difficulties of producer operation, and especially the difficulties of procuring reliable tests. When the initial charge of fuel in a producer is, as it has been in many careful Government tests, very nearly equivalent to the total consumption of fuel in a 24-hour run of the producer at its rated capacity, it is obvious that exact knowledge of the state of this initial supply and the fuel applied to its replenishment is necessary to satisfactory results even in all-day tests. When the period involved in the test is only a few hours, the possible errors involved, even in the most conscientious and careful estimate of fuel conditions, may easily rise to 30 or 40 per cent. The fuel in a producer is in all stages of combustion, from green coal to coke and ash, and just what the relative condition of the coal in various parts of the mass may be is nearly impossible to determine during a practical test. Hence it is very easy, even with the best intentions, to make serious errors. When, as sometimes unfortunately happens, the experimenter is looking for good results for advertising purposes, it is extremely easy to get them. For example, in one of the Government tests reported in the bulletin just referred to, the consumption of coal per brake horse-power hour in consecutive eight-hour periods had an apparent variation sometimes exceeding 100 per cent. When the producer had been in steady operation for a day, so that it had settled down to somewhat uniform performance, these discrepancies still existed in spite of the fact that the average results, reckoning from the beginning of the test, were fairly uniform. Certain periods of eight hours showed less than half a pound of coal per brake horse-power per hour apparent consumption, while other periods showed in excess of 1¼ lb. The average of the whole test, covering 18 eight-hour periods, was 0.93 lb. of coal per brake horse-power hour.

It is therefore evident that producer tests lasting only through a working day are liable to lead to erroneous judgments, even when made with the most conscientious care. Even 24-hour runs may lead to considerable errors owing merely to the extreme difficulty of determining the real depth and condition of the fuel bed. Hence when one hears reports of producer gas plant tests running down to 0.6 lb. or 0.7 lb. of coal per brake horse-power hour, as is sometimes the case, it is pertinent to inquire diligently into the exact condition of the test. It is not unlikely that some of the apparently disappointing results procured have been due to reliance upon tests subject to errors of this kind.

On the whole, therefore, one is inclined to look to the producer, rather than to the engine itself, for explanation of difficulties of the gas power situation. A producer can be operated after a fashion with almost any kind of attention, and still keep the engine turning over, but it is fool proof merely in this sense, and not in the sense of being able to go steadily on working efficiently without intelligent care. Here we believe is to be found the cause of the really great difference between good foreign producer plant practice and that which has sometimes proved highly unsatisfactory in our own country. Every central-station man knows to his cost the difficulty of getting the proper grade of labor, particularly when the tasks in hand are of unfamiliar character. On the other hand, abroad, where the gas engine and producer have been used for a much longer time than here, a proper grade of labor is much more easily obtainable, and hence average results are likely to be

better. It may not really take as much skill in the abstract to operate a producer and gas engine plant as a boiler and steam engine plant, yet it requires skill and a different kind of experience, not easily obtainable here.

We are not disposed, however, to acknowledge a permanent defeat of gas power, since in certain places the results already attained have been highly satisfactory. The possibilities of gas power have not yet been approached. It has, however, been pretty thoroughly demonstrated that operating a gas plant successfully is not so easy a task as the more enthusiastic advocates of it assert. The convenience of the system is so great and its economic possibilities so alluring that the matter will not be dropped on the strength of any casual failures, and we hope and believe that the work of the Government on the subject will lead to a far better understanding of practical working conditions and a greater application of the system, especially since recent experiments give hope of the successful utilization in this way of fuel not well adapted for ordinary purposes.

An Intangible Value

The real problem in State valuation of a public-utility plant resolves itself into a computation of the values that should be allowed above the actual physical property which can be appraised by an engineering investigation. Whatever differences of judgment may exist between interests that are necessarily somewhat opposed in a valuation of this character, it should be agreed generally that for a beginning the reasonable investment required to reproduce the physical property will be assumed.

With equitable principles established for the basis of the purely physical items of the plant, there would still be room for negotiation in fixing the values of units and the incidental costs which are inevitable in construction. These, however, can be worked out much more easily than the complex problems attendant upon the determination of a fair and reasonable value for the assets which will never be discernible in any appraisal that aims to strip the value of the plant in an arbitrary way to the lowest possible amount that will represent physical property whose existence cannot be denied.

While the question of valuation is one that has naturally alarmed the holders of securities who could not foresee what terrors might be involved, it is now a fact which must be accepted that under the authority of recent laws, commissions are proceeding to make appraisals as a basis for careful consideration in decisions relating to rates.

Since this is the situation and appraisals of this character have been completed or are under way in which all the vital questions concerned will arise, it is highly essential that the best and fairest thought of well-balanced minds be given to the problem until some reasonable bases shall be adopted generally. It is to be regretted that the public, through false teaching as much as through lack of proper information, is inclined to segregate the values of public utility plants into the loose terms usually designated as "physical" and "franchise" values. That much being done, the public, following to a conclusion the train of thought started by agitators on this subject, is disposed to sweep aside all merit in any but net physical value and to insist that nothing more than it shall be recognized in any case.

However, those who have given most careful thought to this subject have reached conclusions which, although varying in detail, may be traced to the recognition of the same fundamental principles that must form a part of the foundation in any valuation that is just to the security holders whose funds have been invested in a property. The latest formal expression of judgment on one of the questions bearing on valuation is that of the Railroad Commission of Wisconsin.

While the decision of the Wisconsin commission, in which it discusses its attitude, is rendered in connection with a case involving electrical rates, the principles stated do not differ in kind from those which have existed in the early years of many electric railway enterprises. The commission says, in the case of the Menominee & Marinette Light & Traction Company, that "the value of a plant is made up of a reasonable cost-value of the physical property used and useful in carrying on the business, and in many cases, also of the cost of developing the business of the plant as represented by the deficits during the development period."

This point is discussed with a clear recognition of the fact that the cost of "building up a business," as it is expressed by the commission, may be a necessary element which will demand and secure recognition. Although the Wisconsin commission feels that it is not in a position to state definitely just what loss was sustained during the early years of operation in this case, its conclusion concerning the principle involved is plain from the following excerpt:

"But from the facts given, and from the conditions generally which are known to surround plants so situated as the one in question, it appears to us that it might not be fair to the respondent, nor in line with public policy, to limit the rates in this case to only a bare 7 per cent return on the cost of reconstructing the plant new. For these reasons, it appears that justice may require that an extra allowance be made in the amount or expense upon which the rates provided for in the order herein rest or have been computed."

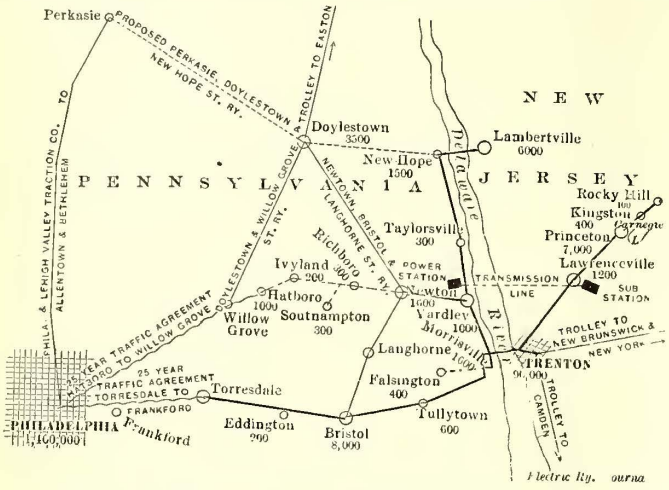
The history of street railways, due to their longer life and more unfortunate susceptibility in many cases to expensive changes in the art, is filled with investments which have been of greater cost than any that electric light or power plants have found necessary to keep equipment and service abreast of the times.

Prof. M. E. Cooley, in testifying before the Railroad Commission of Wisconsin early in the present year in the case involving the rates of fare of the Milwaukee Electric Railway & Light Company, discussed two values which he designated as "going cost" and "going value." He discussed these as additions to the inventory value, comprising (1) the cost of making the property a going concern and (2) the value of the property as a going concern. In his analysis of these values, he showed that the common history of properties included an actual loss in the early days and this loss was a just cost which in all fairness should be taken into account in an appraisal.

While the extent of values of this character differs in each case, such values form part of the undoubted cost of construction of public-utility properties.

PASSENGER AND FREIGHT BUSINESS OF THE NEW JERSEY & PENNSYLVANIA TRACTION COMPANY

The New Jersey & Pennsylvania Traction Company with headquarters at Trenton, N. J., operates about 40 miles of single track. As shown on the accompanying map, which also gives the population of the communities served, the lines run out of Trenton to Princeton on the northeast, to



New Jersey & Pennsylvania Traction Company—Map of Territory Served by the Company and Population of Communities in the District

Lambertville on the north, to Newtown on the northwest and to Morrisville on the west.

SOURCES OF TRAFFIC

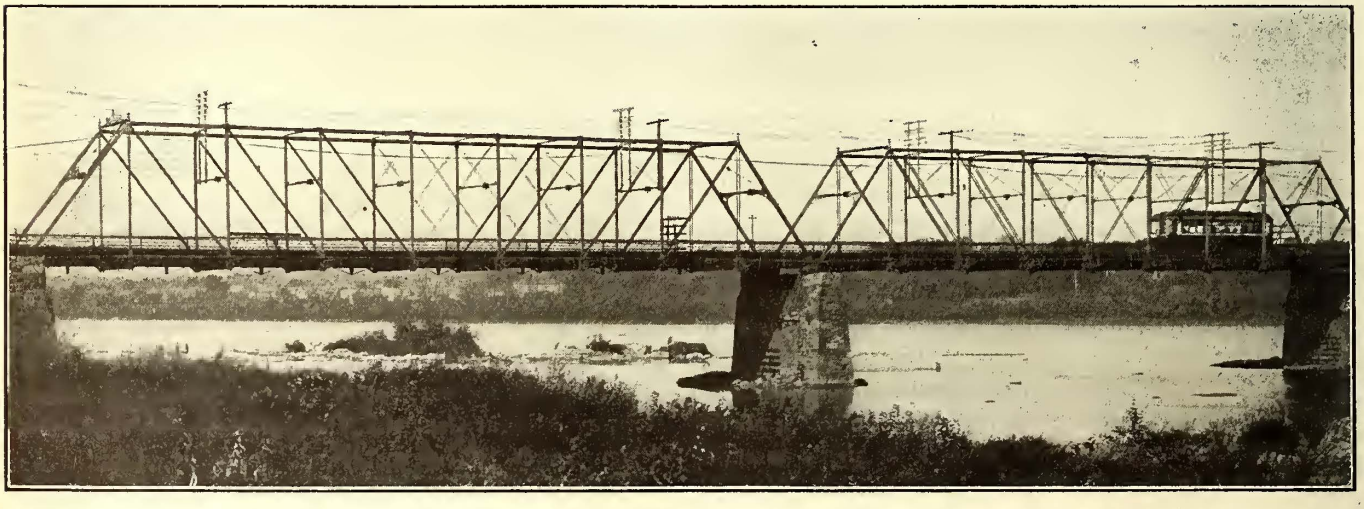
Besides the normal traffic between the places shown on the map, the company gets considerable business through its connections with other railways. Thus trips to Philadelphia can be made over the Philadelphia, Bristol & Trenton Street Railway, which enters Trenton via the home company's Morrisville line. There is a 15-year agreement made with the entering company in the year 1905, whereby the latter pays 4 cents out of every 5 cents collected on the local run between Morrisville and Trenton. The foreign cars go in with their original crews, but use the Trenton company's track, line and power.

In the summer months there is heavy travel to Willow Grove, near Philadelphia, despite the fact that Trenton passengers are obliged to take the roundabout way via Doylestown. To increase the popularity of this trip, the New Jersey & Pennsylvania Traction Company is planning to shorten the trip by building a 12-mile line from Newtown via Richboro, Ivyland and Hatboro. It will be observed from the map that aside from the effect of other indicated extensions, the company already meets the Camden lines on the south and the electric railways from the most populous section of New Jersey on the east. Both of these connections bring many trolley tourists into and beyond Trenton. Another good factor in the company's summer earnings is that produced through the bungalow settlements on the Delaware River, between Trenton and Lambertville. The earnings per car-mile in August, 1909, were 28.52 cents.

One of the illustrations on page 1050 shows the neat brick passenger station and general office building in Trenton, which adjoins the car house and repair shop. As will be apparent from the following paragraphs, the New Jersey & Pennsylvania Traction Company has no uniform rate of fare for given distances owing to the variety of franchise requirements, but a unique feature is that all fares are straight cash.

FRANCHISE AND FRANCHISE CONDITIONS

The New Jersey & Pennsylvania Traction Company, which is a consolidation of several lines, has actually constructed but 1.91 miles of track, and that section is entirely within the city of Trenton. Of this 1.25 miles is of 4 ft. 8½-in. gage, connecting with the Princeton line, and 0.66 mile of 5 ft. 2⅛-in. gage, connecting with the Trenton City Bridge Company and Yardley, Morrisville & Trenton division. The local franchise runs for 50 years, with renewal privileges. Continuing the Princeton line, the subsidiary Trenton, Lawrenceville & Princeton Railroad extends for 9.57 miles over a private right-of-way to Stony Brook. A 50-ft. right-of-way was acquired by purchase, and under the steam railroad act no franchise of any kind other than the State charter was required. From Stony Brook to Witherspoon Street, Princeton, 1.46 miles, the Trenton, Lawrenceville & Princeton Extension Railroad has the same kind of charter. From the foot to the head of Witherspoon Street, Princeton, the Princeton Street Railway has a street railway charter to cover its 0.52 mile of track. This is a 30-year franchise, with renewal privileges. The company was required to pave with Belgian block between the rails and to the curb line within a period of years, but a compromise was made whereby it laid paving at once between and for two feet on each side of the rails with yellow vitrified brick and also laid macadam to the curb.



New Jersey & Pennsylvania Traction Company—First Two Spans of Bridge over the Delaware River

Beginning at the Trenton city bridge, the subsidiary Yardley, Morrisville & Trenton Street Railway has 6.09 miles of track, of which 4.57 miles extends directly through to Yardley. An additional track leaves the main line at the river bridge, circling through Morrisville and meeting the line again after covering 1.56 miles. All this portion of the system is along or upon public roads and streets. From Yardley, the Newton & Yardley branch extends 5.23 miles to Newton, almost entirely upon private right-of-way alongside the public highway.

The Trenton, Newhope & Lambertville division begins at a point in Yardley, distant 5.07 miles from the Trenton terminus, or 4.71 miles from the terminal of the New Jersey & Pennsylvania Traction Company's sole section and extends almost entirely over private right-of-way to New Hope and Lambertville, a distance of 10.88 miles. There are no uncommon conditions in any of the franchises on the Pennsylvania side of the river, except the usual macadamizing between the rails, etc. All of this line is on private right-of-way or public right-of-way, excepting the New Hope-Lambertville bridge, on which the bridge company receives a stipulated rental for trackage rights.

TRACK

The different sections of the New Jersey & Pennsylvania Traction Company's system were built at different times by different interests and consequently the construction varies somewhat. The tracks within the city of Trenton are laid with 7-in. Trilby rails, on 6-in. x 8-in. x 8-in. ties embedded in concrete. The same standards are used in Princeton. In Morrisville and Yardley 9-in. girder rail is used, and in Newtown and New Hope 7-in. girder rail. On the Trenton, Lawrenceville & Princeton line 65-lb. 5-in. high T-rail is used, but a portion of the line in Trenton is laid with 80-lb. A. S. C. E. section. The line outside of Yardley and Morrisville is laid with 60-lb. A. S. C. E. sections, while the Newtown and New Hope divisions have 80-lb. A. S. C. E. rails. In all future non-city work on its system the company will use 80-lb. T-rail.

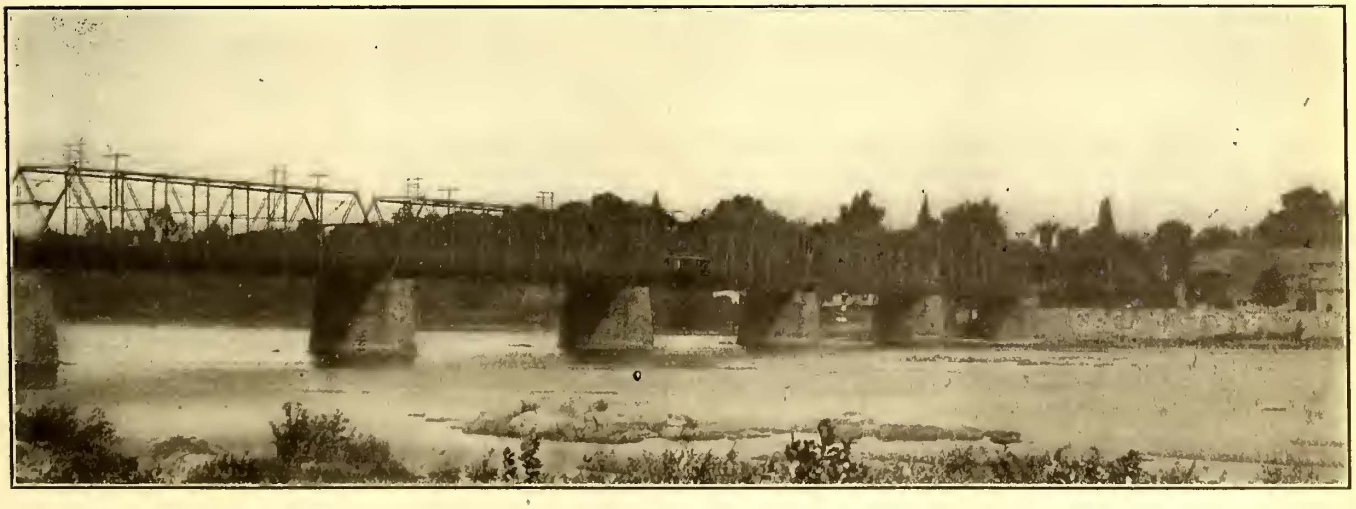
The maximum grade is 5 per cent and its length is 1700 ft., but it offers no operating difficulties as it is only about half a mile from the Yardley power house. On the New Hope line there is a 350-ft. stretch of 4 per cent grade, but the rest of the line varies from level to 1 per cent, except for two short 4 per cent and 5 per cent grades on the Yardley, Morrisville & Trenton line. The Trenton, Lawrenceville & Princeton line has a maximum grade of 1.98 per cent and the maximum curvature is 7 deg. at Lawrenceville; no other curve exceeds 4 deg., the majority being 2 deg. and 3 deg. The Princeton line has four freight sidings, which are also used as emergency passing sidings. The switches are all split point with spring frogs and most of them are spring point. The targets are lighted by electricity.

The largest bridge on any of the lines is the handsome structure across the Delaware River at Trenton, shown in two accompanying views. This bridge is 1300 ft. long and has seven through spans. It was purchased from the Trenton City Bridge Company's stockholders in 1901. This bridge is the only electric railway entrance into Trenton from the west, besides which the company derives revenue from vehicle and passenger tolls. At Neely's Mills, on the Lambertville division, is one steel through span of 90 ft., with 150 ft. of trestle now being filled in with dirt. There are no other bridges on the Pennsylvania divisions of more than 50-ft. span, all deck plate girder or low through trusses. On the Princeton line there are two 53-ft. through plate girder spans, one crossing each branch of the Shabbekunk Creek, besides the Stony Brook Bridge. The latter consists of two 45-ft. deck plate girder spans, with 36-ft. trestles at each end and stone culverts for short distances beyond to carry off the overflow. There are quite a number of 10-ft. to 24-ft. span deck bridges both of steel and wood.

The lines are ballasted principally with broken stone from the company's quarries on both the Lambertville and Princeton divisions, but some gravel and cinders are used on the Princeton line. The overhead construction offers no special features, being carried from wooden poles throughout, except that iron poles are used in the larger towns. Bracket construction is used for 5 miles out of the total of 40 miles.

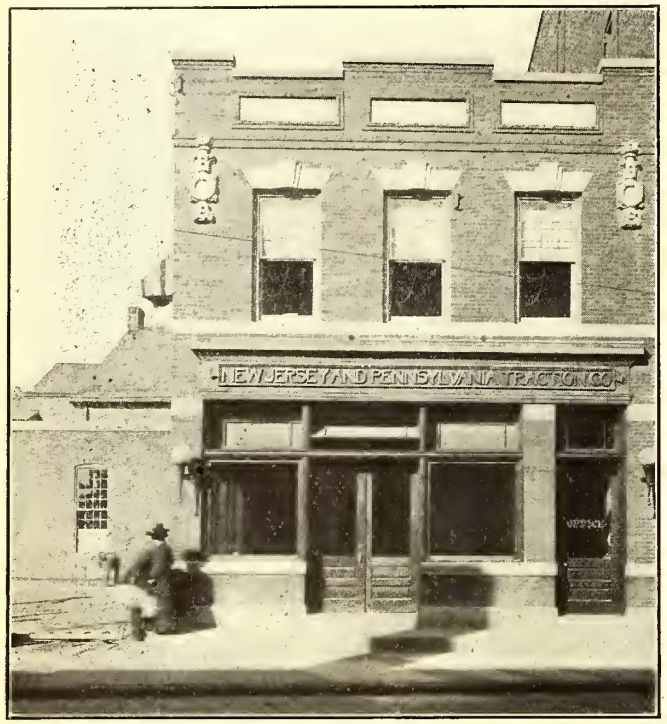
THE FREIGHT BUSINESS

The freight business, which now amounts to about $15,000 a year, really has been in operation longer than the passenger service as some goods were carried on the Trenton, Lawrenceville & Princeton Railroad by steam locomotives prior to the installation of electric power and the passenger service. For several years the freight business was regarded as a necessary evil and was carried only because the Princeton charter demanded it. During the past three years, however, closer attention has been paid to this subject, and since April 1, 1909, the business has been put on a thoroughly sound basis both as to operation and accounting. During a period of six months not a trip has



New Jersey & Pennsylvania Traction Company—Remaining Five Spans of Bridge over the Delaware River

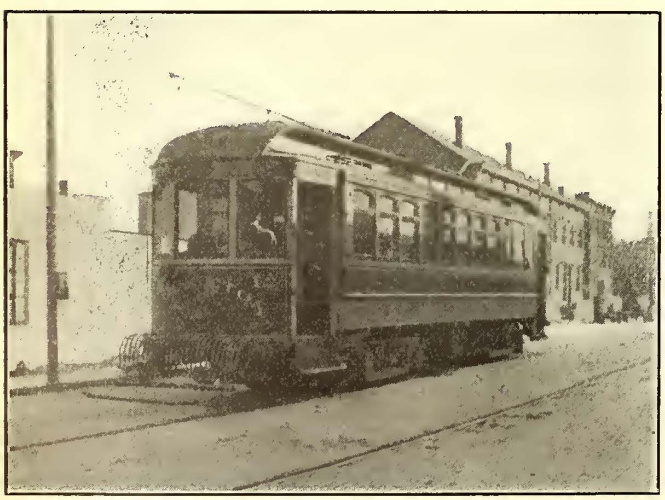
been missed by the freight cars on either of the three divisions, and 80 per cent of the time the cars have left their terminals on the minute. The longest delay within this period was 33 minutes, and the average delay was 3½ minutes. This record is all the more remarkable inasmuch as shipments are received up to 10 minutes of the leaving time, are then billed and the conductor's and agent's sheets enclosed.



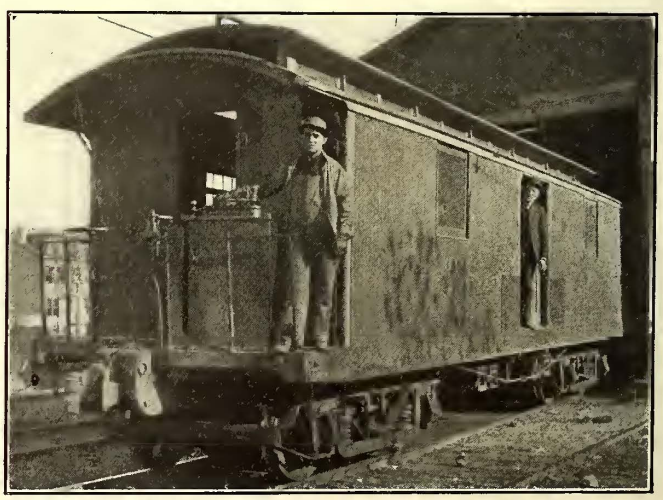
New Jersey & Pennsylvania Traction Company—Waiting Room and General Offices in Trenton

During the earlier period of the freight service, various hours of the day and night were tried and the day schedules found to be the best. The first car leaves at 5 a. m. for New Hope, 16 miles distant, making 11 regular stops to discharge freight, arriving in New Hope at 6 o'clock. Returning at 6:20, the same number of stops are made, principally to pick up milk cans, and, counting in a 25-minute layover at Brownsburg to clear passenger cars, the car arrives at Trenton at 7:50 a. m. The same crew again loads the car and leaves for Newton, double heading with the 9:50 a. m. passenger car. It returns with that car on the 10:50 a. m. trip from Newtown and arrives in Trenton at 11:40 a. m. At 2:25 p. m. the crew leaves, on another car (owing to the different gages), for Princeton, picking up through cars from the Philadelphia & Reading Railway at the Trenton city line and distributing freight along the route. As high as 624,000 lb. has been hauled on a single trip, the load including two steel hopper-bottom cars containing 106,500 lb. and 107,300 lb. of coal each. From two to four loaded cars is a usual day's haul, although there are some days on which no through cars are hauled. The return trip from Princeton is begun at 4:40 p. m. and is supposed to end at 5:15 p. m., but very frequently work along the line delays the return from 30 minutes to an hour. Extra trips are made from time to time, usually with one member of the regular crew and an extra man, another extra being added to the regular run. Special attention has been paid to hauling ice during the past season, and on the Princeton division trips have been made at any time from 5 a. m. to 12 midnight. None of the steam railroads in this territory gives service to compare with this for promptness.

Contrary to the usual claim made by electric railways, this company does not find the package business to be a source of revenue. Even with a minimum rate of 25 cents per 100 lb. the package business produces less than 3 per cent of the total business. It is the heavy freight, such as coal, ice, stone, paper, baled hay, straw and large shipments of meats and provisions which pays. All the through freight cars are secured from the Philadelphia & Reading Railway on a per diem basis. The incoming freight includes nearly every kind of goods manufactured, while the outgoing consists principally of artificial ice, baled hay, straw, apples and stone. The rate on these items is 25 cents per ton in carload lots, with a minimum of $5 per car. One hay-pressing plant along the line is a heavy shipper to New York. Cars for this point are frequently called for as late at 2 p. m, are ready at 3 p. m., loaded and prepared for the incoming train from Princeton at 5:02 p. m., placed on the Reading's East Trenton branch, 5 miles away, by 5:15 p. m., taken from there by a local freight at 5:25 p. m., transferred to the Trenton branch of the Philadelphia & Reading and deposited the same night in Jersey City.



New Jersey & Pennsylvania Traction Company—Standard Type of Passenger Rolling Stock for Suburban Service



New Jersey & Pennsylvania Traction Company—Baggage Car, with Four 75-hp Motors, Used for Handling Freight

The New Hope-Lambertville division is the only one

upon which the freight traffic is almost exactly balanced, with a slight advantage in favor of incoming material. On the outbound trip merchandise, bread (which is a large item here) and empty milk cans form the load, while on the return trip paper from a New Hope mill and filled milk cans balance the earning load. On the Newton division the inbound material consists of large quantities of flour aside from a few small articles. Milk tickets are sold at the rate of one-half cent a quart on 30-quart tickets. On the New Hope division the milk is carried on the freight car, but on the other divisions it is transported via the passenger cars. All the empty cans are returned on the freight car.

The average receipts per motor-car mile on the Princeton division are 58 cents, with 20 cents as operating charges to cover the crew, agents, supervision, printing, etc., exclusive of power; on the Pennsylvania line the receipts are 25 cents per motor car-mile, and the expenses are 16 cents. The expenses for 1909, excepting power cost, will run about 33 1/3 per cent of the freight receipts. The losses and damages amount to about 1/6 of 1 per cent of the gross receipts. None of the claims is large, the usual one is for a missing package in a lot of two dozen or more. As receipts are taken for all goods delivered to the consignee, it is not difficult to determine whether or not the claim is just The only loss claims during a period of three months were for a bag of sugar, a small bag of flour and a can of milk accidentally overturned. The flour was part of a large consignment and was mixed in delivery; the milk was very much in evidence, but the sugar was not located. A single claim for breakage was made and promptly settled. The company is now building in its shops a freight car with steel floor framing. The general traffic and freight business is in charge of T. G. Kitchin.

POWER IMPROVEMENTS

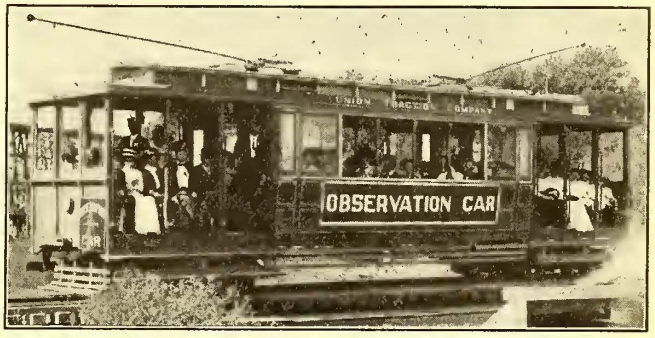
During the past year or two the company has secured some remarkable savings in power cost and distribution. The changes in plant location and apparatus made to secure these economies will be described in an early number.

ELECTRIFICATION OF THE SPIEZ-FRUTIGEN RAILWAY

The Bernese Alpine Railway has made a contract with the Siemens-Schuckert Company for the electrification of the Spiez-Frütigen line in Switzerland with 15,000-volt, 15-cycle current. This potential will be delivered directly from two 3200-hp turbo-generators at Spiez. The trolley wire will be hung from a catenary at heights ranging from 4.8 m (14 ft. 9 in.) to 7.2 m (23 ft. 6 in.). The rolling stock will consist of two locomotives and three motor cars. The latter are to be arranged for 64 third-class seats and have double trucks. On the Spiez-Frütigen section, which has a maximum grade of 1.55 per cent, the cars will have two motors, totaling 440 hp; but on the Lötschberg line, which has grades up to 2.7 per cent, the motor equipment will be doubled. A complete motor car will weigh 55 metric tons and will be capable of taking a trainload of 240 tons up a 1.55 per cent grade or a trainload of 160 tons up a 2.7 per cent grade at 45 km (27.9 miles) an hour. Each motor car is supplied with two bow collectors. The step-down transformers have six voltages for running, and also supply heating current. The car lighting is by direct current obtained from a motor-generator set and storage battery equipment.

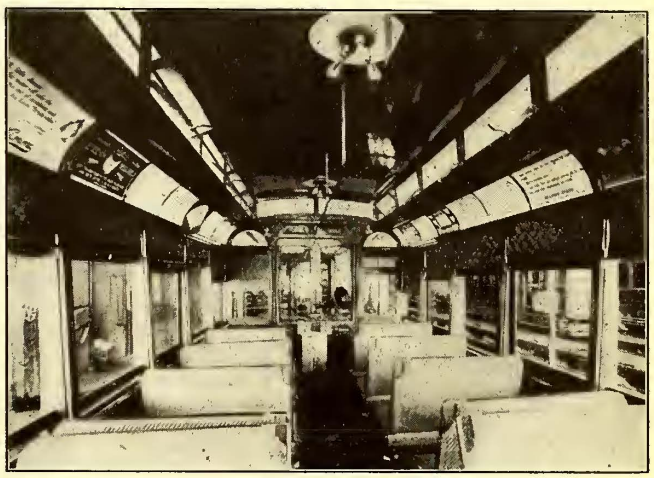
OBSERVATION CAR SERVICE IN SANTA CRUZ, CAL.

S. W. Coleman, manager of the Union Traction Company of Santa Cruz, Cal., operated an observation car on the lines during the last summer. An ordinary passenger car was used for this purpose, and a trip of 18 miles was



Exterior of Santa Cruz Observation Car

given for a fare of 25 cents. Santa Cruz is a city of 15,000 in winter, and in summer it has probably 40,000 people, including the visitors. The car, besides passing the principal points of interest in Santa Cruz, took the passengers to Capitola, a suburb 6 miles from Santa Cruz.



Interior of Santa Cruz Observation Car

As it was necessary to cover the same route twice, a novel feature for entertainment was introduced on the return trip. A phonograph was placed in the front end of the car and good music was furnished.

GEAR AND PINION GREASE IN DETROIT

On page 902 of the ELECTRIC RAILWAY JOURNAL for Oct. 23, 1909, a short account was presented outlining the methods used by Sylvester S. Potter, master mechanic, Detroit United Railway, for reducing the cost of gears. The second sentence stated that the cost of lubrication had been reduced to a certain amount. It should have read that the cost of the gears had been reduced to a figure ranging between 56 and 80 cents per 1000 miles, and the cost of pinions to an amount of from 32 to 40 cents per 1000 car-miles. Mr. Potter advises that these costs for gears and pinions are made possible by the use of the gear lubricant, which is compounded according to the formula presented.

The motormen of the Swindon (England) municipal tramway system receive a bonus for attaining a fixed minimum current consumption in operating their cars.

THE ELECTRIC SYSTEM OF THE GREAT NORTHERN RAILWAY AT CASCADE TUNNEL *

BY CARY T. HUTCHINSON, CONSULTING ELECTRICAL ENGINEER OF THE GREAT NORTHERN RAILWAY

The first three-phase installation on a trunk line railway in the United States was put into operation early in July of this year at the Cascade Mountain tunnel on the Great Northern Railway, about 100 miles east of Seattle, Wash.

The Great Northern Railway crosses the Cascade Mountains through a tunnel 13,873 ft. long; this tunnel is on a tangent and has a uniform gradient of 1.7 per cent. Rising to the tunnel from Leavenworth, on the east, the ruling grade is 2.2 per cent, and from Skykomish on the west to the summit the ruling grade is 2.2 per cent.

The operation of the tunnel with steam locomotives was at all times difficult and frequently very dangerous on account of the heat and smoke from the locomotives. In the tunnel the rails became very wet from condensed steam, and were frequently covered with a layer of coal soot and ground sand, making them very slippery. The temperature in the locomotive cab was almost unbearable, rising at times as high as 200 deg. Fahr. This tunnel is the limiting feature to the capacity of the Great Northern Railway for hauling freight across the mountains. Mallet compound locomotives are used on this division, one at the head of the train and one pushing. It is impossible for steam locomotives to haul heavy trains on the mountain at a greater speed than 7 or 8 m. p. h.

Great Northern Electric System—Cascade Yard Showing Bracket Construction on Curve

The original problem was to provide electric equipment to handle a train having a total weight of 2000 tons, excluding the electric locomotives, over the mountain division from Leavenworth to Skykomish, a distance of 57 miles. The system was to be first tried out at the Cascade Tunnel. The tractive effort required to accelerate a train having a total weight of 2500 tons on a 2.2 per cent grade, using 6 lb. per ton for train resistance, 10 lb per ton for acceleration, and 44 lb. per ton for grade resistance, making a total of 60 lb. to the ton, is 150,000 lb.; this would require four locomotives of a tractive effort of 37,500 lb. each. The railway company's engineers limited the weight on a driving axle to 50,000 lb.; therefore four driving axles per locomotive were needed, giving a coefficient of adhesion of about 19 per cent. The locomotive was, therefore, designed to give a continuous tractive effort of approximately 25,000 lb., and it was expected that four would be used with a train of maximum weight. The locomotives as built greatly exceed this specification.

GENERAL DESIGN OF LOCOMOTIVE

The locomotive as built has the following principal characteristics: Total weight 230,000 lb., all on drivers; two trucks, connected by a coupling, each truck having two driving axles; a three-phase motor connected by twin gears to each axle; gear ratio 4.26; diameter of driving wheels, 60 in.; synchronous speed of motor, 375 r.p.m., giving a speed of 15.7 m.p.h at no load, dropping to 15 m.ph for a load corresponding to the one-hour rating The motors are wound for 500 volts and are completely enclosed and air cooled; clearance between stator and rotor, ⅛ in.; trolley pressure, 6000 volts. Each locomotive has two three-phase transformers reducing the pressure from 6000 to 500 volts, arranged with taps so that 625 volts may be used on the motor.

The specifications of the motors required an output of 250 hp continuously for three hours with 75 deg. C. temperature rise when supplied with not more than 2000 cu. ft. of air per minute. The test results of the motor show a continuous output of 375 hp at 500 volts with 1500 cu. ft. and 400 hp at 625 volts with the same air. The one-hour rating of the motor at 500 volts with 1500 cu. ft. of air per minute is 475 hp. The continuous output at 500 volts corresponds to a tractive effort of 9350 lb. per motor and the one-hour output to a tractive effort of 11,900 lb. per motor. The locomotive will therefore give 37,400 lb. tractive effort in continuous duty, or 47,600 lb. tractive effort for one hour.

The locomotive has been tested to a maximum tractive effort of nearly 80,000 lb., corresponding to a coefficient of adhesion of nearly 35 per cent. With 60,000 lb. tractive effort each locomotive can accelerate a train of 885 tons trailing on a 2.2 per cent grade, using 60 lb. per ton as the unit tractive effort. Making some allowance for the sake of conservatism, the rating of the locomotives on this division can be put at 750 tons trailing load.

ELECTRIC EQUIPMENT OF LOCOMOTIVE

Each locomotive is equipped with four three-phase induction motors, wound for 500 volts at the primary or stator. The motors are completely enclosed and are cooled by forced air circulation from a large blower. They are suspended from the axles in the standard manner, except that they are geared at both ends of the armature shaft. On account of the low speed and high torque required it was not considered safe to use a single pair of gears. The gear has 81 teeth, the pinion 19 teeth, giving a gear ratio

* Abstract of paper read before the American Institute of Electrical Engineers, New York, Nov. 12, 1909.

of 4.26. The gears are of specially hardened steel, and in order to secure perfect alignment the two pinions on each shaft were cut simultaneously. At first it was the intention to use some form of spring connection between motor and driving wheel, but this was subsequently abandoned, as it seemed that there would be sufficient flexibility in the armature shaft to take out any small differences between the two sets of gears. As far as can be told at present, this assumption appears to be correct, for there has been no difficulty with the gears and no unequal wear. The gears run with little noise and the construction seems satisfactory.

The locomotive carries two three-phase air-blast transformers, having a nominal rating of 400 kw each, transforming from 6000 volts to 500 volts normally, or to 625 volts by the use of taps. The continuous capacity of the transformers is not as great as that of the motors, although it is fully up to the specification, and it may be that the quantity of air to the transformers will have to be increased when the locomotives are put in continuous service.

Compressed air for the brakes is supplied by two 100-cu. ft. induction-motor-driven compressors; the cooling air is supplied by a 9400-cu. ft. motor-driven blower. The locomotive is equipped with a combined straight and automatic air-brake system.

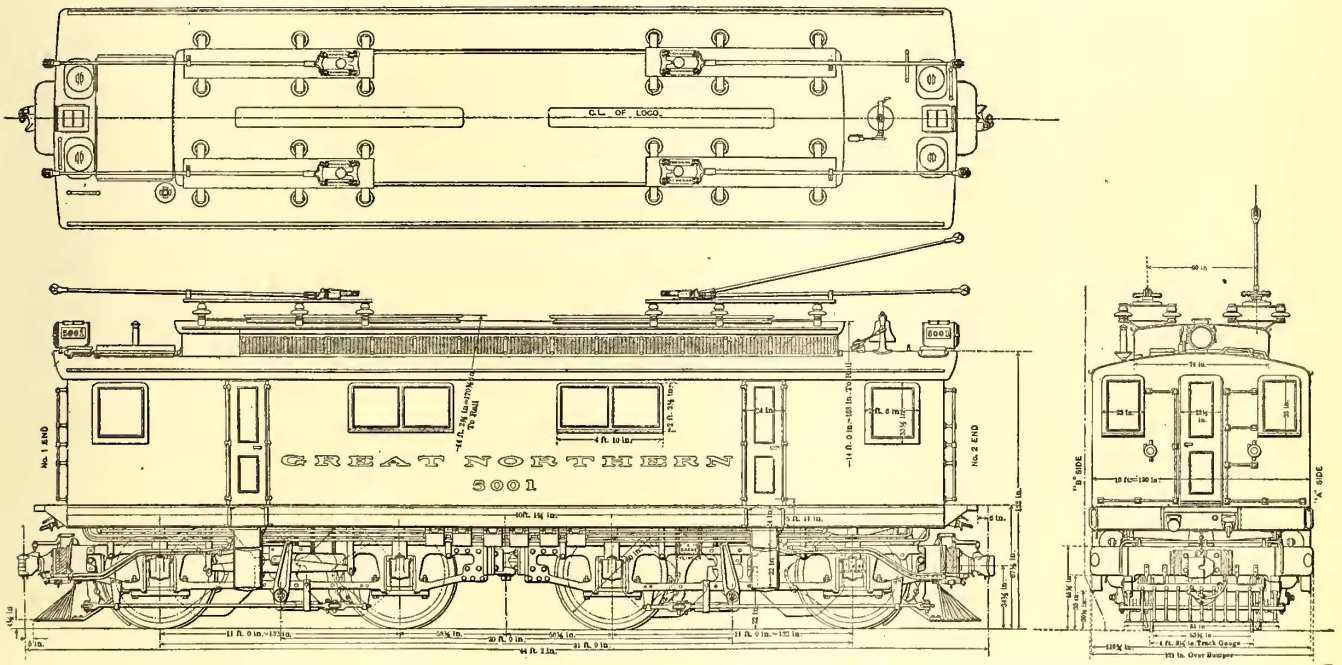
The control system of each motor is separate; the circuits branch from the transformer and are independent through

MECHANICAL DESIGN OF LOCOMOTIVE

The locomotive is of the articulated or hinged type, having four driving wheels on each half of the running gear, without guiding wheels. The hinged sections are so rigidly connected that they tend to support each other vertically and guide each other in taking the curves, although the hinges are designed to offer minimum resistance to lateral flexure. There are no springs to prevent this flexure, and the wheelbase is free to accommodate itself to any curvature. The effect of this guiding action is to minimize the flange wear, as in the Mallet locomotive.

The equalization system takes advantage of the vertical rigidity of the truck to distribute the spring stresses over groups of springs instead of concentrating them on single springs; the truck section on the one end is side equalized, but the section on the other end is carried on a three-point suspension. The springs are thereby equalized in groups, and the groups are so arranged as to eliminate all skew or twisting stresses in the truck frame.

The framing of the running gear is of substantial steel castings annealed and held together by body-bound taper bolts in reamed holes. Side frames are castings of truss pattern; end frames and bolsters are steel castings of box-girder type; the end frames and all parts are designed for buffing stresses of 500,000 lb. Bolsters are hollow castings, and form part of the air reservoir for the motor ventilation; the air being supplied to the motors through a hollow center



Great Northern Electric System—Plan and Elevations of Three-Phase Electric Locomotive

the resistances. There are 14 contactors in each motor circuit, or 56 in all. The pilot control is in duplicate, one switch at each end of the locomotive. There is a clear aisle on each side of the locomotive from end to end, all of the apparatus being assembled in the center of the cab.

Iron grid resistances are provided for each motor. There are 13 steps in the control, but in order to reduce the number of contactors to the lowest possible point an unsymmetrical system is used. A change is made in the resistance of one phase only in passing from step to step. This arrangement in effect treats the three-phase circuit as a single-phase circuit. On each step of the control the torque is the average of the three values of the torque of the separate circuits. The principal advantage of this is that 56 contactors do the work that would otherwise require 128, thus effecting a great gain in the simplicity of the control apparatus.

Experience with the locomotive in service indicates that the initial torque, which is approximately 20,000 lb., is somewhat high, and the control is now being changed so that on the first step two motors only will be thrown in circuit, and on the second step all four motors. This change is readily made by eliminating step 12, which tests have shown to be of little or no value.

pin. The motor gears are shrunk on an extension of the wheel hub, thus eliminating the torsional stresses from the locomotive axles.

The cab is carried on the trucks through center pins on each bolster, the center pin on one end having a slight longitudinal sliding motion to allow for variation in the distances between truck center pins in taking curves. The cab extends the entire length of the platform, and is made of No. 10 steel plates, which carry a monitor that supports the trolley base and has a ventilated opening running through the center and perforated side plates to permit the escape of air from the interior of the cab. The greater part of the control apparatus, the rheostat, the transformers, contactors, etc., is placed in a separate compartment 60 in. wide and 22 ft. long, enclosed by steel partitions extending directly up to the monitor roof. This leaves two open operating spaces at the ends of the locomotive, connected together by two side aisles 30 in. in width. This center compartment is divided into three parts by steel-plate partitions; the middle part contains the high-tension apparatus, including switchboard; the end parts are duplicates, each containing one transformer and the contactors for two of the motors. The rheostats are placed in the monitor at the top of the cab. The air for ventilation, after

passing through the transformers, cools the rheostats and then escapes to the atmosphere. Placing these rheostats at the top of the cab has also the advantage of raising the center of gravity of the locomotive, which is nearly 60 in. above the rail head, higher than is usual with electric locomotives.

GENERATING SYSTEM

The power house is located on the Wenatchie River, about 2.5 miles west of Leavenworth. There is a low concrete diverting dam in the river at a point about 12,000 ft. west of the power house, and from this dam a pipe line leads to the waterwheels. The pipe line gives a static head at low water of 203 ft., and in ordinary water of about 200 ft. The operating head at rated load is 180 ft. The pipe line ends in a surge tank at the corner of the power house, having a total height of 183 ft. above its foundation. The tank proper is 30 ft. in diameter, and with a storage height of 54 ft. above its hemispherical bottom, gives a storage capacity of approximately 38,000 cu. ft.

The power house is designed for three main units and two exciter units. There are now installed in the power house two main units, each turbine rated at 4000 hp, directly connected to a three-phase alternator. The two main units now erected, with the exciter, require approximately 500 cu. ft. of water per second when operating at full load of 8000 hp, giving a velocity of flow in the penstock of 8.7 ft. per second. The extreme low flow of the river at the dam is estimated to be 380 second-feet. The small pond formed by the dam has a storage capacity equivalent to 8000 hp-hours for a depth of 1 ft. It is possible to draw the water in the dam down 3 ft. There are two other power sites in the canyon, each affording a head of 200 ft., available for subsequent developments.

The entire hydraulic installation was designed and constructed under the direction of J. T. Fanning, of Minneapolis.

ELECTRIC EQUIPMENT OF POWER HOUSE

The two main generating units have each a nominal capacity of 2500 kva at 375 r.p.m., 6600 volts and 25 cycles. There are two exciter units, each having a nominal capacity of 125 kw at 750 r.p.m. These units also have a large overload capacity; they frequently carry 150 per cent overload, on account of the very poor regulation of the waterwheels. A third unit, identical with the first two, has been ordered.

The power house also contains four transformers for raising the pressure to 33,000 volts, each of a nominal capacity of 833 kw, but guranteed to operate on 100 per cent overload for one hour, with a low rise in temperature. Three of these units are in service, and the fourth is kept as a spare.

The switchboard apparatus is of the usual type, having panels for the generators and the feeders, and is provided with the usual measuring instruments.

One reason leading to the use of the three-phase system was the possibility of returning energy to the system on down grades. With the present installation it is not possible to make any use of the energy so returned, but in order to prove this practically an automatic rheostat controlled by the speed of the generator was installed in the power house; when a train on the down grade reaches a little more than the synchronous speed, the electrodes of the water rheostat are automatically lowered by an amount proportional to the difference between synchronous speed and the speed of the generator; this throws a load on the system and acts as a brake to the train. The operation of this apparatus is entirely effectual.

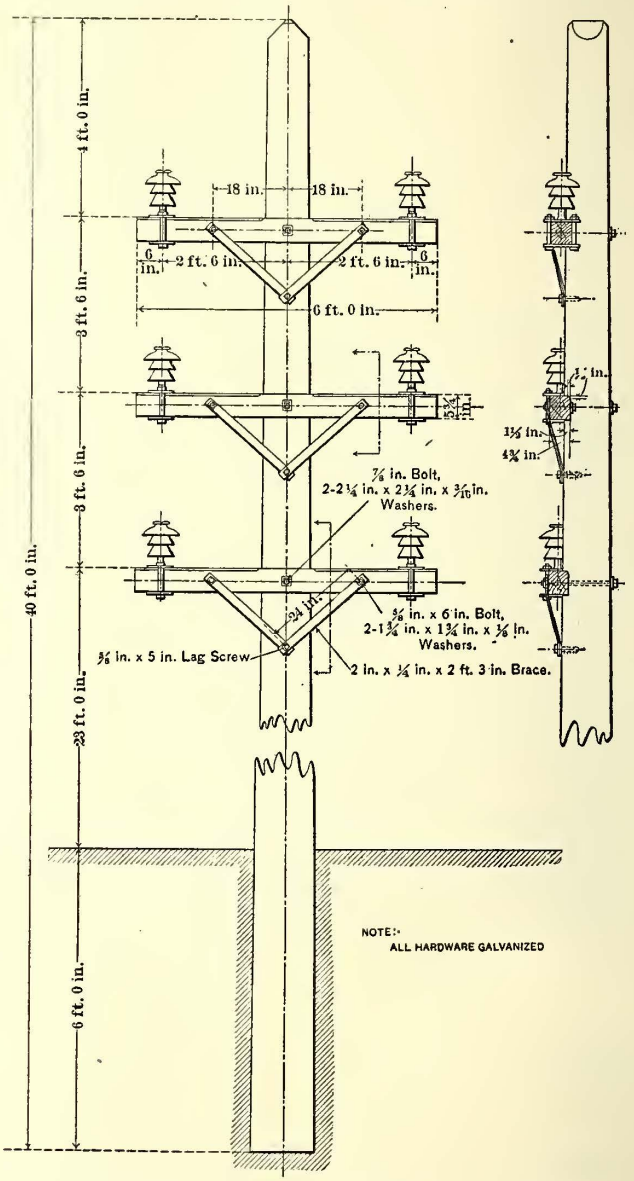
The nominal capacity of parts of this equipment, in particular of the transformers, may seem unusual; but it must be remembered that the plant is intended to operate on a load having extreme fluctuations, the entire load being on for, say, 15 minutes, and then off for two or three hours; consequently the transformers can be made small.

This plant has operated satisfactorily, with the exception of certain troubles with the waterwheels. In particular, the generators have shown ability to hold their rated pressure under extreme variations of speed, due to the effective control of the Tirrill regulators. The generator fields, designed for 125 amp, have frequently carried 300 to 350 amp, and the regulators have held the pressure normal, in spite of fluctuations of 35 to 40 per cent in speed.

TRANSMISSION LINE

The transmission line extends from the power house at Leavenworth to the substation at Cascade, a distance of approximately 30 miles, following the railroad all the way. The line carries two circuits each of No. 2 B. & S. gage stranded hard-drawn copper wire. Each circuit is in a vertical plane at one side of the pole, thus permitting the use of short cross-arms. The upper cross-arm was placed some distance below the top of the pole in order to leave room for a ground wire, which has not as yet been installed. The line is divided into three sections by two out-of-door switches operated by means of a pole deposited with a station agent; each switch is near a station.

The telephone line is carried on the same poles. The



Great Northern Electric System—Details of Standard Transmission Line Pole and Cross-Arms

transmission line is not transposed, but the telephone line is transposed at every fifth pole.

The construction of this line was completed a year ago, and it has stood through one winter, during which there were more than 30 snow and rock slides. Only one of these slides caused damage to the line, and in this case only one of the two circuits was interrupted. The same slide interrupted the operation of the railroad for 8 to 10 hours.

SUBSTATION

The single substation is at Cascade, near the east portal of the tunnel. Three single-phase transformers are in service and a fourth is in reserve; these transformers are duplicates of those in the power house. The equipment of the substation is along the usual lines, and calls for no spe-

cial comment. The low-pressure busbars at the substation are connected to the overhead wires in the Cascade yard, and also to the Wellington feeder, which runs through the tunnel to the extreme end of the Wellington yard.

TRACKS ELECTRIFIED

In the two yards at the ends of the tunnel the main track and two side tracks are electrified, together with the necessary crossovers, etc. The total length of the track equipped, including the tunnel, is about 6 miles.

The length of the several parts of the overhead structure is as follows:

Substation to east portal of tunnel.....	200 ft.
East portal to west portal.....	13,900 ft.
West portal to end of electrified track.....	6,960 ft.
Total	21,060 ft.

OVERHEAD CONSTRUCTION IN YARDS

Bracket and cross-catenary construction is used in the yards. The trolley wires are 24 ft. above top of rail and 5 ft. apart. For single tracks a bracket type of construction is used, and for multiple tracks a cross-catenary type, supported by very heavy wooden poles located about 8 ft. from the center line of the outer tracks, thus leaving unobstructed the space between adjacent tracks. The wires are supported at intervals of 100 ft.

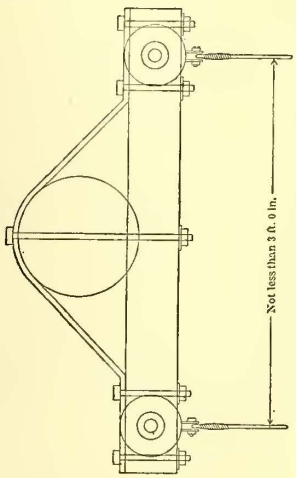
Multiple track supports consist, for each phase, of a steady span supported by and insulated from a cross-catenary span, both spans being secured to cross-arms on the poles by means of porcelain petticoat strain insulators. The spans for the two respective phases are 3 ft. apart. The wires of the same phase, for the different tracks, are insulated from each other by means of wood breaks and porcelain link insulators, in series. On the brackets each phase is insulated from ground by means of a wood break in series with a porcelain petticoat strain insulator.

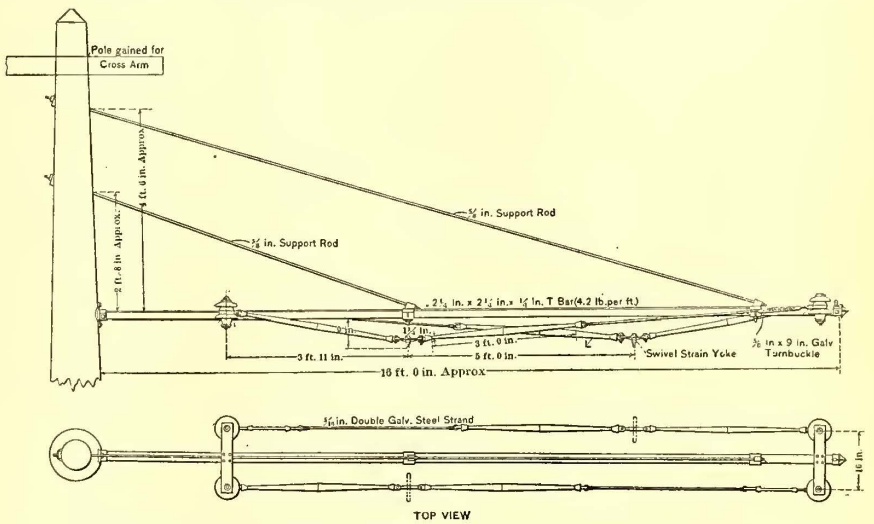
Where wires of opposite phases cross at turn-outs, they are insulated from each other by section insulators made of wood and about 5 ft. in length. Four insulators are used, each connected at one end to a special 8-deg. crossing pan and at the other end to one of the four wires converging toward the crossing. Except for one track, whose wires are cut straight through the crossing pans without section insulators, it is necessary to switch the controller to the off position when the trolley wheel passes under the insulators. Methods of avoiding this are being tried out.

Heavy steel bridges, forming anchorages for the trolley wires, are located in both yards at intervals of 1000 ft. Lightning protection, though thunder storms are rare, is afforded by arresters connected to the wires at the ends of the tunnel and yards.

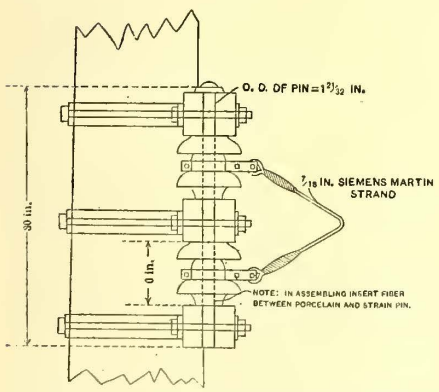
Both rails in the tunnel and one rail in the yards are bonded, with cross-bonding at frequent intervals. A single No. 0000 exposed bond is used at each joint, having a length of 36 in. in the tunnel and 36 in. and 50 in. in the yards.

The use of double insulation everywhere is the reason for the almost total freedom from troubles of any kind originating on the overhead structures. The only troubles experienced up to the present have been at the section breaks and turn-outs, and have been caused by the trolley wheel leaving the wire. There has been no failure of the wires at any point of the overhead structure nor any breakdown of insulation.

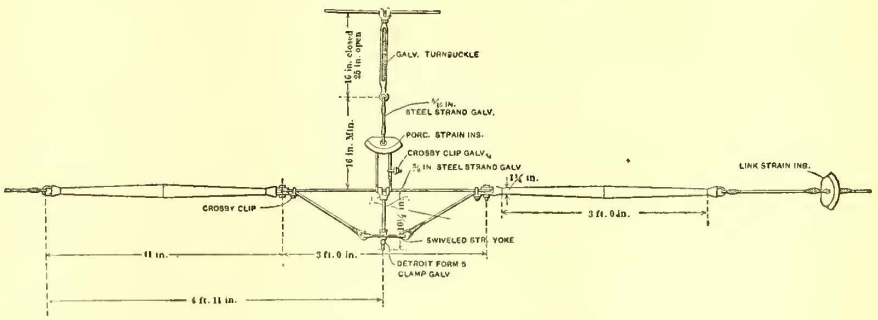




Great Northern Electric System—Bracket Construction in Yards



Great Northern Electric System—Method of Attaching Cross Catenary Spans to Side Poles



Great Northern Electric System—Detail of Cross Catenary Trolley Wire Suspension

OVERHEAD CONSTRUCTION IN TUNNEL

In the tunnel the wires are 17 ft. 4 in. above the top of the rail and 8 ft. apart; the latter spacing enables train-men to operate the hand-brakes, or walk on the tops of freight cars, the construction being such that head-room is not interfered with. Each wire is supported every 50 ft. by means of a 14-in. Detroit clamp attached by swiveled connection to a stud, which is in turn swiveled to the middle point of a turnbuckle. The two eyes of the latter, by means of strand wire, connect each to a link and petticoat strain insulator arranged in series, the two petticoat insulators being secured to the roof of the tunnel by means of two expansion bolts, about 5 ft. 6 in. apart. Anchors and side-braces for the wires in the tunnel are located at intervals of 3000 ft.

Practically all metal work in the tunnel supports is copper or bronze, but experience has shown that galvanized iron, soon becoming protected by a slight coating of soot, would have been satisfactory. The insulators when first put in service were covered by a very thick coating of wet soot, but, even under these conditions, it was found possible gradually to bring the voltage up to normal without breakdown. Volumes of smoke and steam issuing from steam locomotives caused only a slight surface leakage, and one rough cleaning sufficed to put the insulators in reliable working condition.

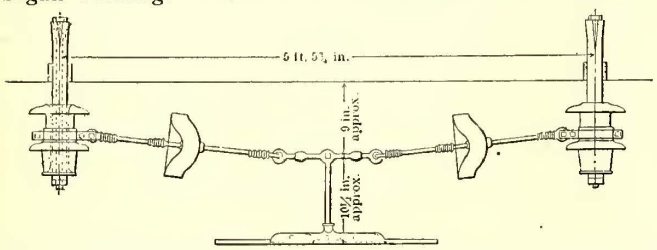
Spacing the wires 8 ft. in the tunnel was necessitated by the requirement of the railroad company that there should be no construction in the roof of the tunnel which could possibly interfere with a brakeman's walking on top of a freight car. This change in the location of the wires complicated the construction somewhat, and was one of the principal reasons leading to the use of a trolley wheel in place of a bow collector. It has, however, caused no material inconvenience and is satisfactory as long as the trolley wheels are in use, but if a change is made to a bow collector, which is not impossible, there may be difficulty in adapting the bow to this location of the wires.

ELECTRIC LIGHTING

It is intended ultimately to clean and whitewash the tunnel and light it electrically, and for this purpose a lighting system has been installed. Five transformers of 4 kw capacity each are placed in refuge chambers. Incandescent lights are spaced 50 ft. apart and are connected five in series of a 500-volt system. Several plans were worked out for this lighting system, but taking into account maintenance costs, it seemed best to use a standard 110-volt carbon filament lamp.

TELEGRAPH LINES

The telegraph wires, 10 in number, run through the tunnel in a cable. The service on these wires was thrown entirely out of commission when the electric locomotives began running. There is no interference with the telegraph wires due to the transmission lines paralleling them for 30 miles, and the entire interference seems to originate in the tunnel. In order to eliminate this interference, a neutralizing transformer has been installed, and adjustments are now in progress. There has been little difficulty in making the ordinary single-wire telegraph service satisfactory, but considerable difficulty has been experienced in getting the quadruplex to work satisfactorily; this matter is still unfinished.



Great Northern Electric System—Longitudinal View of Tunnel Suspension Scheme, Supports Spaced 50 Ft. Apart

OPERATION OF THE SYSTEM

The electric service was started on July 10, although one or two trains had been handled previously. From that time to Aug. 11 practically the entire eastbound service of the company has been handled by electric locomotives.

During this period of 33 days there were 212 train movements, of which 82 were freight, 98 passenger and 32 special. In each case the steam locomotive was hauled through with the train. The tonnage handled was as follows:

Freight tonnage	171,000 tons
Passenger "	88,500 "
Special "	15,500 "
Total	275,000 tons

This was an average of 8350 tons per day, all eastbound.

The average freight train weight was as follows:

Cars	1,480 tons
One Mallet locomotive	250 "
Three electric locomotives	345 "
Total train weight	2,075 tons

The maximum weight of cars was 1600 tons; the minimum 1200 tons.

The representative passenger train handled was made up as follows:

Coaches	426 tons
One steam locomotive	250 "
Two electric locomotives	230 "
Total train weight	906 tons

The maximum was about 125 tons greater.

The power required to haul these trains seemed greater than it should be, and investigation showed that the difference was accounted for by the unexpectedly high frictional resistance of the steam locomotives as a trailing load. Tests were made on several engines, with the following results:

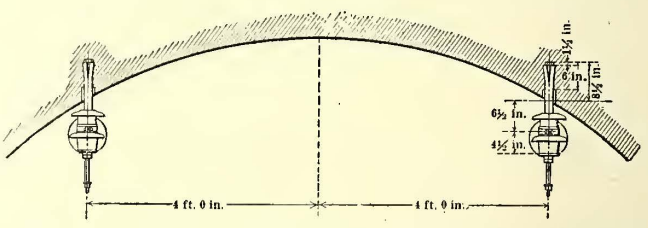
LOCOMOTIVE FRICTION TESTS

Test No.	Engine classification.	Total weight with tender Tons.	Weight on drivers Tons.	Total resistance on 1.7 per cent grade lb.	Equivalent weight of freight cars Tons.
1	Mallet No. 1904..2-6-6-2	250	158	19,340	482
2	" No. 1911..2-6-6-2	250	158	17,500	432
3	" No. 1905..2-6-6-2	250	158	24,200	602
4	Consolidation.....2-8-0	159	90	10,080	255
5	Pacific.....4-6-0	188	70	10,270	257

The tests were made by towing an engine through the tunnel behind an electric locomotive, fitted up with test instruments. An allowance of 6 lb. per ton was made for the resistance of the electric locomotive. The equivalent load in cars is based on car resistance of 6 lb. per ton.

If the grade resistance be deducted from the total pull, and the difference lumped as "pounds per ton" for the locomotive and tender, there results an average for the three Mallets of 47.0 lb. per ton for the frictional resistance on a straight level track as against 13 lb. per ton for the electric locomotive. The figure for the electric locomotive was obtained from tests made by towing it by a motor car on straight level track at Schenectady, N. Y. Included in it is the resistance of the gears and bearings of the motors.

During the period of 33 days under consideration there were no delays due to failure of the electric locomotives, and but two trifling delays due to failures of the electric plant, both chargeable to the transmission line and both caused by accidents beyond the control of the operating force. On Aug. 11 the electric service was discontinued, owing to failure of both waterwheels. Service was resumed on Sept. 9, and has been continued regularly since. The plant was taken over by the operating department of the railroad late in September.



Great Northern Electric System—Cross Section Through Top of Tunnel, Showing Supports for Trolley Wires

The westbound service was not at first regularly handled by the electric locomotives, as there is nothing gained by braking the trains electrically on this short stretch, but now westbound passenger trains are so handled for the benefit of the passengers.

REGENERATION

A number of tests have been made to determine the power returned when regenerating. The following is a typical example:

TRAIN: MALLET ENGINE, 1550 TONS CAR WEIGHT, TWO ELECTRICS ON 1.7 PER CENT GRADE

Force due to grade	Frictional resistance	Remainder for acceleration
Mallet ..... 8,500 lb.	11,500 lb.	— 3,000 lb.
1550 tons in cars....52,500 "	9,300 "	+43,200 "
Three electrics.....11,700 "	2,070 "	+ 9,630 "
	Total for acceleration	49,830 lb.

This is equivalent to 1495 kw delivered to the gears of the motors at 15 m.p.h.

The efficiency of the locomotive is approximately 80 per cent—hence the power returned to the line should be 1200 kw. The test of this train gave 950 kw; this difference is due to the standard practice, not yet abandoned, of keeping a certain number of pressure retaining valves on the cars set on down grade.

The Mallet, instead of adding to the delivered power, is an additional load that has to be carried by the train.

A similar test on a 10-car passenger train weighing 950 tons gave:

Delivered power, calculated.....590 kw
Delivered power, measured.....597 kw

In this case there was no added resistance due to the use of pressure retaining valves.

These tests merely confirm the calculations, as they should. On a 1.7 per cent grade, 1 ton descending at 15 m.p.h. will deliver 0.67 kw to the system; on a 2.2 per cent grade it will deliver 0.91 kw.

EFFICIENCY

The losses in the system when delivering 4000 kw to the locomotive at the west end of the Wellington yard are:

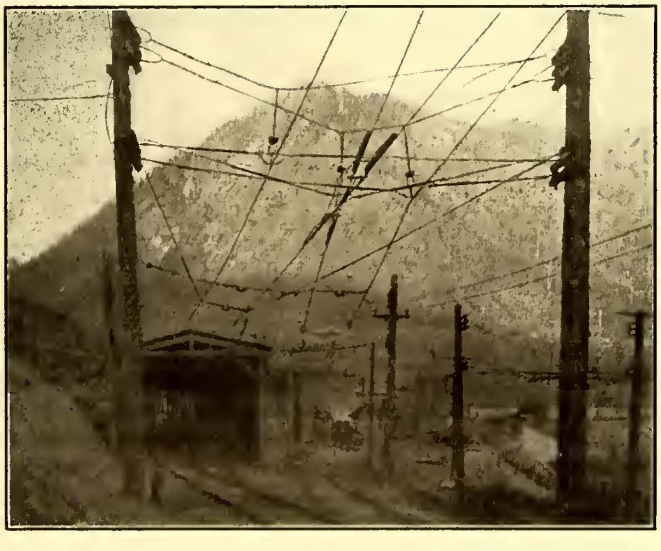
Place	Power Kilowatts	Per cent
Power house low-tension busbars.....	4,740	100
Substation low-tension busbars.....	4,250	89.8
Trolley wheel of the locomotive.....	4,000	84.5
Driving axles of the locomotive.....	3,320	70

The average efficiency is somewhat higher than 70 per cent.

HANDLING OF TRAINS

The maximum duty was imposed upon this equipment from the outset. On account of very poor regulation of waterwheels steam has been used in one of the Mallet engines in starting all freight trains in the Wellington yard. An attempt has been made to use just sufficient steam to enable the Mallet engine to turn itself over, and steam is shut off at the portal of the tunnel. In addition to this, in order to provide smoother starting, a slight braking pressure has been maintained on the locomotive at starting, which is gradually reduced.

On several occasions trains have broken in two, due to the trolley wheel on the rear locomotive leaving the wire and thus cutting off part or all of the power supply to the

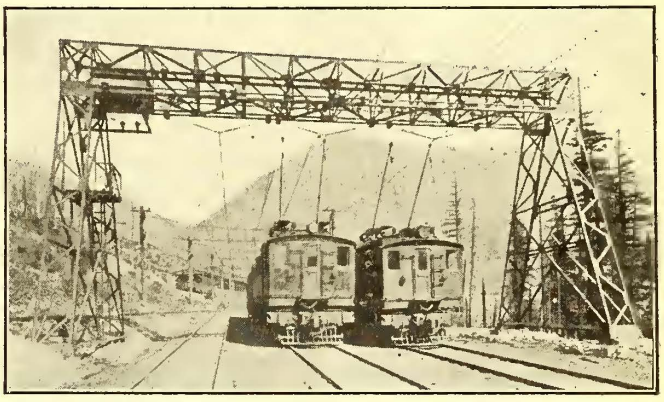


Great Northern Electric System—Overhead Construction Above Switch Point in Wellington Yard

rear locomotives. This throws a greatly increased drawbar pull on the front locomotive, and the consequence is that the train is jerked apart. This happened in the early stages of the work, and was due to the fact that the turnouts were not in the best order, and also that the engineers had not sufficient experience in handling trains. Another means taken to avoid the broken drawbars was to use the rear Mallet engine to assist the train over the trolley crossings in the Wellington yard. This was a temporary measure and has been discontinued.

ECONOMY OF STEAM LOCOMOTIVES

It is interesting to compare the performance of a Mallet compound locomotive under the same operating conditions as this system. The data for this are given by Mr. Emerson, superintendent of motive power of the Great Northern Railway, in a discussion before the American Society of



Great Northern Electric System—Anchor Bridge in Wellington Yard

Mechanical Engineers on locomotives of this type. As an excellent performance, he gives these data:

Recent performance shows that on a round trip over this division the L-1 engines handled 1600 tons with a total of 43 5/6 tons of coal, or equivalent to 25.13 lb. of coal per 100 ton-mile.

The division referred to is from Leavenworth to Everett, 108.7 miles. The work done per ton for a round trip over this run is readily calculated from the profile as 4.26 kw-hours at the rail. This is the work done per ton in lifting the train. The work done against train resistance, assuming it to be 6 lb. per ton, for 108.7 miles, is 1.3 kw-hours. The total work done in a round trip per ton, therefore, is 5.56 kw-hours. There should be a negligible addition to this for starting the train.

The average train weight is 1980 tons. The coal used was 43 5/6 tons, equal to 87,660 lb., or the coal per kw-hour was 8 lb.

A modern steam station can deliver 1 kw-hour for 3 lb. of coal at the busbar, which, with an efficiency of 70 per cent to the rail, gives a consumption of 4.28 lb. per kw-hour at the rail. In other words, the Mallet compound requires nearly twice as much coal per kw-hour at the rail as would be used in a modern steam station in the place of the hydroelectric station at Leavenworth.

ADVANTAGES OF THREE-PHASE SYSTEM

This installation has demonstrated that the three-phase induction motor has certain very marked advantages over any other form of motor for heavy traction on mountain grades. These advantages may be summarized as follows:

1. *Maximum electrical and mechanical simplicity.* This was one of the principal reasons for using the three-phase system, as the motors will stand any amount of abuse and rough use.

2. *Greater continuous output within a given space than can be obtained from any other form of motor.* This is due to the fact that the losses can be kept lower in a three-phase motor than in any other type. The electrical efficiency of the motor is high for a wide range of load.

3. *Uniform torque.* This is important, particularly at starting. A three-phase motor will work to a 3 or 4 per cent greater coefficient of adhesion than a single-phase motor at 15 cycles.

4. *The possibility of using 25 cycles.* This leads to less cost and a better performance of power station apparatus; moreover, the power supply can readily be used for other purposes, as well as for traction.

5. *Constant speed.* This is ordinarily stated as a disadvantage of the three-phase motor; but it is a distinct advantage in mountain service, particularly in limiting the speed on down grades. It has also the advantage on up

grades that meeting points can be arranged with greater definiteness. There is a general notion that the impossibility of making up lost time with the three-phase motor will be a decided drawback to its use. This would be true if there were the same liability to lose time with three-phase motors; but when a train can be counted on to make a definite speed, without regard to conditions of tracks or of its load, there is less liability to lose time.

6. *Regeneration on down grades.* This matter has been discussed since the earliest days of electric traction, but has not been, up to the present, put into practice. Although this result can be attained with other forms of motors, yet it is most perfectly attained by three-phase motors, there being no complications involved. This is of importance in reducing the power house capacity required for a given service; although, no doubt, the saving in power house capacity will not be as great as indicated by theory, owing to the various emergencies that must be provided for. Nevertheless there will be a material saving. A 2500-ton train on the average down grade of 1.5 per cent will deliver about 1400 kw to the system. The equivalent power house capacity would cost at least $200,000; hence if only 20 per cent of this can be utilized, the saving will equal the cost of one locomotive.

7. *Excessive short-circuit current is impossible.* Consequently destructive torque on the gears and driving rigging is eliminated. There is no necessity for the complication of a friction connection between the armature and driving wheels, as in the design of recent large direct-current electric locomotives.

8. *Impossibility of excessive speeds.* Even when the wheel slips the speed remains constant. Therefore, the maximum stresses put on the motor are less and are more accurately known than with any other form of motor.

DISADVANTAGES OF THREE-PHASE SYSTEM

The principal disadvantages of the three-phase motor, for traction use, are commonly stated to be:

1. *Constant speed.* This is rather an advantage for this class of service.

2. *Constant power.* The fact that the motor is a constant-power motor, and therefore requires the same power at starting and while accelerating as at full speed, is not a matter of any particular consequence in a service where the stops are very few, and consequently the proportion of total time spent in acceleration is small, or where the additional power required to accelerate the train is a small percentage of the power used by the train at full speed. In this particular case on the 2.2 per cent grade, when accelerating at the rate of 10 lb. to the ton, the power required during acceleration is only 20 per cent greater than that required at full speed; this is not a serious matter.

3. *Small mechanical clearance.* In this particular motor the clearance is ⅛ in., which is ample for all practical purposes.

4. *Inequality of load on several motors of a locomotive due to differences in diameter of driving wheels.* To meet this an adjustable resistance is included in the rotor of each motor. The motors are then balanced up and no further attention is required as long as the wear on the driving wheels is approximately the same. If, at any time, the load becomes badly unbalanced, it is a simple matter to readjust the resistances.

5. *Low power-factor of the system.* This does not seem to be borne out by practice. The power-factor, as shown by the switchboard instruments in the power house, is 85 per cent. This is a good result, and is much higher than the power-factors of many single-phase systems.

6. *Two overhead wires.* There is no doubt that two wires will cause more trouble than one, and in case of complicated yard structure it might not be practicable to use two overhead wires; but where the problem is that of a single track with an occasional turn-out or crossing, there is, practically speaking, no more difficulty in maintaining two wires than one.

In brief, in service of this character the three-phase motor has marked advantages in capacity, reliability, simplicity and general trustworthiness, when compared with any other motor.

SOME MINOR ADVANTAGES OF ELECTRIC TRACTION

In the many discussions of electric traction which have recently taken place, several minor advantages have not been sufficiently emphasized. One of these advantages lies in the fact that with electric traction the exact performance and condition of the locomotives and of all elements of the system are accurately known at each moment. On the other hand, with steam locomotives neither the engineer nor the motive power officer can have any clear knowledge of the conditions of operation at the moment; he can only ascertain the performance of the locomotive by elaborate tests, which, as a matter of fact, are seldom made. The ratings and performance of steam locomotives are made up largely by "authority" based on a few tests from time to time, and take no cognizance of the actual condition of the locomotives.

With electric locomotives the operation on a heavy grade becomes as simple as on the level. The engineers and trainmen feel much greater confidence in the electric locomotives, and consequently the mountain division ceases to be a terror to them.

Electric traction will permit the use of very long tunnels, which are not now possible on account of difficulty of ventilation. There is no particular reason why tunnels of 10 or 12 miles should not be operated as easily as those of 1 mile.

The great increase possible in the speed of trains with electric traction and the consequent increase in the capacity of a single track will operate to postpone for a long time the necessity for double tracking. This double tracking on a mountain is very expensive, and this saving alone will, in some cases, more than offset the cost of electrical equipment.

CONCLUSION

The construction work in the tunnel and yards was carried out under great difficulties, owing to the necessity of not interfering with the regular service of the road. At times it was not possible to work in the tunnel for more than one hour a day, and for days at a time two or three hours was all that could be allowed, but in spite of this the work was carried out with very satisfactory speed, due particularly to the skill and ability of R. Beeuwkes and W. S. Skinner, the author's assistants, and the unstinted assistance of the engineering department of the Great Northern Railroad.

DISCUSSION

In introducing the speaker, President Stillwell referred to the history of three-phase motors, which were introduced in this country in 1888. A serious effort was made at that time by American engineers to adapt this motor for railway use, but the conclusion was reached that its constant speed characteristic rendered it unsuitable for that purpose. Mr. Stillwell then paid a tribute to DeKando for his services in connection with the development of three-phase traction in Europe.

After the paper had been read by Dr. Hutchinson, W. S. Murray, electrical engineer of the New York, New Haven & Hartford Railroad, was called upon to make some remarks.

Mr. Murray stated that, although an advocate of single-phase motors, he agreed with Dr. Hutchinson in the wisdom of selecting three-phase motors for this particular service. One reason was that the acceleration required was low, but for general railway work he believed a motor with the characteristic of a series machine would be preferable. The resistance per ton during acceleration of one of the freight trains on the Great Northern Railway on a grade of 2.2 per cent can be divided as follows: Gravity, 20 lb. per ton, or a total of 44 lb.; acceleration, at the rate of 0.1 m.p.h.p.s., 10 lb.; friction, exclusive of the locomotive, about 8 lb.; or a total of 62 lb. After the train has been brought to speed, 10 lb. disappears, leaving, as stated in the paper, about 20 per cent more power during acceleration than in operating the same train on the same grade at full speed. The two factors that cause this low ratio are that the acceleration is slow and the grade is high. The reverse

conditions exist in high-speed suburban service where the acceleration is high and the grade is low. Thus, with no grade, a passenger train which is being accelerated at 0.7 m.p.h.p.s. would require 70 lb. per ton, and assuming the average friction per ton up to 60 m.p.h. to be 10 lb., the total pounds per ton required would be 80. After the train has arrived at the balancing speed of 60 m.p.h. the resistance may be 15 lb. per ton, or a difference in power of 530 per cent instead of 20 per cent. This illustrates the difference in the two problems. Mr. Murray also discussed the question of power factor, which, he said, on the New Haven road seldom rises above 85 per cent, and more frequently is below 80 per cent.

E. B. Katte, chief engineer of electric traction of the New York Central & Hudson River Railroad, thought it would be hard to improve either the electrical or mechanical design of the Great Northern locomotives for the purposes for which they are intended. He thought the reasons for adopting the system over the entire mountain division were obvious, but if only the tunnel section was to be considered, it seemed to him, without going into the figures, that the direct-current system would have had several advantages, such as the possibility of using storage batteries and multiple-unit control, with two or more locomotives at the head of the train. He also thought that it would be interesting if Dr. Hutchinson would explain why the ground wire, for which provision had been made on the top of the transmission lines, had been finally omitted. On the New York Central, where similar provision had been made, the ground line was omitted because the poles were made of steel, and each was carefully grounded to a large copper plate set in permanently wet ground, and it was believed that each pole would act as a lightning rod, and thus protect the line. But on the Great Northern Railroad the poles were of wood and the insulator pins did not appear to have been grounded. The speaker also asked if any special protection had been provided against the destruction of the wood poles by fire. In conclusion, he said that the experience described with insulators covered with the soot from steam locomotives was similar to that of the New York Central. At first the New York Central engineers were much perturbed because of this accumulation on the 11,000-volt insulators, but after careful tests on several insulators which were well covered with soot it was found that the flashing-over point was several times the normal voltage, even when the soot was well saturated with water.

B. J. Arnold said that last summer he had the privilege of personally inspecting the line, and the operation appeared very successful. In the yards the use of the double overhead conductors seemed somewhat complicated, and he agreed with Mr. Murray that where there were many yards a system requiring a single conductor was more desirable. That was one of the principal reasons why the single-phase system was selected for the Sarnia tunnel. He did not believe that there was any ideal electric railway system, but that each system possessed special advantages for certain conditions.

F. N. Waterman, of New York, quoted some figures from the Valtellina Railway, which he had inspected in Italy some time ago. The traffic was a combination of freight and passenger service. The average run was short and required frequent acceleration, and with a number of trains on the line the load factor was 55 to 60 per cent. The ratio of maximum to average output was as favorable as 3.5 to 1 with single train operation. He attributed this to the employment of cascade control on most of the trains and the characteristic of three-phase motors, which cease taking current when the frequency falls by the amount of their slip, and return current to the line if it falls to a greater extent. The water wheels driving the generators at the power station of the Valtellina Railway would fall off in speed some 5 per cent, as the full load came on, while the average slip of the synchronously running trains was less than 1 per cent. He thought that this property of induction motors should be of great value in cases where a small number of light trains was operated. He had recently made some calculations of the effect of cascade control in comparison with a series-multiple control, such as used on the New York Central locomotives, and had found with two speeds at least an equality for the two systems. If considered on the basis of constant current, the three-phase locomotive would show an advantage. Mr. Waterman then discussed motor clearances, which he said on the Italian locomotives were only 2 mm, but very large bearings are used and the wear is very small.

J. H. Davis, electrical engineer of the Baltimore & Ohio Railroad, presented the following comparison between the conditions on that road and on the Great Northern Railway:

Physical conditions:	B. & O. R. R.	G. N. Ry.
Length of electrified section, miles	3.7	4.0
Ruling grade	1.5%	2.2%
Average grade	1.0%	1.7%
Length of longest tunnel	7,400 ft.	13,873 ft.
Train weights:		
Freight, inc. steam and elec. locos	1,928	2,075
Passenger, inc. steam and elec. locos	990	906

	B. & O. R. R.		G. N. Railway.	
Tonnage handled per day:	No. Tr.	Weight.	No. Tr.	Weight.
Passenger	21	6,630	3	2,690
Freight	28	29,600	2½	5,290
Special	0	.....	1	470
Totals	49	36,230	6½	8,350

	B. & O. R. R.		G. N. Railway.
Equipment:	Pass.	Freight.	Freight.
Number of locomotives	5	2½	4
Weight (tons)	90	160 (2 units)	115
Number of motors	4	8	4
Rated horse-power	1,100	1,600	1,900
Tractive eff. rated load	26,000	70,000	47,600
Speed at rated load, mph	16	8½	15

(NOTE: Data on B. & O. equipment based on natural ventilation—Great Northern on forced ventilation.)

L. R. Pomeroy, of the American Locomotive Company, said that seven years ago he had made an examination of the Cascade tunnel situation to determine the possibilities of electrical equipment. At that time it was very difficult to arrive at the actual cost of steam operation. Since then he had been furnished with a road test of the Mallet steam locomotives over the section described in the paper—that is, from Leavenworth to the Cascade Tunnel summit, and also for a neighboring road with similar physical conditions. From these figures, which he quoted, he concluded that a train with a trailing load of 2500 tons over the section on which the test was made, would require about 5750 kw-hours at the rail per trip. Assuming 5 lb. of coal at the power station per kw-hour, a total of 28,750 lb. of coal would be required. The coal consumption of steam locomotives to do the same work at the same speed would be 68,832 lb. Mr. Pomeroy then discussed the monetary saving by electricity, and found that for the service assumed the saving for coal and water with electric locomotives would amount to $268,769 per year.

W. N. Smith, electrical engineer of Westinghouse, Church, Kerr & Company, said that the operating conditions on the road in question were particularly favorable to three-phase operation, but he was doubtful as to whether the double trolley system would be satisfactory at higher speeds. He thought that the mechanical reliability of the moving contact system was at the foundation of successful electric railway operation and that this was one of the advantages of a single-phase system. He also thought that

the future development of the overhead moving contact would be on the lines of a wide roller type of collector, with pantograph mounting. He then referred to recent electric locomotives with side rods, and expressed his belief that the development of electric locomotive design was in this direction, not only because the center of gravity was thereby raised, but because the mechanical parts could be standardized independently of the electrical equipment, so that the same arrangement of frames and running gear could be used in either direct-current, single-phase or three-phase locomotives.

F. S. Denneen, of the Ohio Brass Company, gave some reasons for the selection of the type of overhead construction used. He said that direct suspension instead of the catenary type was employed because of the use of two contact wires over each track, having a difference of voltage of 6600 volts, and that the installation of auxiliary supporting wires would greatly have complicated the problem of insulation. The diagrams of the overhead structure in the single track yard also show that each phase is supported by an independent span and that auxiliary insulation is provided in every case; that is, the major insulation may be said to consist of two heavy porcelain strain insulators, and the auxiliary insulation of the wooden break strains. The former insulators are rated for 10,000 volts and the latter for 3200 volts or over. The wires of the same phase are carried on one cross catenary and those for the opposite phase are carried on another, and there is insulation between the wires of the same phase over different tracks. This was done to keep the circuits entirely independent. The hanger is made up on the unit system, so that any piece can be removed and another piece inserted, and the time required for repairs cut down to a minimum. In the tunnel construction bronze fittings were generally used on account of the presence of moisture, although, as Dr. Hutchinson had said, it is possible that malleable iron or other iron properly galvanized would have answered. The expansion bolts which carry the large porcelain strains in the tunnel were made from steel tubing, galvanized by the hot dip process. Originally, it was proposed to design the overhead frogs with tongues, but this was abandoned at the time because of complications, but the speaker thought this could be done now if necessary.

W. I. Slichter, of the General Electric Company, referred to some of the details of the design of the motors used in the locomotives. The principal characteristic which differentiates the equipment from European railway installations is the weight of the trains, which are about three times as heavy as the European trains. This made it necessary that there should be no reduction in the tractive effort after it was once applied, and that there should be sufficient control steps so there would be no danger of slipping the wheels or straining the drawbars. The control is accomplished by using rheostats in the secondaries of the motors, varying the resistance by contactors. The control system consists of 14 contactors per motor, five of which are in the primary, there being one contactor on one phase and two on each of the other two phases to provide for reversing the motors. This leaves nine contactors in the secondary to give 13 steps, which is accomplished by a scheme of dividing the resistances into two or three groups, each having its contactor, and these groups are brought into different combinations, so that each group is used over and over again, sometimes in series, sometimes in multiple with the others, and not left idle after being used once. A separate and independent set of resistances is provided for the secondary of each motor to avoid the tendency of the motors to exchange current and "buck" when they are all connected in multiple to one set of resistances. The speaker also described the automatic device at the power station by which the water rheostats mentioned by Dr. Hutchinson are thrown into service.

C. L. DeMuralt, of New York, said that the paper to his mind brought out, first, that the efficiency of the three-phase system was extremely high, and, second, its great recuperative feature. With a longer line and with more trains this would become a very important factor. He thought that there was no serious objection to the double trolley, because it was largely a question of design. There should also be little additional maintenance, because the maintenance cost was made up principally of labor, and the same gang of workmen could work on two wires almost as quickly as on one. Referring then to the constant speed of the motors, he thought that as a rule this was advantageous rather than disadvantageous. He hoped that the installation would do a great deal toward demonstrating the desirability of the three-phase system in this country.

Calvert Townley, vice-president of the Connecticut Company, emphasized the benefit to electric traction which this successful installation involved, and expressed his belief that this feature was of far greater importance than that of the particular system used, although the system employed had been adopted under conditions where it should produce as favorable results as it would anywhere. He thought some additional particulars in regard to the capacity of the locomotive would be instructive, as there seemed to be a difference between the rating as given for the locomotive and that as quoted for the transformers. In conclusion, Mr. Townley said that while the induction motor was very simple, the control system required was naturally more complicated than with the direct-current or single-phase system, because with three conductors it is necessary to protect against twice as many surges. He also doubted whether the uniform speed characteristic of the three-phase motor was not a disadvantage from an operating standpoint, because it is often necessary to make up lost time.

Dr. Steinmetz stated that the successful development of the rotary converter had had a great deal to do with the great impetus given in this country to direct-current railway work some 15 years ago. Abroad, where a prejudice existed against the rotary converters, correspondingly greater attention had been given the three-phase motor. The single-phase motor furnished one solution of the electric railway problem, but most engineers have come to realize that it is not a universal motor. Its application was seriously circumscribed, in the opinion of the speaker, by the necessity claimed for it by many designing engineers of a lower frequency than the standard. The three-phase motor, being a constant speed motor, had all of the characteristics inseparable from this type of motor; that is, low efficiency in acceleration and automatic regeneration. It was well suited for certain conditions, such as mountain divisions, for running continuously with heavy torque, both positive or negative, and for very high-speed passenger service. But it was not so well suited for general railway work as the direct-current or single-phase commutating motor, because the latter can replace the steam locomotive without requiring the rearrangement of operating methods to a constant speed service. Whether the latter is an advantage or a disadvantage as compared with variable speed requires further consideration. In rapid transit service the series characteristic in a motor is generally considered to

be especially necessary, but it is somewhat of a curious coincidence that in the most extreme case of rapid transit, the high-speed passenger elevator, the shunt motor and induction motor are used for the sake of reliability and capacity.

Frank J. Sprague referred to three installations which were very similar in their characteristics; the Sarnia tunnel, the Detroit tunnel and the Cascade tunnel, yet different electrical systems had been selected for each; for the first, single-phase; for the second, direct current, and for the third, three-phase. In each, also, the advantages of electricity over steam were marked. Another somewhat similar installation was that of the proposed equipment of some 140 miles over the Sierra Nevada division of the Central Pacific Railway, which he was now studying. In this distance there are 30 miles of snow sheds and 2 miles of tunnels. At present freight trains of various lengths up to a half-mile long and 2500 tons in weight are run in both directions at from 7 to 10 miles an hour. Passenger trains are operated at about twice the speed of freight trains. The grade conditions are very severe. Electrification, if carried out, will be for the purpose of increasing the capacity of the section. The specifications require larger capacity at the head of a passenger train than that of any locomotive yet constructed. The speaker said he believed that the system if equipped would be another successful example of electrification.

Dr. Hutchinson, in concluding the discussion, stated that he had not described the system employed as being applicable to any other conditions than those to which it had been applied, except that be believed it was suitable for the entire mountain division. The ground wire mentioned by Mr. Katte was not installed because there was no lighting, and wooden poles were adopted because they seemed to suit the service best. The points on regeneration made by Mr. Waterman were interesting, but regeneration was of no value until several units were in use. The location of the trolley wires mentioned by Mr. Smith was determined by operating conditions, and not by the electrical conditions. Referring to the capacity of the locomotives, Dr. Hutchinson said that the transformers had a rated capacity of 800 kw and a guaranteed overload capacity of 100 per cent for half an hour. This, he thought, would be sufficient for the entire run.

At the conclusion of the meeting President Stillwell announced that any members who desired to do so could submit written discussions on the paper.

ELECTRICAL CONTRACTORS FOR THE GREAT NORTHERN RAILROAD ELECTRICAL EQUIPMENT

According to a rule of the American Institute of Electrical Engineers, the paper on the electrical equipment of the Great Northern Railroad presented by Dr. Cary T. Hutchinson last week did not contain the names of the manufacturers of the apparatus used in the installation. Through the courtesy of Dr. Hutchinson, however, the following names of the manufacturers who supplied a considerable part of the equipment are mentioned below:

Electric motors and control, General Electric Company; trucks and locomotive frames, American Locomotive Company; overhead material, Ohio Brass Company.

The Prussian State Railways is now operating 70 storage-battery motor cars on its lines, and has ordered 33 more of the same type.

T-RAIL CONSTRUCTION IN LITTLE ROCK

At the annual meeting of the American Society of Municipal Improvements, held at Little Rock, Ark., Nov. 11, D. A. Hegarty, general manager of the Little Rock Railway & Electric Company, read a paper on T-rail construction in paved streets. Mr. Hegarty made a strong plea for T-rail, in which he said the greatest portion of the metal is in the head, where it is needed, and which can be reversed when one side is worn, which is not the case with the grooved rail. He also declared that the effect of wear on the latter rail is to sharpen the edge of the head, and this makes the rail injurious to the rubber tires of vehicles, but he maintained that with a T-rail wear of this kind cannot occur.

Mr. Hegarty then described the method of installing T-rail track in Little Rock. The section used is a 70-lb. A. S. C. E. The roadbed is first graded to the proper depth; the earth is then tamped. If any soft places are encountered in the subgrade, the earth is removed and the space is filled with coal cinders. A layer of 8 in. of broken stone is then placed on the subgrade and thoroughly packed. Then creosote ties, which are 6 in. x 8 in. x 8 ft. are laid upon the ballast and are spaced 2 in. centers except at joints, where they are placed 18 in. centers. The rail is then laid on the ties and the joints connected with 4-bolt Continuous rail joints, suspended between the ties. After the track is thoroughly tamped and surfaced, concrete is filled in up to the top of the ties. Then a sand cushion, 1 in. in thickness, except where crowned in the center, is placed on the top of the concrete. The brick paving is then placed on the sand and thoroughly grouted and rolled. A special brick is laid next to the rail on the inside and the space between the outside of the rail and paving is filled with grout.

The rails are bonded at each point with two soldered and compressed terminal bonds of No. 0000 capacity each, placed under the angle plates. The track is cross-bonded every 300 ft. with two No. 0000 tinned copper conductors and is also connected every 300 ft. to a 1,000,000 circ. mil tinned copper wire ground return.

THE PARMA PROVINCIAL RAILWAY

The Parma (Italy) Provincial Railway runs partly in the city of Parma and is now operated with single-phase current from the city to several suburban points. The city section is 10.9 km (6.7 miles) long over all with a maximum grade of 4.6 per cent, while the suburban lines are 38.74 km (24 miles) long and a maximum grade of 3.2 per cent. The operating potential in the city limits is 400 volts and in the country is 4000 volts at 15 cycles. Catenary construction of the Siemens-Schuckert type is installed on the suburban sections only. The rolling stock comprises 10 motor cars, 11 trailers and 18 freight trailers. The motor cars carry two 50-hp motors which are arranged for automatic voltage conversion at a point near the power station. These motor cars have seven first-class seats, 21 second-class seats and a freight compartment. The power station equipment consists of Cornwall boilers and superheaters, two Tosi steam engines of 750 hp each coupled to a 750-kva single-phase generator. Two 43-kw d.c. generator sets furnish the excitation and lighting current. The electrical equipment in the power house, the suburban cars and the catenary work were furnished by the Italian Siemens-Schuckert Company.

REVIEW OF THE DENVER MEETING OF THE CLAIM AGENTS' ASSOCIATION*

BY ELLIS C. CARPENTER, PRESIDENT OF THE ASSOCIATION AND CLAIM ADJUSTER, INDIANA UNION TRACTION COMPANY

The Denver convention was attended by one of the most representatives bodies of street and interurban railroad claim adjusters that I have ever seen assembled. They represented large interests operating in Massachusetts, New York, Pennsylvania, New Jersey, Maryland, Alabama, Tennessee, Ohio, Indiana, Illinois, Missouri, Iowa, Oklahoma, Colorado, Washington, Oregon, California and British Columbia. Written contributions upon various subjects were sent by delegates who could not be personally present, representing properties in Kansas City, Syracuse, St. Louis, Louisville, Fort Worth, Cincinnati, St. Paul and Minneapolis.

The prompt and regular attendance of almost every delegate at every session showed the deep interest in the convention. At every session there were present, besides the claim adjusters, delegates representing the legal, operating and accounting departments, to all of whom a cordial welcome was extended.

MEANS OF PREVENTING COLLISIONS

During the various sessions eight subjects were before us. After the reading of the paper and the written discussion, the subject was open for general discussion. The first subject was, "What Is the Best Means of Preventing Collisions of Cars and of Cars with Vehicles and Pedestrians?" The collision of cars is a class of accidents causing injury to many passengers, and there is seldom any escape from the payment of resulting damages. The following suggestions were offered:

The proper instruction and training of employees before being permitted to operate a car; on city lines during heavy fog, or at night, run car so that it can be stopped within the distance a motorman can see; in some cities the schedule is waived, and motormen are instructed to operate so as not to strike the car in front; motormen must know that hand and air brakes are in good condition before taking the car from the car house; bulletin boards, 30 x 48 in., are hung in reporting places, and at the end of each month there is posted a comparative statement for all divisions, showing collisions (as well as other accidents) occurring during the month and the same month of the previous year.

Collisions with vehicles are handled in much the same way. Motormen are impressed with the necessity of anticipating what the driver may do, and approaching in such a was as to avoid colliding by running at proper speed, sounding gong vigorously, having current off, and relying more upon the brakes than the gong.

Pedestrians, especially children and aged persons, will not always be as careful as they should when they pass behind a car from which they have just alighted, and attempt to cross in front of a car on the other track. Conductors should ever be watchful to see if a car is approaching on other track, and, if danger is apparent, shout out a warning. Motormen must be constantly on the lookout, and especially careful in such cases, cars being brought almost to a stop before passing, and, when approaching children starting toward the track, or near the track, run very carefully and under complete control. In one instance, a "kangaroo court" was organized among the employees, and those having this kind of accidents were brought before this court and tried.

A cash reward was suggested for trainmen operating cars without accident during a given time. Make the minimum age of employees 25, and give preference to married men and men of middle age, who feel that, in case of accident, they have something more than their positions to lose, and something more to look forward to than "pay day."

Careful physical examinations should be made, and men with imperfect vision rejected. Keep motormen upon the same line, so that they may become familiar with the dangerous places. Last of all, careful, proper and constant instruction should be given by the superintendents, adjusters and others, as to the dangers of having and the delights of avoiding accidents.

BOARDING AND ALIGHTING ACCIDENTS

The second subject considered was "How Can Boarding and Alighting Accidents Be Diminished or Prevented?"

Inquiry from various sources indicated a surprising state of affairs regarding this class of accidents. Some reported about 25 per cent of all accidents to be of this class; others as high as 90 per cent. This certainly indicates the existence of a condition worthy of the attention of every department of the service interested in saving the dollars.

This class of accidents is of such more frequent occurrence on city lines. Some of the causes assigned were: Lack of uniformity in types of cars; carelessness of employees; the almost universal habit of men in boarding and alighting from moving cars; the old, old story of women getting off backward, many times just before the car stops, due probably to the fact that a very large percentage are right-handed and carry their bundles or hold their skirts in their left hand, so as to leave the right hand free to hold in alighting from the car; the type of summer car with running board along the entire length of the car, with so many exits; the lack of guards to prevent boarding and alighting from moving cars.

The remedies suggested were: Proper instructions to employees, so that they may understand that the prime virtue of railroading is safety; shouting warnings to persons about to be placed in danger; discontinuance of the open or summer type of cars; placing a mirror on the outside of the front of the car so that the motorman can see that the rear of the car is clear before starting; printing on the back of transfers, the proper way to alight, so that it will be before the passenger when on the car; the use of the semi-convertible pay-as-you-enter and pay-within cars with folding step; interesting school superintendents, and having teachers of all grades instruct children in the proper way to alight from cars, and the danger in alighting from moving cars. These, with other suggestions, were offered as some means of preventing this class of accidents.

The person to whom the third subject had been assigned did not respond, so that subject was passed.

FURNISHING COPY OF STATEMENT

The fourth subject was: "Is It Good Practice When Statement of Injured Party Is Obtained of Accident to Furnish Him with Copy of His Statement?" This was one which more directly concerned the legal and claim departments. There were arguments for and against the proposition, but the consensus of opinion seemed to be that only in extreme cases was it desirable to furnish copies of statements taken to either claimants or witnesses and this should be left to the judgment of the person taking the statement.

In procuring signed statements there seemed to be a unanimous opinion that the investigator should seek facts, treat the party giving the statement fairly, setting out as clearly as could be done the witness's version of the matter under investigation, even though the facts were unfavorable to the company, so that when full investigation was had the adjuster, from the facts reported in the statements, could have a basis upon which to act. Some companies take only the signed statements of injured persons, merely interviewing the witnesses, and keeping a written memorandum of the facts elicited by the investigator.

SCHOOL OF INSTRUCTION

The fifth subject was: "Is a School of Instruction for Trainmen Essential? If So, in What Departments Should the Instruction Be Given and by Whom?" This subject was so closely allied to many of the other subjects that during the various discussions it was usually touched upon from some standpoint.

Every road, so far as the expressions indicated, instructs its employees in one way or another, but there seemed to be a lack of uniformity in such instruction.

That trainmen should receive instruction before entering the active service and that the instruction should continue at intervals throughout their entire term of service, there seemed to be no question. This instruction should cover

*Abstract of paper read before the Central Electric Railway Association, Indianapolis, Ind., on Nov. 18, 1909.

the essentials in the operating, mechanical and claim departments as they were the departments most effected, and these departments, acting under and with the management, should join hands in the proper course of instruction, looking to the prevention of accidents where possible and the proper handling of accidents when they occur. All jealousy should be eliminated; the good of the service, the promotion of good fellowship and the saving of money should be first considerations.

The authority of the claim department with some companies is very limited; in others it is very much greater. With the larger companies both legal and medical departments are under and responsible to the claim department, and representatives of these talk to the men, who thus have the opportunity to view accidents and their results from various standpoints.

Many companies require trainmen to pass written examinations. Where proper instruction has been given a better service is rendered and accidents are reduced.

INFORMATION FOR NEWSPAPERS

Our friends the newspapers were not overlooked. The sixth subject was: "Should Information Be Furnished Newspapers Regarding the Work of the Claim Department?"

This subject aroused a rather heated discussion, as there were several ex-newspaper men among the delegates. Some had obtained good results by reposing confidence in the news-gatherers, and seldom was there occasion to say that the confidence had been misplaced; others had not fared so well. In the smaller communities, where a personal acquaintance means much, it seems to be the better policy to keep close to the papers. Where accidents occur of sufficient importance to be of general interest, the main facts, upon which can be based a readable story, should be given out. This does not necessarily apply to minor accidents or matters of small moment.

Whenever a verdict is rendered against a corporation the plaintiff's attorneys seldom fail to see that it is properly advertised in the newspapers; on the other hand, the defendant corporation, when a verdict is rendered in its favor, seldom pays further attention to it and the papers can mention it or not as they see fit.

Although more than 80 per cent of personal injury damage suits result in favor of the defendants, so little attention is given to them after the verdict is rendered, and so much attention is given by the attorneys for plaintiffs in their successful cases, that the newspapers have molded sentiment to such an extent that in some localities the opinion prevails that in order to get justice you must at once go to court with your case. In order to offset this sentiment and get the public on the right track considerable attention should be given to reporting correctly the facts and outcome of law suits which result favorably to defendant corporations.

In case of fake claimants, where convictions secured, the widest publicity should be given.

RELATIONSHIP BETWEEN MEDICAL AND CLAIM DEPARTMENTS

The seventh question proved to be of considerable interest. It was "What Should Be the Relationship of the Medical and Claim Departments? How Can the Medical Best Serve the Claim Department in the Handling of Accidents?"

The experience of one of the very largest companies, operating in a large city, has shown the best policy to be to practically ignore the doctor, and not in any way to protect his bills, but let him look wholly to the claimant for his compensation.

With the smaller companies, and those serving the smaller cities and country districts, this policy was not advocated, but rather the opposite. There seemed to be a higher standard of ethics among medical men in the smaller places and they are more apt to reciprocate if treated fairly and courteously.

With the smaller companies, in case of accident, the nearest physician is called to give first attention. With many of the larger companies regular employment is given to a company surgeon and some have a surgical staff subject to call. Many times the physician can promote a good feeling for his company, or its representatives, and by kindly words pave the way for the claim adjuster.

Physicians, in making reports upon cases of injury, should always give the company the serious side, and not minimize the extent of injuries.

RELATIONS OF CLAIM AND OPERATING DEPARTMENTS

The next question considered was "The Claim Department and Its Relation to the Operating Department." This was treated under three heads:

(a) "The importance of reporting all accidents promptly to the claim department." The prompt reporting of this class of accidents will practically eliminate one of the great and costly evils, "the blind or unreported claim." The operating department can, by proper discipline, materially aid in the matter. Employees must be made to understand that when an accident happens on or about the cars or property of the company, the first duty, after caring for the injured, is it procure witnesses and make prompt report of the circumstances. They must not assume the duties of court and jury, and pass upon the matter as one of no moment, and one of which no report is necessary; for fear the injured party will not concur in this decision, prompt reports must be made of trivial as well as of serious matters.

(b) "The importance of co-operation between the operating and the claim departments in all matters relating to accidents." Where co-operation does not exist between these departments, there is a deficiency in results. Valuable data can be gathered by the claim departments regarding various kinds and cost of accidents, and by co-operation the operating department can aid in decreasing or eliminating such accidents. A unique way of keeping tab upon the various kinds of accidents was suggested. Upon a map of the lines of the company various colored pins are used to designate the location and type of accidents. For instance, in all cases of wagon "hits," a black-headed pin is used; automobile "hits," green; pedestrians, red; "fall-offs," white; car collisions, brown, etc. Where accidents become frequent in any locality, special attention is given to that locality for a time, until the trouble is remedied.

(c) "The opportunities afforded the claim department by learning the causes of many accidents and suggesting a remedy to the operating department for its consideration." Many times in the investigation of an accident the real cause that may have been overlooked by others will be discovered by the claim department and a remedy suggested. The attention of the operating department can be called to the more dangerous places. The cause of sentiment against the company or its employees in certain localities where it appears to have been aroused can be ascertained and reported.

THE UNREPORTED ACCIDENT

The last question taken up was: "The Unreported Accident: Its Evil and Remedy."

This class of accidents is a bugaboo to the claim adjuster. When such a claim is presented he has absolutely nothing from which to determine its merits, and whether or not a settlement should be effected. He must put his wits to work to uncover and develop the case from what information he can elicit from the claimant.

As a rule, it is not wise to make speedy settlement of this class of claims. It is in this class the fakir is usually found. The adjuster must claim his residence to be among the Ozarks, and be shown before making settlement.

Where the claim finally appears to be just, and the fault with the employees, settle with the claimant if it can be done within reason; but remember that there should also be a prompt settlement between the head of the department and the employee at fault.

Should a fakir be uncovered, then, too, remember that a speedy settlement in court is due, so that he may, after conviction, have ample time for reflection.

By means of proper instruction, conversation, meeting in smokers, or other forms of entertainment, where the management and heads of departments can greet the employees and promote good-fellowship, the evils of the unreported accident can be discussed, and in a great measure eliminated.

If there has been anything of value suggested herein, we commend to you a careful reading of the full report of the convention proceedings when published.

Throughout the entire convention the deepest interest

was manifested by the delegates. The kindly spirit of the first greetings grew as the meetings progressed until when the hour arrived to bring the convention to a close there seemed to be such a bond of good-fellowship existing as could be expressed only by singing "Auld Lang Syne," which was done with a hearty good-will while marching about the convention hall with hands joined, and when the last word had been sung the convention was adjourned.

REVIEW OF DENVER MEETING OF THE TRANSPORTATION & TRAFFIC ASSOCIATION*

BY J. B. CRAWFORD, SUPERINTENDENT, WINONA INTERURBAN RAILWAY

The American Street & Interurban Railway Transportation & Traffic Association was organized in January, 1908. At the convention held in Atlantic City in the following October, the officers elected at the organization meeting were re-elected for the coming year and it is a great pleasure to call your attention to the excellent results obtained by them and the various standing committees during the past year. When we consider the short time this association has been organized, we can but be impressed by the large amount of work done and the good accomplished, as shown by the valuable reports presented at the Denver convention this year.

In President Allen's annual address before the association at Denver he discussed with strong approval the work of the standing committees and the future progress which can be made by perpetuation of the plan of organization of this association, which provides for the maintenance of such committees. The standing committees of the Transportation & Traffic Association are on the following subjects: Passenger traffic, interurban rules, express and freight traffic, city rules, transfers and transfer information and training of transportation employees. As these reports have all been printed in pamphlet form and distributed to member companies, I will confine my remarks to the discussion brought forth and to the lessons to be learned. The committee on passenger traffic had an exhibit of 358 samples of printed matter received from 137 different companies, consisting of time-tables, pamphlets, folders, flyers, post-cards, etc. The discussion which followed quickly resolved itself into one on advertising, and was exceedingly interesting and instructive. The consensus of opinion seemed to be that a pleased patron was the best advertising medium, that time-tables and display advertising in newspapers were productive of the most far-reaching results, and that it was best not to place advertising matter in folders, for while the advertising paid for the folder it also cheapened it; in other words, the better the folder the better the results.

Among the unique methods of advertising brought out by the discussion were the following: Sending copies of new folders and pamphlets to all newspapers within a radius of 50 miles, thereby securing flattering notices from many of these newspapers, which resulted in numerous written requests for copies of folders; stringing banners across the intersecting streets where a great many people passed each day calling attention to any special excursion; sending circular letters to various business houses whose traveling representatives canvassed the territory served; sending personal letters setting forth the important features of some particular park or resort; putting up a large electric sign at some prominent point which was passed by several steam as well as electric lines; sending a complete time-table and folder to each one of the ticket agents of the steam railroads in the vicinity; advertising in newspapers that certain cars to a summer resort or park would be overcrowded and instructing the public when to take cars and how to avoid the crowded cars; distributing folders from house to house, not in the old way of throwing them over the fence, but by ringing the door-bell and handing the folders with a polite remark to the person opening the door; advertising the fact in newspapers that beautifully illustrated folders could be had on inquiry at certain department stores.

The lessons to be learned from this discussion seem to me to be: First, that good advertising and lots of it pays and pays well; second, that it behooves us all to exchange ideas with our neighbors so as to find out what the other fellow may be doing of which we may take advantage, to the great development of our own particular property; third, that while nearly every electric railroad in the country advertises more or less advertising is scarcely ever done in a methodical or carefully planned manner.

The next report taken up was that of the committee on interurban rules which, owing to its length, was not read, but was considered for discussion by divisions. This discussion was lively and interesting from the start, especially on the subjects, "Movement of Trains" and "Taking of Train Orders." It became evident, as one proposed amendment after another was voted down, that the committee had given this report more thought and attention than had been expected, and was well prepared to defend the report and explain the reasons why rules were recommended.

The report of the committee on express and freight traffic was read next by P. P. Crafts, the chairman. The old question as to whether freight and express business pays was considered, as was also the question of soliciting. The committee believed that a good lesson could be drawn from the experience of the steam railroads on the latter question and that the employment of a live freight solicitor who could be depended upon to pursue the subject constantly and in an intelligent manner could not fail to result in increased freight earnings. The statistics of traffic accompanying this report are most instructive and show among other things that a number of companies have made contracts with old line express companies. The discussion following the report was principally about the proper operating charge for freight cars. The chairman suggested that the committee on express and freight for the coming year might go into the question of operating expenses very carefully and he hoped that the companies would respond freely to all questions asked by the committee.

On account of lack of time the paper of Mr. Vaughan, of Grand Rapids, Mich., on this subject was read by title only. This is an exceedingly clear and interesting paper and should be read by all.

The report of the committee on city rules was next taken up and discussed by sections in the same manner as the report on interurban rules, and while all did not agree with the committee, it was very evident that earnest effort had been made in the accomplishment of a task by no means easy and one of great value to the city railways of the country at large.

The report of the committee on transfers and transfer information, and the paper on "Transfer Laws and Suggested Changes," by Arthur A. Ballantine, of Boston, were postponed until next year, announcements being made by President Allen that the entire subject would be taken up again in 1910.

The paper by J. V. Sullivan, Chicago Railways Company, entitled, "Chicago's Transfer Crusade," was next read. In this paper Mr. Sullivan showed how Chicago had probably more transfer points than any other city in the world. To those who have city lines, the story of this crusade should be one of exceedingly great interest, as there is hardly a city in the United States in which transfers are issued where the privilege is not abused to such an extent as to seriously affect the revenue. This paper shows what can be accomplished by appeal to the better nature of the traveling public, and by the aid of a carefully planned and well-directed campaign beginning with a properly enacted law and ending with a strict and continual enforcement thereof. The abuse of the transfer privilege is a constant and growing menance to city properties throughout the country, and it is to be hoped that the Transportation & Traffic Association will recommend a plan of action and a law such as is outlined in Mr. Sullivan's paper. If passed and enforced, such a law would put a stop to the misuse of a privilege which was never intended to be abused. The discussion following the reading of this paper was principally about the difficulty of securing convictions under the present laws and of the necessity of collecting transfers at the end of each trip and of checking them at least once a week.

Matthew C. Brush, formerly of the Newton & Boston

*Abstract of paper read before the Central Electric Railway Association, Indianapolis, Ind., on Nov. 18, 1909.

Street Railway, stated that that company collected transfers at the end of every half trip, the envelope containing them being inserted in a time stamp before deposit at the terminal. In this way an absolute check was kept. Several delegates liked the idea of the time stamp, as explained by Mr. Brush, and desired to know more about its use.

J. W. Brown, chairman, then read the report of the committee on the training of transportation employees. Following the reading of the report, N. W. Bolen, Public Service Railway, of New Jersey, presented a written discussion in which he recommended that the report be studied carefully. W. R. W. Griffin, of the Rochester Railway Company urged the adoption of the standard forms and blanks recommended by last year's committee. C. J. Franklin, Portland Railway, Light & Power Company, and P. P Crafts, Iowa & Illinois Railway, spoke in favor of the merit and demerit system, although the committee did not see fit to recommend its adoption. The committee, however, did recommend that this system of discipline be watched carefully by member companies in order that the results obtained might be fully understood and its value as a means of discipline completely determined.

I would like to make a few suggestions for the consideration of every member of the Central Electric Railway Association. The Transportation & Traffic Association is to be congratulated and the State of Indiana is honored by the selection of Robert I. Todd as president of the association for the coming year, and I would therefore suggest that we all stand shoulder to shoulder with our new president and assist him in every possible way, to the end that the greatest good may be accomplished during his administration. Another suggestion is to call your attention to the benefits to be derived from becoming an associate member of the American Street & Interurban Railway Association. Time will not permit me to enumerate the benefits, but if you will look into the matter it is my belief you will be convinced that you cannot afford not to join. This year the associate membership has increased from 249 to 817, which is a strong evidence of the appreciation of the great work done by the association for our chosen field, the electric railway industry.

A CENTRALIZED TESTING ORGANIZATION *

BY JOHN G. CALLAN, ELECTRICAL ENGINEER, ARTHUR D. LITTLE, INC., LABORATORY, BOSTON, MASS.

In the purchase and administration of supplies, street railroads are confronted by the same problems which have driven several governments and large steam railroads and industrial plants to establish standardizing and testing laboratories, to buy wholly on specification, verifying quality of shipments by test, and to keep systematic account of every item consumed.

The principal reason which has deterred street railroads from adopting this method of purchasing is the practically prohibitive cost of establishing, manning and operating a laboratory of such scope and personnel as to be of any real use. Compromise attempts to use slight equipment and an inexpensive staff—almost never adequately trained and experienced—usually cost much, achieve little, and in their eventual abandonment discredit the whole idea. With a road of moderate size, any given element of the testing equipment is idle most of the time, and the man in charge is most often employed on matters wholly foreign to his training. When we add to this the fact that specifications based on this man's inevitably meager experience and obscure reputation would possess doubtful value and command scant respect, it is natural that most managers have continued to buy on the word of the seller.

The logical way of handling purchases is the support of a thoroughly adequate laboratory by a considerable number of roads or similar enterprises, and its employment by each road or company for exactly and only such part of the time as is necessary. In this way there is available for each road at any time a staff ample in numbers and equipment, having experience and the specialized technical skill which experience alone can impart, at a minimum of expense to each road. This laboratory might conceivably be organized and operated by associations of street railways, by the State, or by an educational institution; or it may be established by private enterprise and its services in such amounts as required be contracted for by individual roads or groups of roads. For several reasons the course last named offers the greatest guarantee of an organization of that vigorous and alert character and keen initiative which insures results. In such an essentially non-competitive business as street railroading the interchange of experience and ideas which such a clearing house promotes is not only wholly unobjectionable, but constitutes a valuable source of usefulness. Such service saves considerable sums of money, but only by centralized effort can the work be done at once well enough and cheaply enough to render such savings available except to the largest roads. It is probable that even these could with marked advantage consolidate their laboratory service with that of the right kind of commercial laboratory.

The work that such a commercial laboratory will be called upon to do will usually fall within the following groups:

1. Fuel Engineering: Choice of coal; specifications; tests; fire-room practice.
2. Lubrication: Lubricated parts.
3. Specifications backed by tests and inspection for all important supplies.
4. Electrolysis and corrosion.

FUEL ENGINEERING

In buying coal the essential purpose is to buy power, and the proper criterion is the number of horse-power hours bought for a dollar, firing cost included. Numberless purchasers, even where coal is the largest single expense item, buy that coal by methods which invite and obtain results materially inferior to those easily attainable and daily secured by the Government and by other consumers using scientific purchasing methods. The purchase of coal without specification is quite generally decided by price coupled with the custom of the locality, the recommendations of firemen, dealers or nearby power users, eye inspection and the like, without any accurate knowledge of heating value. Often purchase is made on the strength of a reliable trade name which possesses commercial value precisely because it enables the dealer to command for a given coal a better price than the same coal would bring if it were divested of that name.

In the absence of specification buying, the purchaser has much justification in paying this additional sum for a trade name, since then his only reliance is on the reputation of operator and dealer. For example, coal from two adjacent veins, one with a "bone," the other without, or "run of mine" from the same vein, in one case "shot off the solid," in the other properly undercut, will differ in value to so considerable a degree that the risk involved in the use of unknown and unanalyzed brands renders experiment very doubtful and hazardous.

In the fire room there is a chance for astonishingly wide differences in production of power resulting from combustion of the same amount of a given coal, and, in addition to this, the combustion chambers, grates, draft and like elements may cause a plant to be very ill suited to one kind of coal and well adapted to another.

The prevention of scale and corrosion in boilers is frequently a matter of grave importance, and affords a problem always amenable to attack by a chemist skilled in this particular art. The percentage profit on proprietary boiler compounds is usually exceedingly high, and while many are good, many others are practically valueless. In a lesser measure corrosion of surface condenser tubes, erosion and fouling of turbine blades and like problems afford an opportunity for the mechanical and chemical engineer to save money.

A well-authenticated case in Fort Wayne, Ind., shows an average saving of over 20 per cent in coal per electrical horse-power through the adoption of a new fire-room practice, with no other change whatsoever. This and other instances indicate that the magnitude of possible fire-room economies is seldom realized, and in the same plant where much well-justified attention has been lavished on jackets, reheaters, lagging, feed heaters, and countless minor de-

* Abstract of a paper read at the November meeting of the Central Electric Railway Association, Indianapolis, Ind., Nov. 18, 1909.

tails of engine-room practice, the boiler room has too often received little thought and scant attention. Frequently, the only working expert on fire-room practice and choice of coals is the fireman, and the coal dealer's estimate of suitability of his wares goes unchallenged and unchecked.

To stop these leaks requires the establishment of methods at once scientific and practical in the purchase and the burning of coal. The best results are achieved by placing the whole matter in the hands of a competent fuel engineer either in or out of the organization. He will first note the firing, draft, flue gas, type of boiler, shape of combustion chamber, and other like basic premises. This information, coupled with consideration of location relative to coal fields, character of load and local smoke ordinances, will give him an accurate idea of what reliably available coal will in this particular case impart the maximum heat units for a dollar spent on coal and firing. This may be a different coal in summer and in winter. A certain 5000-hp plant saves $4,500 a year by this simple expedient.

If all coal of the same nominal size and from the same field were alike the expert would have finished, but this is never accurately true, and often the discrepancy is wide. The next step is to draft a specification based on the characteristics which an average good quality of this particular coal should possess—that is, its heating value per pound, volatile matter, ash, moisture, and constituents, such as combined sulphur with associated iron which give rise to a tendency to clinker. The contract should preferably agree to pay a certain price for coal of this specified quality, with equitable deductions for worse quality and premiums for better, and option to reject for drop below a certain point. Systematic tests determine the quality of each shipment and afford basis for settlement.

Such an arrangement affords substantial advantages in view of the wide variations in ash, moisture and heat units of nominally identical shipments. The buyer suffers much more frequently than the seller through these variations. He always suffers through failure to select that coal and maintain that fire-room practice which are best suited to his needs.

LUBRICATION AND LUBRICATED PARTS

The basis of maximum economy in lubrication is that founded on specifications prepared by an engineer familiar in detail, not only with the technique of oil and grease manufacture, but also with the requirements and results in numerous similar cases. At the same price and for the same service are sold oils of widely different lubricating value, and conversely substantially identical oils under different names sell at widely different prices; while particular brands are insistently and successfully heralded as exclusive possessors of the most extraordinary properties.

When it is realized that a simple change of gearcase grease has in at least one instance practically doubled the average life of pinions on a high-speed interurban road, it becomes clearly apparent the lubricants cannot be chosen at random, while, on the other hand, an examination of current prices for absolutely interchangeable oils shows that an excessive outlay is not needed to secure a good lubricant, and that a large percentage of the expenditure can easily go for the trade name. Due attention to feed, filtration and to accurate analysis and record of lubrication cost always pays. They are too often neglected.

It may broadly be said that no oils and few greases possess abstruse or recondite properties, and that they are always a proper subject for purchase on straight specification basis. Babbitts and bronzes for bearings require specifications checked by analysis and occasionally microscopic examination of samples, but they further require on the part of the purchaser expert broad experience and a knowledge of foundry practice, since a number of bronzes of like analysis may possess rather widely different characteristics, and elements are often introduced for deoxidizing, purging, and the like, which do not finally appear. A properly qualified expert allows for these and bases his judgment on experience as well as analysis. It is not unusual for one bearing metal to show five times the wear under like conditions that is found with another of about the same cost. A large Eastern commercial laboratory has made an excellent profit for one group of roads by establishing a small foundry for bearings and other parts.

SPECIFICATIONS AND INSPECTION

In buying supplies on specification and determining quality of shipments, judgment must again be coupled with specialized skill. Certain materials can be fully determined as to value by laboratory tests, while others require careful observation and tabulated comparison. Steel rails, cement and trolley wire may properly be bought on straight physical and chemical specifications, backed by brief and summary tests and inspection, while finishing and insulating varnishes, and the like, require prolonged tests closely approximating service, under systematic observation. The latter will be true wherever the same materials differently treated may produce widely different results, and where, at the same time, wear is essentially a prolonged process of aging. Obviously, experience and knowledge of the trade are here of paramount importance, and the properly qualified expert should be able to furnish such knowledge and experience quite as much as to make analyses.

Paints exemplify a class of materials occupying an intermediate position, where analysis and a knowledge of the trade are co-ordinately important. The best paint is invariably the cheapest, but the most expensive is not always the best, nor is the paint best for wood necessarily at all suitable for iron. Insulating compounds for fields and armature coils vary from excellence to comparative worthlessness, and the prices of those possessing value are by no means a measure of that value. There is a truly extraordinary amount of misinformation current on this subject, and the short-cut tests most in vogue are for the most part not only valueless but wholly misleading.

Preservation of wood by coal tar creosote, bichloride of mercury, zinc chloride, petroleum residue or other agents deserves distinctly more attention than is usually accorded it. In very many cases it will be found that, figuring interest rates and probable cost of replacement at probable replacement date, this expenditure is a very profitable one.

Structural material, cement, rails, special work, car wheels and axles, motor gears and pinions, brushes, springs, brake shoes, trolley wire, ears, insulators and other overhead material, trolley wheels and harps, rail bonds, poles and ties, cables and small supplies, such as packing and solder, should all be bought strictly on a specification basis, with analysis and inspection to check deliveries.

ELECTROLYSIS

The subject of electrolytic corrosion is certain to become more prominent with lapse of time, and as in other matters affording opportunity for agitation, this prominence is likely to be sudden and somewhat irrational. Those roads will be in the strongest positions which have resorted early to all reasonable preventive measures. There are occasionally geographical arrangements of trackage and extraneous conductors which concentrate electrolysis at certain points, and in such cases it is often necessary to resort to expedients other than good bonding. Relay switches or aluminum cells and suitably placed earth or sea plates each have their proper function, but all require skilful application.

CONCLUSION

There can be no valid question of the financial wisdom of fuel engineering, specification buying, system in lubrication, scientific attention to boiler corrosion and scale, electrolysis and the other things set forth above. Most roads, indeed, make some more or less perfunctory effort to attend to some of these things now, often by employing a man to look after some detail that has come up for attention and giving him a vague roving commission to care for as much more as he can. The man that supervises the firing must know more about firing a boiler than the fireman—not only theoretically, but in the practical way that spells results. Similarly, the man who draws specifications on coal must know the coal fields, methods of mining and preparation, the technique and personnel of the trade, besides being a coal chemist; and so with oil, wire, rails, paints, preservatives and all the rest. One man who could make himself felt in all these fields may exist, but no moderate-sized road could profitable pay for all his time, nor is that more necessary even with the largest roads than that each family should have a private and exclusive doctor, dentist and oculist. Carrying the somewhat absurb analogy further, we may imagine the lame character of

specialized skill which might be expected from such a family attendant, especially if he filled spare time with a bit of barbering, manicuring and chiropody.

Clearly this is one of the fields where the engineering is best done by an organization larger and better than any one road can support, and impartially at the service of all, whether maintained by the State, by a college, an association of operators, or, probably best of all, by enlightened private enterprise.

PUBLICITY FOR ELECTRIC RAILWAYS*

BY A. D. B. VAN ZANDT, PUBLICITY AGENT, DETROIT UNITED RAILWAYS

In the daily and weekly newspaper along your lines, either city or interurban, with which you come in contact your railway is mentioned oftener than any other one subject. Did you ever stop to think what that means?

Day after day, month after month and year after year the name of your railway appears in public print—in the advertising columns and in the news columns—many times more frequently than does the name of any other corporation or individual. Whether with praise or with blame, whether with truth or with falsehood, it is a rare issue of the home paper you read if no mention of your road is made.

And the public, reading, believes. Why not, then, try to intelligently direct this information that goes to the people, for they are interested in what is said about you? They are your patrons.

This, then, is the reason and not the excuse for a department of publicity. Such a department is the connecting cog between the actual operation of the railway and the people through the press.

Publicity is of two kinds: First, advertising; second, news. Just where one ends and the other begins is not clearly marked; it depends greatly upon the newspaper itself. The division of publicity may be expressed in another way: First, information as to when and where the cars go; second, stories of events arising in the management and operation of the road.

Whenever there is any uncertainty as to what is reading matter and what is paid matter, leave it to the business manager of the paper. He will let you know.

Let me first consider the matter of advertising, that function of publicity where money is spent in the expectation of increasing the business of the road.

Let this be the keynote of all advertising matter—a dollar spent must bring back, either directly or indirectly, something over a dollar. If it does not, it is bad advertising. Advertise what you believe in, and whenever you believe you have something to sell. Advertising simply because the business office of a newspaper or a program solicitor asks you is a waste of good money and good printers' ink. The advertising solicitor makes his money by persuading you to take his space; that is his business. To make absolutely sure that the advertising will produce results in the way of increased travel is the business of the railway's publicity agent.

What shall a street railway advertise? It should advertise what it has to sell—rides. To properly advertise its rides that are for sale it must of necessity keep constantly before the people where the cars go and when they go. The people must be impressed with this: that at certain times the cars leave the waiting room for certain places. This structure of advertising is founded upon reliable power, reliable tracks, reliable cars. Indeed, your publicity man may very often cause the public to overlook a little lack of reliability.

Your advertising can be made picturesque by pointing out places of interest. All decorative features are most excellent aids in developing business, but the one great thing ever to remember is that you are advertising the fact that at certain hours your cars go to certain places.

Where shall traction lines advertise? First of all, in the newspapers. For exclusively city lines and for interurban lines where the service is more frequent than half-hourly I do not believe there is much in the way of direct benefit to be derived by publishing timetables; the advertising in such cases should call attention to what is going on in the way of extra attractions that will draw extra business. Because the thing the railways have to advertise is time, and because of the probability of shifting schedules, I prefer the daily and weekly publications. I do not believe much profit is to be obtained from the monthly paper, and nothing comes out of the yearly issue.

Almost equally prolific in its results, and certainly much cheaper, is the use of the cars themselves, both inside and out. I would suggest that for neatness and for eventual economy in the way of saving printed matter, every car be equipped with a glass front frame in which can be pasted such information as to schedules or other matter as will help to produce results. Similar frames, or, at least, bulletin boards, in the waiting rooms can be made to produce excellent results.

In connection with the publicity of timetables, I desire to emphasize strongly the absolute necessity that the operating department give ample notice to those in charge of the press department of coming changes. If a car is scheduled to leave the station at 10 a. m. and the new schedule calls for 9:45 a. m., a lack of knowledge by the public does not add many new friends.

Another source of publicity, and one that is growing in favor, is the issuance of a monthly or weekly leaflet or magazine by the railway itself. Such periodicals, while advertising the timetables, possess a greater usefulness in fostering a spirit of concord between the company and its patrons. They require, however, considerable thought and application to accomplish the work for which they are intended. One thing to guard against is a tendency to increase the expense beyond that warranted. A small publication full of life and widely circulated, will produce much better results than the artistically labored but heavy-toned periodical that costs so much that its issue is limited. Prepare your copy for the masses; the rich can read their coupons.

The source of publicity most bothersome to railways and other quasi-public utilities is the church, the political and the social advertising sheet issued by each organization only occasionally, but issued by so many organizations during the year that the demand upon the advertising fund is close to startling. Personally, I do not like these sheets. Money spent this way, however, is wasted no worse than when it goes to the average industrial edition with which we are so familiar. If the exigencies of the occasion call for contributions, charge them up to the charity account, not to the advertising man's fund.

The other feature of publicity has, I fear, been overlooked at times by some of the quasi-public companies. I mean the matter of dealing with the press in the matter of news.

No matter what may be the motive of the man higher up in newspaper ownership or control, whether that motive be just or unfair, or based on a mistaken view of things, it should be borne in mind that there are two classes of people who believe absolutely in the newspaper they read, unless it is such matter as they of their own personal knowledge know to be different than stated. One class is composed of the reporters who come to you, the men you meet in the course of daily happenings. The other is the reader. To the reporter the paper he is on is a part of himself. Striving always in himself to be fair, the paper is his bias, for the paper is to the average newspaper man the highest type of publicity he has ever been connected with; this is the natural condition of progress. The second believer in the paper is the reader; it is the fountain of his knowledge, the source of his instruction.

Make the giving of news a definite department of organization, with the same attention to it as to the operation of the cars. There is no magnificent isolation of the motorman like that of the engineer; the very makeup of the electric car gives rise to a marked familiarity by the public with a part of the company's business. The same passengers take the same car with the same crew day after day, and this increases the public's familiarity, but the trouble is that this knowledge is only partial. The people who ride see only a small portion of what goes on; the public sees a steady flow of nickels into the coffers of the com-

* Abstract of a paper read before the Central Electric Railway Association at the Indianapolis convention, Nov. 18, 1909.

pany; it does not see the expenditures. The public sees tracks torn up and service rendered under difficulties and proceeds to damn the company almost on the theory that it is being done deliberately to annoy and delay the riders. Of the cost of this track expenditure the public has almost no comprehension; the same public is absolutely unfamiliar with the enormous task it is to maintain power and with the constant outgo of the dollars in the shops and yards.

All these things can be treated instructively and entertainingly in the press and by means of pamphlets. You who are experts know all this; it is an old story to you, but to the passengers and the people along your line it is like an unknown country. Whenever the familiarity of the public becomes real there will be less talk of watered stock and more wonder as to how you can do so much at so little cost to the rider.

The other day I was talking with a newspaper man of many years' experience in Detroit, and during the conversation I asked him what he thought double-truck cars cost. "About $1,500, or probably $1,200," was the reply. And the press is the school to which the public goes!

All such news as I have suggested is educational. There is another class, that might be classed gossip—stories of fighting snowstorms, changes in schedule, the appointment of agents and all that sort of thing. It is well to bear in mind that all news is comparative. The appointment of John Doe as station agent at Snagg's Corner is just as important to the readers of the Snagg's Corner *Courier* as is the selection of Richard Roe as president of the road to the readers of the metropolitan paper.

Then there is the matter of news concerning collisions, accidents, etc. Some railways have gone on the theory that the publication of this class of news worked against the good government of the road and tended to create claims for damages. Some police departments have worked along the same theory in the suppression of stories of crime, but in recent years the police have gradually learned that publicity has made the press an agent in detecting the criminal, and, similarly, railways have found that the publication of accidents has often brought good results in the way of evidence tending to upset outrageous claims for damages.

It should be remembered that misinformation is more dangerous than information, and a story scattered broadcast through the newspapers can never be followed by a correction that will reach all those who read the mis-statement. It is therefore necessary to get in on the ground floor, as it were, in getting your side before the public. Accidents always have their witnesses, and in the excitement of the moment and the high pressure rush of the daily paper to get the story for the next edition much that is fiction reaches the reporters' ears, so that the thing to do is to co-operate with the press by assisting in arriving at the real truth.

To illustrate the point: Recently the bare announcement reached a Detroit paper that an interurban car ran over and killed a man. It was only a few lines, and there would have been no scare head used, but even although it was unexpressed, the impression on the reader's mind would possibly have been that there was carelessness on somebody's part. Our investigation, and I gave the story to the paper almost as soon as it had received the dispatch, showed that the man, as the car reached him, deliberately put himself in front with suicidal intent.

Needless to say, this made more of a newspaper story and, equally needless to say, there was no possible opinion in any one's mind adverse to the company.

By an ordinance recently passed by the Chicago City Council, fares are to be returned to passengers when a surface or elevated car is delayed for 10 minutes or more. It does not appear to be clear whether fares must be refunded in case the delay is not the fault of the traction company, but is caused by a wagon breaking down on the tracks, a fire blockade or some similar cause. Hitherto, although the conductors have usually given transfers to the nearest available line by which passengers could resume their journey, there has been no ordinance requiring fares to be refunded.

TESTIMONY IN CLEVELAND VALUATION

In the proceedings before Judge Tayler of the United States Circuit Court, who is the arbitrator in the negotiation between the Cleveland Railway and the city of Cleveland concerning the renewal of franchises, at Cleveland on Oct. 27 testimony was given by Bion J. Arnold. Mr. Arnold was examined by Horace E. Andrews, president of the Cleveland Railway.

Mr. Arnold described his work as chairman and chief engineer of the Board of Supervising Engineers, Chicago traction, and as consulting engineer of the New York Public Service Commission, First District. Mr. Andrews asked what conclusions were reached regarding overhead charges in the valuation of the Chicago surface railways. The commission which did this work was composed of Mr. Arnold, Prof. M. E. Cooley and A. B. duPont. Mr. Arnold replied that after making a complete inventory of the physical properties of the companies, values were placed upon all of the items in the inventories and certain percentages were added to cover organization, engineering, superintendence, incidentals and contractors' profits, as follows: On track, electric power distribution system and buildings, 15 per cent; on power plants, 10 per cent; and on cars and car equipment, 5 per cent. Nothing was added to the following items: Real estate, patent rights, ordinary shop machinery and tools, stores, supplies, office furniture and fixtures, horses, wagons, miscellaneous items. In addition to the reproduction value of the property thus obtained there was added to cover legal expenses, interest during construction, brokerage and contingencies, 10 per cent.

Mr. Andrews asked Mr. Arnold as to his testimony in the case involving the valuation of the Coney Island & Brooklyn Railroad presented before the New York Public Service Commission, First District, as published in the Electric Railway Journal of Sept. 25 and Oct. 16, 1909. The witness said that his testimony covered the entire subject of appraisal of the property, relating not only to the cost of reproduction, but outlining a method of ascertaining the present value of the property. He thought that it was a complete analysis of the subject. It contained the views of himself and several competent assistants that he had in this work.

Newton D. Baker, city solicitor, said that, of course, this testimony had covered a very much wider range than any inquiry which he supposed existed in Cleveland, but he would not object to its introduction.

Judge Tayler said he would value it as a matter of expression of principle which might be informing to him in interpreting various facts and testimony. Mr. Baker thought it would be valuable.

Mr. Arnold stated that in the New York work he acted simply as an advisor and consulting engineer to the commission and while the views expressed represented his personal beliefs, they might or might not be followed by the Public Service Commission. He did not wish to attempt to commit in any way the Public Service Commission to his personal views and did not wish to answer questions which would tend to show that he was assuming to commit the commission in any way.

OVERHEAD CHARGE NECESSARY

It was testified by Mr. Arnold that he had found that it was necessary to add to the value of the physical property that can be seen by the eye, an amount representing an overhead charge. This charge varied with each specific

case so that his judgment as to what would be a fair overhead charge in Cleveland would be a matter for investigation. It was customary to add generally from 5 to 10 per cent for contingencies. That charge was supposed to cover incidentals, including contingencies, incomplete inventories and loss and wastage of material during construction. Under company's administration expense there would be the following: Rent, officers' salaries, State and city permits and fees, property owners' and local consents, legal expenses in connection with construction, superintendence and inspection, accounting departmet, printing, storeroom expense, etc. These were all connected with construction and had nothing to do with the promotion of the road. Promotion expenses, discount on bonds and other contingencies like those were entirely separate from the items which he had mentioned.

Most of those who had directed construction work had found it absolutely necessary to add something to take care of unforeseen costs. He presumed that in eight cases out of 10, a road cost more than the promoters or the engineers expected when they started to build. There were often expenses in connection with the operation of a road during the first six months or year or undertaken necessarily to bring it up to good operating condition that had to enter into the cost of operation, or of construction and completion of the property, which were not often taken into account in the preliminary estimates or in the construction period. Very often there were carrying charges, such as making up for loss in operating expenses or loss in interest due to the fact that excessive rates of interest had to be paid during the preliminary period of operation of the railroad. If the enterprise was not sufficiently profitable to make enough money to meet operating expenses and pay interest somebody must meet the cost. It was such items as these to which Mr. Arnold referred in discussing the development expenses or charges which were not included in the list given. Mr. Arnold added that he did not recall any other items except those that would be covered by the detailed development expenses that should be included in addition to the overhead charge in valuing a property.

Testifiying regarding some of the development expenses, Mr. Arnold said they would include promotion expenses, discount on bonds, such other items as he had in mind in his reference to the cost of operation for the first few years, and other incidental expenses of that class, legal expenses in connection with securing the charter, the promotion of the road, securing the franchises, securing the property owners' consents, and other items of that character that entered into the promotion of a railroad and promoters' profits if any were paid.

PROFITS OF PROMOTERS

Answering a question as to whether it was fair to assume promoters' profits in the development of a railroad property, Mr. Arnold declared that he would not want to say that a promoter would always have to be paid a profit in order that a road might be built, but that, as a matter of fact, most railroads that had been constructed so far had been created under conditions which paid some one a promoter's profit. Until the public was in a state of mind to subscribe for railroad securities at low rates of interest, and furnishes the money for the construction of the roads under these conditions, he believed that somebody would have to be paid some kind of a promoter's profit. Otherwise it would not be possible to get people skilled in the art to take hold of the promotion of a road and assume the risk of loss for ordinary salary compensation. He did not say that he believed in paying promoter's profits, but those were the conditions which had prevailed in the past.

The New York Public Service Commission, Second District, had allowed promoter's profit in one instance, Mr. Arnold thought, based upon the actual cost of the property. Responding to further inquiries, Mr. Arnold stated that he included experimentation in development expenses, such as passing from the horsecar and cablecar and the storage battery to the present system. In the construction of many large railway systems changes had been necessary as results of progress in the state of the art, requiring the abandonment of the use of horses and the adoption of the cable or electricity. In order to secure the capital to install the cable or electric systems, companies had been required, as a rule, to issue additional securities and thereby increase their capitalization, presumably on the theory that increased earning capacity of the property or its development would make it possible to earn a sufficient amount to pay interest on the increased investment. Few railways would have been constructed up to the present time if some such practice had not been adopted. Such capitalization has become necessary on account of the changes in the state of the art, and the legitimate development expense necessary to produce the property should remain in the capital account of the company until such time as the company had a chance to earn enough to retire these items, say over a long period of time by an amortization fund of some character

In his testimony on this subject Mr. Arnold assumed that the property had been properly managed and that the company had not been able to earn a sufficient amount of money from the day it was organized until the date the valuation was made to have retired the promotion expenses and other expenses due to development and change in the state of the art. Whatever it had been unable to retire should remain in capital account until it made enough to retire the amounts involved. He believed that those who invested money in a public utility property were entitled to earn a legitimate return upon the investment, but he would not attempt to say what that return should be. It could be agreed upon easily by fair-minded people. If, in order to create a property, there had to be a return on the investment, there should be a return upon development expense until it was possible to make enough to retire the excessive capitalization and, in addition, to pay a reasonable interest upon the investment. He believed that whatever profit had to be paid to the promoter anywhere or discount on bonds, if the securities had to be sold for less than par, should be taken into account together with all the legitimate incidental expenses that seemed to be necessary to get a railway in operation. Everything that was not actually, or that would not actually some day, be a part of the physical property should be retired in some manner, probably through amortization funds for which provision was made at the time the company was organized and the company should be allowed to earn a return on the capitalization and at the same time gradually retire those funds until finally the securities represented the physical property.

Mr. Andrews suggested as a specific case that two railway properties were undergoing valuation in Cleveland. One was built about two or three years ago with modern-type rail, modern cars and motors and apparatus that could be bought to-day, in streets where there had not been rail-

ways previously. The other was started in 1860, or thereabouts, and on some lines was first a horse railroad, with subsequent development into 16-ft. electric cars with 15 hp, which had entirely disappeared. On other lines the cable system was installed first and abandoned later when electric cars were substituted. In other words, the Cleveland property had passed through 40 or 50 years of development of the art. Was it fair, in reaching the relative values of the two properties, to take no account of the history and development of one company as compared with another property built new?

Mr. Arnold stated that he would want to see the books from the day of organization up to the present time and know what the operating expenses had been, how much money had been earned and what dividends had been paid. If the property had earned enough to have paid fair dividends upon the cost of the property and also enough to retire the expenses which he had mentioned, if provision had been made for the retirement of them, he should say that the properties should be valued upon the physical value or approximately that to-day. If it was shown clearly that the property had been incapable of earning enough to retire the funds to which he referred and pay a legitimate return upon the initial and increased costs, he would say that these amounts should be kept in the capitalization and earnings permitted upon them until they could be retired. These items were over and above overhead charges. They were development expenses due to changes in the art and ordinarily called obsolescence.

EARNINGS SHOULD PROVIDE FOR EXPENSES

Provision for amortization of these charges should be made ultimately out of the earnings of the property. Mr. Arnold's principle was that if the property had never earned enough to retire the funds the company was entitled to keep some of the funds in its capitalization, assuming, that is, that they were legitimate expenses and not excessive, that the property had been fairly managed and the obligations fairly contracted in the beginning.

Mr. Andrews asked whether, in Mr. Arnold's opinion, it was fair to include, in valuing a property as a going railroad, the results of energetic development of the property. He had in mind one city of practically the same size as Cleveland which had an earning power, at a 5-cent fare, of more than $1,000,000 less than Cleveland. One company had not adopted electricity as early as the other, did not change its equipment with the times, had not added new cars and had not made traffic inviting. Mr. Arnold expressed his belief in the allowance of a value for skilled management. If he could settle all the traction problems in the country he would pay a premium in some way for suitable skill in the management of properties. He would pay the owners of the properties, in case they were owned privately, a legitimate return upon the investment, a rate of interest which could be agreed upon and something in addition for skillful management. How much that should be he did not attempt to say. Whether the premium would be paid to the managing officer who exhibited the exercise of skill or to the stockholders of the company would be a matter for agreement.

Judge Tayler said that the only criticism which he had heard suggested of the plan under consideration for operation of the Cleveland property was the limitation to a return of 6 per cent on the stock. The company was said to be under no incentive to give such operation as might be induced if 7 or 8 per cent could be attained by more effective and economical management. After all, was not the matter of efficiency in the present human equation of the man who was charged with immediate responsibility? Mr. Arnold replied that it was so in the main. There might be financial conditions which could not be controlled, but assuming that these were not disturbing, efficiency depended upon the human equation.

Judge Tayler said that if the man who was responsible received such reward for his personal endeavor as it entitled him to have, gaged according to the efficiency and economy of his operation, care would be taken of that one element.

Mr. Arnold said that was true so far as the hope of getting results was concerned. He did not know whether capital could be secured to take the chances at lower rates of interest, but hardly thought it could. He believed that capital would have to be offered some increase over 3, 4 or 5 per cent return on the investment.

Judge Tayler assumed that capitalists received 6 per cent from one form of security and would furnish capital for less in another form. In charge of operation of the property was a man who would be under no restraint except that which capacity laid upon him and he would receive a reward which was compensatory with the success of his efforts. Would Mr. Arnold allow for something that might otherwise arise out of want of incentive to give efficient management to the property?

Mr. Arnold suggested that Judge Tayler was assuming that the railroad was built and that the stockholders were satisfied with 6 per cent originally.

Judge Tayler was excluding for the time being the cost of financing. He was referring to the real scientific executive management of the property as a vehicle for the transportation of passengers. Was not that purely personal to the individual if he was not hampered by the board of directors?

INCENTIVE TO MANAGING OFFICER INSUFFICIENT

Mr. Arnold answered the question affirmatively, but said that to put a man in that kind of a position it was necessary to have the financial conditions ideal. He was leaving that side of it to Judge Tayler. Judge Tayler referred to that as a problem of the future, but said that he was hopeful that unsatisfactory conditions which arose would disappear with the lapse of time. Mr. Arnold stated that he doubted the possibility, at any rate at present, of interesting sufficient capital at low rates to create public utility enterprises with simply an incentive to the managing officer to manage the property.

Judge Tayler suspected Mr. Arnold was correct in so far as his statement applied to the beginning of an enterprise; there must be some established quantity of business and conditions.

Mr. Arnold added that the element of risk would have to be removed entirely. Judge Tayler said that problem did not exist in Cleveland or at least it was modified. Judge Tayler asked Mr. Arnold to undertake to make, so far as he could with the data before him, a concrete application of his principles to some of the conditions existing in the Cleveland case. Mr. Arnold answered that he knew nothing about the Cleveland situation. He could simply tell his views and what had been accomplished in Chicago. He had never been on the stand as a professional or expert witness in a legal case and he declined to take that position.

Judge Tayler asked a question designed to show the amount on which the overhead charge would be based. Mr. Arnold said he would base this charge upon the cost of the property new, irrespective of what depreciation had been

allowed in the valuation. An engineer who was building a road new would base his item of incidentals upon the cost of the property new and not upon the depreciated value.

Mr. Andrews asked whether an item should be included for discount, commission and expenses in the sale of securities. Mr. Arnold would call that a development expense in addition to the overhead charge. Interest and taxes during construction were included in the allowance of 10 per cent in the Chicago case. Provision for working capital should be made in the capitalization of the company.

During the cross-examination by Mayor Johnson, overhead charges were defined by Mr. Arnold as non-physical charges upon physical property. Mr. Andrews asked Mr. Arnold whether it would be fair now, in valuing a property in which electric service had superseded a cable railway, to eliminate all of the expenditures which preceded the installation of electric equipment. In answer, Mr. Arnold amplified his previous statement on this subject as given in the foregoing report. His course would depend upon the value he was endeavoring to find. If he wanted to arrive at the cost of reproducing the property new, he would not find any cable system in sight and would not value it because he could not see it. If he endeavored to get the present value of the property, he would not be able to see the cable system because it would not be there. If he endeavored to arrive at the cost of a property for the purpose of fixing a rate of fare, he would include the value of the cable system or any other similar system or development expense unless the records of the company showed that it had earned enough money between the commencement of operation and the time of the valuation to have eliminated the cost of the cable or other experimental system by a proper sinking fund arrangement and to have paid, in addition, a reasonable return upon the investment in the property during the time. If Mr. Arnold found that the property had never earned enough money to eliminate the expense of this development, he would leave in the capital of the company the cost of the cable system or so much of it as he found the company had been unable to amortize.

Mr. Andrews asked Mr. Arnold whether he would think it equitable to the stockholders of two companies, one of which was finished a couple of years ago, while the other had passed through 40 or 50 years' existence, in a valuation for consolidation purposes, to take the history and development into account in one case and disregard these factors in the other. Mr. Arnold thought the same element should be taken into account in the consideration of each company.

CHICAGO CABLE SYSTEM VALUED AS GOING CONCERN

Mr. Andrews asked whether any value was assigned to the cable system in the Chicago valuation. Mr. Arnold said that value was assigned although the cable system was practically out of use at the time. The argument of the railway companies was that the cable system should be valued as a going concern. The cable houses were standing and the cables were in the slots and the properties were maintained so that they could be started at any moment in case the electrical equipment, which had been installed under temporary and revocable permits from the city, should have to be abandoned. The legal representatives of the railway companies contended that since the franchises of the cable companies contained clauses that allowed them to operate until the city purchased, they had the right to operate until purchased and that consequently the property should be considered as a going concern.

The attorney representing the city conceded to that argument, subject to the action of the City Council, and the properties were so valued.

Answering a question by Mayor Johnson, it was stated by Mr. Arnold that it would make no difference whether the cable properties were in operation or not. The appraisals would have been made on the same value because they were based upon a legal position and not upon the actual physical condition. On account of the legal situation the railway companies were allowed several million dollars for properties which were then obsolete or assumed to be obsolete.

ADDITIONAL TESTIMONY

Little work was done last week in the traction arbitration, as Mayor Johnson secured the consent of Judge Tayler to be absent a few days on private business. The work is so far reaching and the manner of presenting testimony so tedious that the conclusion will scarcely be reached, it is believed, before the first of the coming year. Judge Tayler, however, may be following up the testimony in such a manner that little time will be required for him to reach a decision upon the various points at issue.

Prof. E. W. Bemis, superintendent of the water works department, spent some days in Detroit, looking up figures on the life of track and on Nov. 5 was put on the stand to refute the statements made more than a week ago by Charles H. Clark, engineer of maintenance under Receiver Bicknell, and to show that the valuation made at the time of the Goff-Johnson settlement was too high.

The figures presented by Professor Bemis, showed, he said, that the average life of track was slightly over 16½ years. During the cross-examination President Horace E. Andrews of the Cleveland Railway showed the court that the figures of Professor Bemis proved that the average life of track was 38 years.

Mr. Clark took issue with Professor Bemis and explained his computation again. Judge Tayler said he would take Mr. Clark's tables in the absence of any other data. City Engineer Robert Hoffman stated on the witness stand that the value of the tracks should be reduced $1,500 a mile from the figures placed on them at the time of the Goff-Johnson settlement. He said, however, that he had not had any experience in laying street railway track, but that he was able to prepare tables that proved his contentions.

The winter schedules have been put in partial use and it is probable that considerable dissatisfaction will result. Within a few days all of the 100 open cars that have been in use will be taken off and in their place as many of the old closed cars as can be made to operate will have to be placed in service. Within a month or two 25 new cars will be received and they will be distributed where needed the most. But they will not make up for the loss and the receiver believes that nothing but poor service can be expected. He stated some time ago that the system needs at least 75 large cars to give a fair service, but the court could not give unlimited authority to purchase cars in the present unsettled condition of affairs.

The London County Council Tramways comprise a total of 127.6 miles of track, of which 76 miles are operated by underground conduit conductors, 9.5 miles by overhead trolley, and the remaining 42 miles by horse traction.

MEETING OF THE MASSACHUSETTS STREET RAILWAY ASSOCIATION

The regular monthly meeting of the Massachusetts Street Railway Association was held at Young's Hotel, Boston, on the evening of Nov. 16, with President R. S. Goff in the chair. The evening was devoted to a review of the recent trip of the New England party, under the direction of Charles S. Clark, to the Denver convention, Pacific Coast and Southern States. A large number of lantern slides of the trip were shown, and brief descriptions of the trip were made by different members of the party.

President James F. Shaw of the American Street & Interurban Railway Association, who was the first speaker, referred to the large attendance at the Denver convention, and stated that the registration was 2800, compared with that of about 3000 at Atlantic City. The 1909 convention was as successful as any previous meeting of the association. He paid a tribute to the hospitality of Messrs. Beeler and Evans, of Denver, and to the work of the affiliated associations, which, he said, had done the best work this year since their organization. The well-selected exhibits were mentioned, and President Shaw then spoke of the boundless hospitality which the party received all through the trip. The membership in the association was increased by the trip.

H. L. Wilson, treasurer of the Boston Elevated Railway Company, spoke of the delightful character of the trip and the cordiality which was everywhere apparent. He paid a tribute to the managing ability of Secretary Clark, which was enthusiastically received by all present.

Paul Winsor, past president of the American Street & Interurban Railway Engineering Association, reviewed the efforts which the visited companies made to gratify every wish of the party, and stated that his chief interest on the trip was the question of car design. The lightness of the half-open and half-closed cars of Denver was impressive. Mr. Winsor praised the T-rail and mitre-joint construction in Denver, and emphasized the general interest in securing lighter car weights. Traffic men, as well as motive power officers, are anxious to reduce the weight of rolling stock. The first cost and operating expenses of heavy cars are serious matters. Mr. Winsor thought that one could afford to sacrifice a good deal in order to get a light, single-ended, center-entrance, cross-seat box car, as in Seattle and Tacoma. He praised the work of Stone & Webster in the Southwest, and closed with a tribute to the work of E. C. Foster, of the New Orleans Railway & Light Company.

F. R. Coates, of the Stone & Webster organization, spoke briefly of the scenic and engineering wonders of the Canadian Rockies. Henry C. Page, general manager of the Worcester Consolidated Street Railway Company, spoke of the hospitality of the West and the loyalty of the public to their local street railway systems west of the Mississippi River. He was greatly impressed with the physical fitness of the Denver City Tramway Company, particularly its rails and special work. He questioned the value of a center-entrance car for heavy rush-hour traffic, however. Concluding, Mr. Page touched upon the energy shown by the residents of San Francisco in rebuilding their city, and pointed out the enormous development of real estate in Southern California along the lines of the Huntington system.

E. S. Wilde, general manager of the Union Street Railway Company, New Bedford, submitted a humorous sketch of the doings of the party in El Paso, and Charles S. Clark voiced his satisfaction in the success of the trip as the reward for the work of its organization and management. The meeting closed after the presentation of numerous lantern slides made from photographs by members.

CENTRAL INSURANCE RATING BUREAU ORGANIZED

Representatives of a number of the leading underwriters' associations of the country met in New York the latter part of last week and organized the much talked of Central Electric & Lighting Bureau to handle the electric traction and lighting risks through the entire field. United States Manager E. G. Richards, of the North British & Mercantile Insurance Company, was elected president, and General Agent Cofran, of the Hartford Fire Insurance Company at Chicago, was elected vice-president. The executive committee is as follows: R. M. Bissell, vice-president of the Hartford Fire Insurance Company; Manager A. B. Andrews, of the South Eastern Underwriters' Association; Secretary Weiderhold, of the Underwriters' Association of the Middle Department; Secretary F. W. Jemess, of the Underwriters' Association of New York State; George W. Law, of Law Brothers, of Chicago, managers of the Western Department of the Royal Insurance Company of Liverpool; J. H. Lenehan, of Chicago, general agent of the Western & Southern Department of the Phenix Insurance Company of Brooklyn, and Charles G. Smith, secretary of the German-American and German Alliance Insurance companies of New York. The headquarters of the bureau will probably be in New York City.

The organization will include all classes of companies, both union and non-union, and, it is understood, will have absolutely nothing to do with the placing of business, which will be written through the regular brokers or agents having that business in charge. Among the underwriters' associations represented at the meeting were: Fire Underwriters' Union; The Western Union; South Eastern Underwriters' Association; Underwriters' Association of the Middle Department; Board of Fire Underwriters of the Pacific; Underwriters' Association of New York State, and the Board of Fire Underwriters of Allegheny County.

NEW CARS FOR THE ILLINOIS TRACTION SYSTEM

The Illinois Traction System, of which H. E. Chubbuck is general manager, has on order and is now receiving a large number of passenger and freight cars. This company is also asking bids on additional new equipment. The American Car & Foundry Company is now delivering to the Illinois Traction System 50 80,000-lb. capacity coal cars, in addition to 35 of a similar design received during the summer. Twenty-five 80,000-lb. capacity box cars have been delivered, 5 are under way and the American Car & Foundry Company is now building 10 more of this capacity. The railway company has under contract four motor express cars with smoking compartments. These cars are designed to be used at the head end of a fast three-car train, which will be comprised of one of these combination express-smoker-motor cars, a day coach and a sleeping car, two of which are now in operation and two more under construction. Other cars now under contract include four straight motor express cars, 30 pay-as-you-enter cars for the St. Louis-Granite City suburban service, to be operated over the new Mississippi River bridge which the Illinois Traction System is building at St. Louis, and a recently designed single-truck, pay-as-you-enter city car, of which 3 will be operated in Champaign, Ill., and 10 in Peoria. The Illinois Traction System is asking bids on 30 express trail

cars and 6 50-ton locomotives with all-steel box bodies. This company now has on order three double-truck cars for Bloomington city service and two single-truck cars for Jacksonville city service. The two sleeping cars which are being built by the American Car & Foundry Company will be delivered in December. These cars will be very completely furnished, and are designed with windows in both upper and lower berths, a safe in each berth, commodious toilet rooms and full-sized sleeper sections. Next week the American Car & Foundry Company will deliver the special office car for Mr. Chubbuck, which was mentioned in the ELECTRIC RAILWAY JOURNAL for April 3, 1909, page 639. The car is 63 ft. 6 in. long over all, has a complete electrical equipment and is subdivided into an office compartment, with desk, table, typewriter desk and letter files, an observation dining room, six berths in compartments, and a very complete kitchen arrangement.

SIGNALS FOR ELECTRIC RAILWAYS

The Railway Signal Association has appointed a new committee of 12 of its members to consider the subject of electric signaling for electric railways. Its work is outlined as follows:

(a) Establish the history of the first suitable installation.

(b) Describe systems of a.c. track circuits used with d.c. propulsion, stating propulsion voltages; to include all known practices in the United States and Canada.

(c) Same as (b) except a.c. track circuits used for single-phase a.c. propulsion, stating propulsion voltages.

(d) Same as (b) except d.c. track circuits or their equivalent use with d.c. propulsion.

(e) Describe systems of signals in use on above lines, briefly stating method of control and other points of interest in order to assist the student to formulate comparisons and conclusions.

(f) Invite similar information to be submitted by firms in Great Britain and on the Continent.

(g) Historical sketch and all data procurable of jointless track circuits.

(h) Sketches of circuits in use with each class of installation.

(i) Steam roads equipped with a.c. track circuits in anticipation of being electrified.

(j) Steam roads supplied with a.c. track circuits, not anticipating electrification, showing both types of this kind of installation.

(k) Sketches of various track circuits referred to in outlines.

(l) It is suggested that a subcommittee be organized to gather data relating to the use of a.c. current in signal work on steam roads.

The names of the members of the committee follow: C. C. Rosenberg, chairman, Bethlehem, Pa.; C. H. Morrison, vice-chairman, New York, New Haven & Hartford Railroad, New Haven, Conn.; J. V. Young, Boston & Maine Railroad, Boston, Mass.; W. C. Smith, Boston Elevated Railway, Boston, Mass.; J. M. Waldron, Interborough Rapid Transit Company, New York City; W. N. Spangler, Pennsylvania Tunnel & Terminal Company, New York City; James Heywood, Philadelphia Rapid Transit Company, Philadelphia, Pa.; E. B. Smith, New York Central & Hudson River Railroad, New York City; E. C. Grant, Union Pacific Railroad, Omaha, Neb.; H. A. Logue, Cumberland Valley Railroad, Chambersburg, Pa.; T. B. Whitney, Jr., Hudson & Manhattan Railroad, New York City; W. P. Allen, Pennsylvania Railroad, Philadelphia, Pa.

In the whole Russian Empire there are but 30 cities served by electric street railways.

TREATMENT OF DEPRECIATION ACCOUNTS OF NEW YORK PUBLIC SERVICE COMMISSION

The rules adopted for the treatment of depreciation accounts by the Niagara Gorge Railroad have been filed by B. L. Jones, the general manager, with the New York Public Service Commission, Second District, and are as follows:

RULE CONCERNING DEPRECIATION OF WAY AND STRUCTURES

On and after July 1, 1909, the depreciation of way and structures has been determined at 6.5 cents per revenue car-mile, based on the following figures:

The expenditures for the maintenance of way and structures during six years ending June 30, 1909, were $69,220.53, and the revenue car-mileage for the same period was 1,070,282 miles. This amounts to very nearly 6.5 cents per revenue car-mile, and, in the opinion of the subscriber, did not cover the natural wear and tear, but improved the physical condition of the property in fact.

The rate per revenue car-mile on the property of the Lewiston & Youngstown Frontier Railway Company, operated by this company under lease, has been determined at 5 cents for the reason that it operates through a flat country and is not subject to the same conditions.

RULE CONCERNING DEPRECIATION OF EQUIPMENT

On and after July 1, 1909, the depreciation of equipment has been determined at 4 cents per revenue car-mile, based on the following figures:

The expenditures for the maintenance of equipment during six years ending June 30, 1908, were $38,021.92, and the revenue car-mileage for the same period was 1,070,282 miles. The amount figures 3.55 cents per revenue car-mile and not only maintained equipment in full operating efficiency, but created a reserve of $3,392.04 for obsolescence. The additional sum of 0.45 cent per revenue car-mile will create a probable additional reserve of approximately $1,000 a year.

The foregoing rate per revenue car-mile will also be applied to the Lewiston & Youngstown Railway Company, operated by this company under lease.

A LARGE SELF-COOLING TRANSFORMER

Standard cases with corrugated sides are regularly supplied with self-cooling transformers up to about 600 kva or 750 kva, but beyond these capacities the weight and size of case become so great that some method other than mere increase in size must be used to get the necessary radiating surface. A case recently has been developed by the Westinghouse Electric & Manufacturing Company to overcome this difficulty. It consists simply of a plain boiler-iron case to the outside of which radiating tubes are welded. These tubes are in the vertical position and are given a 90-deg. bend at the top and bottom where they enter the case. The mechanical construction is very strong, so that there is practically no chance of ever springing a leak. Because of the ease with which the tubes can be widely separated from one another, the air circulates very freely among them and the efficiency of the radiating surface is considerably higher than for the ordinary corrugated case. Large self-cooled transformers are of particular value in places where cooling water is not available, very

Self-Cooled Transformer

costly, weather conditions so severe that water-cooled transformers may give trouble or where it is desirable to have as little attendance as possible. The Westinghouse Electric & Manufacturing Company has just built 12 1000-kva, 100,000-volt transformers of this new type, as shown in the illustration, for the Southern Power Company. Three of these transformers are for outdoor service and nine are to be used indoors.

AN ELECTRIC TOWER WAGON

An interesting application of trackless electric vehicles for electric railway service has been developed by the General Vehicle Company, of Long Island City, N. Y., in the emergency tower wagon illustrated in Fig. 1. The entire equipment of the tower wagon is mounted on the well-known 2-ton chassis of this builder. All the spring supports and the special parts are vanadium steel castings, and all the renewable parts are accurately machined to size. Another striking feature is the use of Hess-Bright ball bearings on the armature shaft and Timken roller bearings for all the wheels and countershafts, thereby making friction a negligible factor. It will be observed from Fig. 2, which shows the construction of the chassis, that the frame is constructed of steel channels so proportioned as to support the mechanism in the most efficient manner.

The 44-cell storage battery which furnishes current to the motor at 85 volts is suspended below the main frame in a substantial and accessible cradle. The battery is made up of conveniently sized sections, to permit easy replacement from either side of the vehicle. The controller is of the continuous torque type which changes the motor speeds by degrees without interrupting the power supply. Thus

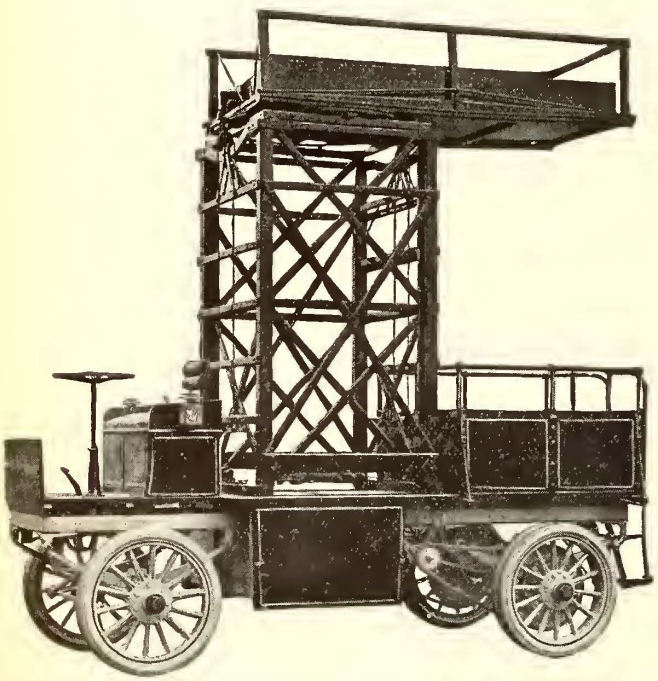


Fig. 1—Electrically Operated Tower Wagon

a smooth, even acceleration is secured, and there are no excessive strains of any kind to decrease the life of the controller, battery, motor, chains, sprockets, gears and tires. The single electric motor used is built along the sturdy lines of an electric railway machine, with a strong, rigid shaft, simple and durable brush fittings, capacity for heavy overloads and high efficiency. This motor, which is of General Electric make, is suspended on a crossbar pivoted to the sideframes in front of the rear axle, as shown in Fig. 3. This pivoted suspension keeps the motor shaft parallel with the countershaft throughout the entire range of chain adjustment and permits the successful use of an efficient silent chain drive. The motor is totally enclosed and protected from water and dirt at all times. It is high above the ground, and may be easily examined from the rear by opening a hinged cover in the motor frames. The use of rigid direct gear drive was abandoned several years ago by this builder in favor of the more efficient and

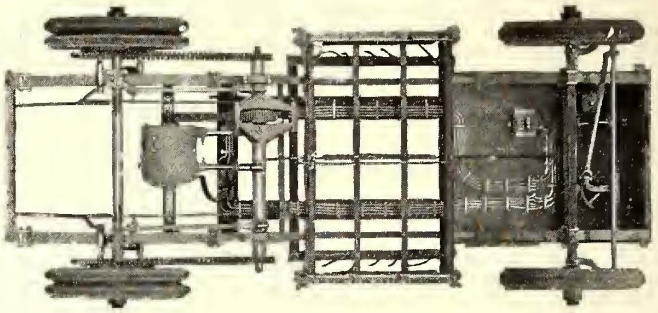


Fig. 2—Top View of Tower Wagon Chassis

flexible chain drive. Easy running roller-bearing chains drive the rear wheels from the countershaft. The large diameters and properly designed teeth, combined with the frictionless roller chain, decrease the transmission losses to a minimum. A single broad silent chain of the tooth-link type drives the countershaft from the motor pinion. A simple and rigid adjustment keeps the chain in its most efficient operating condition.

The artillery type wheels have roller-bearing hubs, giving maximum strength and minimum friction. Solid rubber tires of highest standard quality are used on all wheels. To carry the load easily and transmit tractive effort efficiently, the tires vary in design for different capacities. On the trucks of 4000 lb. capacity and upward, broad single tires are used in front and solid double or twin tires on the rear wheels. The half-elliptic springs, both front and rear,

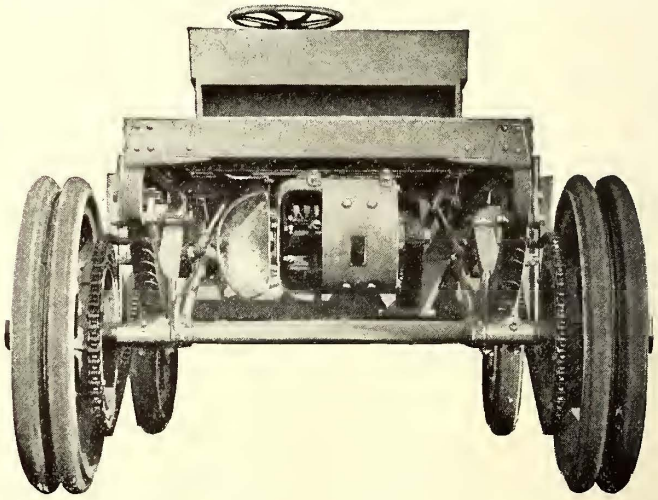


Fig. 3—Rear View of a 2-Ton Chassis, Showing Motor and Drive

are scientifically designed for the load liable to be imposed upon them according to standard capacity rating. The internal expansion leather-faced brakes on both rear wheels are controlled by a foot lever at the base of the steering post. The steering gear is wheel-operated through a vertical steering column to the gear and sector.

The emergency wagon has a speed of 12 m.p.h., and a range of service of 40 miles on one charge of battery. The

wagon has sufficient space for seven men in addition to the driver, besides room for tools and repair materials.

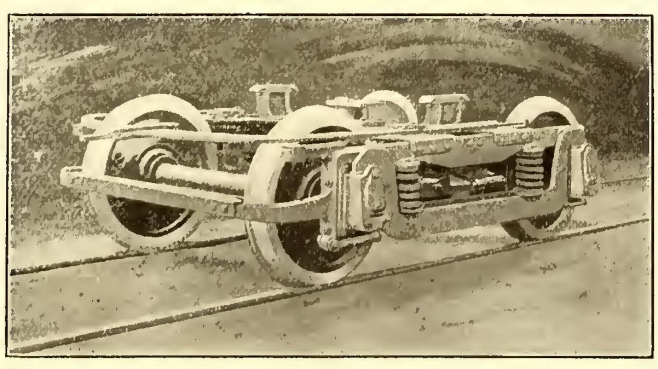
Of course, one of the important advantages of this type of emergency wagon is its immediate readiness for service, and it dispenses with the trouble of maintaining a team of horses for such purposes. Naturally, a broader adoption of electric vehicles by street railway companies will permit the entire discontinuance of horse service. It should be considered that the current required to charge the batteries would not be a source of appreciable expense, because the power could be taken at periods of low line loads. It is interesting to note that the experience of the Rio de Janeiro Tramway, Light & Power Company with electric vehicles of the General Vehicle Company has prompted it to order several tower wagons of the type illustrated.

A NEW M.C.B. TYPE TRUCK

At the Denver convention of the American Street & Interurban Railway Association The J. G. Brill Company, Philadelphia, exhibited for the first time its No. 27-M.C.B. truck, which is specially designed for high-speed service and is built in suitable sizes for use under the heaviest to the lightest cars.

Each side frame, including the pedestals, is forged in a solid piece, eliminating built-up work. While the type of frame is similar to those used in other Brill trucks, it is lighter than the frame of the Brill No. 27-E high-speed trucks of the same carrying capacity. The dimensions of the pedestal yokes and end crossings are smaller, owing to the forged construction and because the load upon the truck is brought to the journal boxes through the equalizing springs and equalizing bars. The truck frame beyond the point of support on the equalizing springs is not subject to heavy load or severe strains except those which occur when the truck enters a curve at high speed. The top of the yoke and the top of the frame have been placed in alignment and the extensions to which the angle iron end crossings are bolted are in line with the axle centers.

The deep channel transoms are held in position by wrought single and double corner plate brackets and wrought gusset plates. The squareness of the truck depends to a large extent on the construction at this point, and the

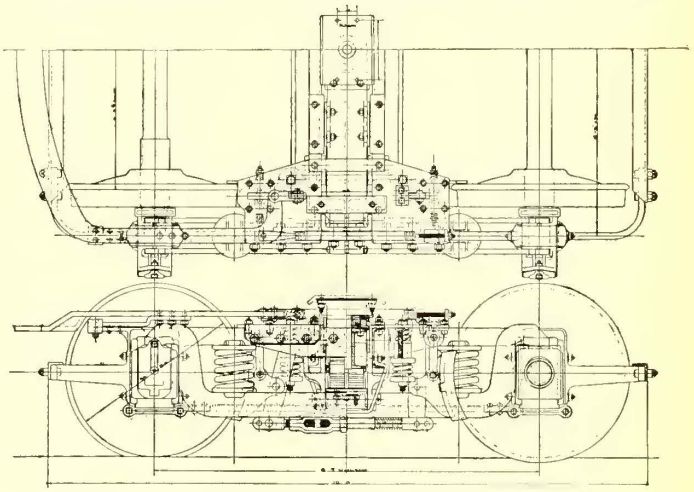


M.C.B. Type Motor Truck

gusset plates, which are of ample dimensions for most severe strains, are folded over the side of the forged frame and are bolted to the frame with bolts which also pass through the wrought plate brackets. This places the minimum number of bolts in shear and secures unusual strength and rigidity.

The tie-bar construction of the No. 27-M.C.B. truck is simple and strong. Channel tie-bars connect the inner pedestals and short tie-bars connect each pair of pedestals. The tie-bars are bolted through the frame in such a manner that they form a rigid reinforcement to the pedestals, and by a simple device the shearing strain is entirely removed from the bolts. The short tie-bars can be readily removed and the wheels and axles dropped.

The brake rigging is also of simple and substantial construction. The radial lever is brought around in a single



Half Plan and Side Elevation of M.C.B. Type Truck

piece to the upright levers, thus reducing the usual number of parts. It is supported by brackets and has a rub-plate bolted to it to provide for wear, but as the bracket forms an extension to the frame, there is no weakening of the frame by bolt holes.

The bolster is cast steel, including the lugs for the side bearings, and rests on two elliptical springs which, in turn, bear on two-part castings in such a manner that shims can be placed readily between the springs and the castings to compensate for wheel wear. The chafing plates on the bolsters and transoms can be taken off and renewed without removing the bolster from the truck. Both of these features are designed to reduce maintenance charges. An additional feature of the bolster chafing plate is its ample vertical dimension, which secures better support to the bolster against tilting and insures uniformity of wear.

A new and ingenious gib construction is used for the No. 27-M.C.B. truck. The gibs are made from pressed steel and the pedestals are machined for absolute fit. The gibs are secured to the pedestal in a special manner. The bolt holes are countersunk on the inner surface of the pedestals to give them a recess into which, by a special form of countersinking of the gib bolt holes, projections of the gib fit to form a socket for the conical bolt heads. There is no reduction in the thickness of the gib where the bolt heads bear against it, and at the same time the bolts are relieved of shearing strain.

The end crossings which serve as an extra safeguard in holding the truck square are angle irons, and are bolted to the extensions of the side frames. The side frame extensions are curved round for extra clearance and present a broad surface where they are bolted to the angle iron crossings, which secures increased strength at this point.

The No. 27-M.C.B. truck has no experimental features. The design is the result of special attention to strength, rigidity and simplicity and a consideration of maintenance.

The Argentine Chamber of Deputies has granted a franchise for the construction of an underground electric railway under the city of Buenos Aires.

News of Electric Railways

Hearing by Massachusetts Commission on Boston Transportation Matters

The Massachusetts Railroad Commission and the Boston Transit Commission, sitting on a joint board, gave a hearing on Nov. 11, 1909, upon the Boston transportation matters referred to them by the last Legislature, including the proposed tunnel and subway of the Boston & Eastern Electric Railroad, the right of the Boston Elevated Railway to own stock of other companies, and several questions in connection with proposed changes in the elevated system and the building of new rapid transit lines.

Frederic E. Snow, of Gaston, Snow & Saltonstall, Boston, representing the Boston Elevated Railway, reviewed the history of rapid transit development in Boston since 1887, and emphasized the expenditures which have been made by the West End Street Railway and the Boston Elevated Railway in the physical equipment of the present system.

The various tunnels and subways have provided for rapid transit through the congested portions of the streets, and have brought the suburban and outlying towns into quicker communication with the business center of Boston. During the period in which the Boston Elevated Railway has been in operation it has provided for heating its own cars in winter at an estimated capital cost of over $1,800,000, and at an annual cost of $240,000. It has also introduced a system of free transfers so extensive that in the year ending Sept. 30, 1908, 158,683,900 passengers used the free transfer privilege, while for the same year the revenue passengers amounted to 273,132,584.

The amount of money required to pay for these improvements in the transportation facilities of Boston, follows: As of Sept. 30, 1889, the first full year in which the West End Street Railway was in operation, the total amount invested by it in permanent property was $12,910,606, or $55,000 per mile of single track. On Sept. 30, 1898, the total amount invested, including the cost of the Tremont Street subway was $29,482,916, or an average of $105,000 per mile, an increase for the 9 years of about $2,000,000 per year. On Sept. 30, 1908, the total amount invested in permanent property, including the cost of the Tremont Street Subway and the cost of the East Boston tunnel, was $66,793,638, or $157,000 per mile, an increase of $3,700,000 a year during the 10 years of operation by the Boston Elevated Railway. Since that date the Washington Street tunnel has been completed, and it is estimated that by 1913 the investment in permanent property will have increased $44,000,000, or at a rate of more than $9,000,000 per year, made up as follows:

Washington Street tunnel, exclusive of approaches, etc.	$7,500,000
Washington Street tunnel approaches, etc.	2,000,000
Main Street Subway, Cambridge and connections to Beacon Hill tunnel	7,000,000
Beacon Hill tunnel	1,700,000
East Cambridge extension	4,450,000
Malden and Melrose extension	3,500,000
Riverbank Subway	3,000,000
Forest Hill's extension	2,000,000
Power stations, equipment, etc., for above	7,500,000
Additions to surface system, estimated	5,000,000
Total	$43,650,000

The investment in permanent property would then amount to $111,000,000, or more than $200,000 per mile of single track. On July 30, 1909, the investment of the Boston & Albany Railroad was only $37,543 per mile and the Boston & Maine Railroad, $41,951.

Mr. Snow said that the facilities to be furnished by a public service corporation must bear a fair relation to the amount of business to be done, and the revenue obtainable. No person could justly require a corporation to furnish additional facilities if the business was not sufficiently large to provide a fair return on the amount of the additional investments required. While improved facilities undoubtedly increase the business of a street railway to a substantial extent, although there may be no increase of population, the company must rely fundamentally for a continued increase in business upon an increase in population in its territory. Since the organization of the West End Street Railway, the increase in the investment provided for transportation facilities has exceeded the rate of population increase many times.

POPULATION OF BOSTON ELEVATED TERRITORY.

Year.	Population.	% Increase.
1890	683,025	—
1895	785,682	15.03
1900	900,497	14.61
1905	971,758	7.91

While the rate of increase of the business of the company since the organization of the West End Street Railway has been far less than the rate of increase of the investment, it has nevertheless been greater than the rate of increase in the population, largely on account of improved facilities. There is no reason to expect a greater rate of business increase in the next five years. Up to the present time the increase in traffic, together with the most rigid economy, has enabled the company barely to earn its fixed charges and maintain a 6 per cent dividend rate; but to enable it to earn its interest charges on the additional investment to 1913 would require an increase in traffic at a much greater rate than for the last 10 years. For the fiscal year 1908 the surplus of the Boston Elevated Railway after paying its fixed charges, 8 per cent dividends, and charging off the very small sum of $200,000 to depreciation, was only $42,063. The completion of the tunnels, subways and other additions to the property will by 1913 impose upon the company an additional charge for interest, taxes and rentals, exclusive of any dividends on additional stock, of $1,638,187, as follows:

4½ per cent on $10,500,000, being the cost of the Washington Street tunnel exclusive of approaches, and of the Riverbank Subway	$472,500.00
4⅞ per cent on $1,700,000, estimated cost of Beacon Hill tunnel	82,875.00
Assuming that one-half the balance would be bonds, interest at 4½ per cent upon $15,725,000	707,625.00
Taxes on the balance to be raised by stock issue, 1¾ per cent on $15,725,000	275,187.50
Assuming that $2,500,000 of the stock will be West End stock on a 4 per cent basis, there should be added for additional rental of the West End Street Railway	100,000.00
Total	$1,638,187.50

During the year ending Sept. 30, 1889, the West End Street Railway carried 104,243,150 revenue passengers, and in the fiscal year 1908, 273,132,584 passengers, or an average annual increase of 8,888,918. The average annual increase for the 10 years ending Sept. 30, 1908, was about the same—9,181,129 revenue passengers per year, in spite of all the improvements which have been made. At this rate of increase the number of revenue passengers for 1913 would be 319,038,239.

The average operating expense per revenue passenger in 1908 was 3.46 cents, while in 1898 it was 3.62 cents. Mr. Snow emphasized the fact that this saving in 10 years was only .16 cent, in spite of the improvements in the transportation system and the fact that every effort was made in 1908 to reduce expenses, owing to the poor condition of general business, due largely to the extension of the free transfer system. It is unlikely that any substantial reduction could be made in the ratio of operating expenses to revenue passengers without restricting the free transfer system. Assuming that the operating expenses per revenue passenger could be reduced at the same rate during the next five years, the operating expense per revenue passenger would be 3.38 cents in 1913, leaving from each 5-cent fare 1.62 cents to be applied to interest charges, taxes, rentals and dividends; and the additional revenue of the Boston Elevated Railway applicable to the payment of interest, taxes and rentals, $936,770, with which to pay additional charges of $1,638,187.50, not including dividends on the additional stock which the Boston Elevated Railway would have to issue.

Mr. Snow urged that these figures show that the transportation facilities of Boston were being developed faster than the business done warrants; that during the next five years the company could not afford to assume any burdens or charges in addition to those which were already provided for, and that even then in order to pay its fixed charges and maintain the existing dividend rate, every effort would have to be made to increase business and reduce expenses. In order to increase the business substantially the company must bring people into Boston with through service between Boston and the districts outside.

Regarding the Boston & Eastern Electric Railroad, Mr. Snow said that the Boston Elevated Railway does not oppose this road, but that if the Boston & Eastern Elevated Railroad is to enter the district in which the Boston Elevated Railway is compelled to maintain tunnels and subways and expensive structures, the Boston Elevated Railway should be given the business in so far as it is business within the city. He suggested that the Boston & Eastern Electric Railroad should either utilize the East Boston tunnel or the elevated structure from Sullivan Square. If the entering interurban roads were to have their own terminals, the Boston Elevated Railway could not maintain an expensive terminal for the benefit of all the people who come within its territory.

Relative to the proposed consolidation of the Boston Elevated Railway and the West End Street Railway, Mr. Snow said that the consolidation would not lessen the expenditures by the Boston Elevated Railway, but would prevent additional expenditures, including $600,000 a year for unnecessary power stations and equipment. The West End Street Railway lease was presumably intended to secure to the public the benefits of a virtual consolidation, meaning a reduction in the investment, and that has been secured to the public up to date. It was essential that this consolidation should be effected before any further extensions of tunnels or subways can be considered.

Regarding divers irresponsible rapid transit bills submitted to the Legislature of 1909 and referred to the joint board, Mr. Snow gave the following figures of their prohibitive expense: Estimated cost of a suggested tunnel from Sullivan Square to Causeway Street, $8,000,000 compared with the cost of $2,900,000 for the existing Charlestown elevated structure and station at Sullivan Square. The completion of the East Cambridge extension and the changes at Sullivan Square will greatly relieve the crowding at Sullivan Square. Estimated cost of suggested South Boston subway, 0.84 mile, $2,500,000, including two stations. This section only has local traffic to furnish revenue, being a peninsula. Estimated cost of suggested subway from Park Street to Main Park, via South Station, 3 miles, $8,570,000. Estimated cost of another suggested subway, terminating at Milton, $16,800,000.

Regarding a proposal to restore elevated trains in the Tremont Street subway, Mr. Snow said this would defeat the purpose of the East Cambridge extension and the operation of the surface cars now in the subway.

Regarding a proposed subway from Park Street to the South Station, length 0.57 mile, cost $3,000,000, the demand for such a service has been very much exaggerated.

The Board then closed the hearing and will report its findings to the Legislature of 1910.

Reports on Valuation of Detroit Property

Engineers of the Detroit United Railway have made a valuation of the property of the company, and publicity was given to their figures before the details of the appraisal made by the committee of 50 were made public.

The appraisal for the company was made under the direction of Robert B. Rifenberick, and it states the reproduction value of the property as a going concern at $24,708,375.40. Some of the detail figures are as follows:

Power stations	$2,432,674.88
Rolling stock	5,129,954.02
Buildings	1,533,775.74
Track, including special work	10,740,842.80
Land	1,627,352.26
Carbarns and waiting rooms	993,294.38
Supplies and stock	1,192,661.07

The remainder of the total is made up by miscellaneous property, tools, etc.

The report of Frederick T. Barcroft, who made an appraisal of the property of the Detroit United Railway for the committee of 50 shows the following results:

Total number of cars	998
Miles of track	170.411
Miles of barn track	12.938

VALUE OF PROPERTY INCLUDED.

1. Real estate	$517,009.55
2. Buildings, except power barns and battery stations	579,876.00
3. Power plants	1,219,050.88
4. Battery stations	189,742.94
5. Power distribution, including overhead feed wires	1,122,636.25
6. Track	2,597,926.89
7. Rolling stock	2,988,312.72
8. Mechanical department, shops, etc	269,901.75
9. Tools, material, supplies, furniture	720,000.00
10. Overhead charges (no depreciation)	1,050,040.00
Total	$11,284,596.98

VALUE OF PROPERTY EXCLUDED.

11. Pavement, subways, suburban station, unused real estate	$1,550,000.00
Total value of all property in city limits	$12,834,606.98

Many reports concerning the figures of the appraisal of the committee of 50 were published before an authoritative announcement was made by the committee. This condition of affairs led J. C. Hutchins, president of the Detroit United Railway, to send the following letter to Chairman Eddy of the committee:

"I do not know that I should be disturbed by some of the reports I read in the newspapers relative to some stated amounts at which the properties of this company are being appraised. It is stated in one newspaper that the values submitted to the committee amount to $12,800,000, and in another at some $10,500,000. Of course these may be only guesses, and I presume are such, but it rather worries me that such figures are floating around, as they, of course, tend to mislead the public.

"We have been perfectly frank and entirely above board in supplying for the information of the committee all of the data at our command. Our local corps of engineers, headed by Robert B. Rifenberick, a very competent engineer, has, after a most thorough study of values, reported to us that the cost of reproducing the company's properties in Detroit would amount to $24,708,375.40, exclusive of good will or franchise values.

"From time to time as this work has been in progress the same data which have been sent to your committee or its engineers have been sent for their consideration to Bion J. Arnold and H. A. Foster, who have been retained as consulting engineers for the company. These gentlemen have not as yet been brought into the situation, except as stated; but it has been our intention, relying on what we have understood to be the policy of your committee, that after all data should have been collected, if differences should arise between our local corps of engineers and the engineers of your committee we would bring in Messrs. Arnold and Foster, engineers of high character and great experience, as our final representatives before your committee. I have no doubt it is the purpose of your committee that such a course shall be pursued. I do not know how far along the committee has proceeded in these matters as to valuations, but am pleased to say to you that we are ready to bring Messrs. Arnold and Foster here at any time that will suit your convenience for a review of the data you have collected respecting values."

The Barcroft appraisal will be purchased by the city for $17,500 and published.

The Detroit United Railway on Nov. 13 accepted the terms of the city ordinance passed recently fixing an operating fee of $300 a day for the use of streets upon which franchises are said to have expired on Nov. 14. The company specifies that it waives no rights as far as an ultimate readjustment is concerned. Of approximately 175 miles of track within the city limits 66 miles are involved in the franchises that are said to have expired. As noted on page 996 of the ELECTRIC RAILWAY JOURNAL of Nov. 6, 1909, the Common Council on Oct. 26, 1909, adopted resolutions declaring that the operation of cars after Nov. 14 on streets where the franchises are claimed to have expired would be by sufferance only and without any expressed or implied waiver on the part of the city, and that after Nov. 14 cars could be operated under conditions heretofore existing, with the added conditions that the company should pay a rental of $300 per day.

The letter of President Hutchins to the Mayor and Common Council of Detroit in relation to this subject says in part:

"The company does not agree with the views and claims stated in said resolutions, which, in its opinion, are contrary to the rights of the company, and believes that after due investigation and consideration you will concede that your position is erroneous. The company, however, recognizes that you are equally desirous with the company that the public shall not be deprived of any service that they have hitherto enjoyed, and that the interest, comfort and convenience of the public will be best served by continuing uninterruptedly the service as now rendered, pending the results of an adjustment of all matters of difference which it is believed all parties desire.

"The company, therefore, without waiving any rights or privileges to which it is entitled under present conditions, and conceding that the city does not waive any of its rights or privileges, and without prejudice to the rights or privileges of either the city or the company, will, in the exercise of its rights and duties, continue to maintain and operate the lines in question under the terms and conditions under which the same are now maintained and operated, and to render service as heretofore, and for the reasons above indicated and to avoid litigation will, in addition, pay to the city the sum of $300 per day for the time being, or until such time as the relations between the company and the city are readjusted."

Final Hearing on Boston, Lowell & Lawrence Electric Railroad

The Massachusetts Railroad Commission gave a final hearing on Nov. 12, 1909, on the petition of the Boston, Lowell & Lawrence Electric Railroad for a certificate of exigency granting it the right to build a high-speed electric railway between Boston, Lowell and Lawrence. William H. Coolidge, counsel for the Boston & Maine Railroad, said that the existing facilities are adequate and that the Railroad Commission has the power to order improvements by the present steam and electric railways if it considers

that the service is not sufficient to meet the needs of the territory. There are five railroads and four street railways in the territory which the proposed road would serve and the rate of fare for the regular patrons of the steam road is less than the new road proposes to charge. Mr. Coolidge argued that the electric railroad law of 1906 is a mere enabling act, saving the Legislature the necessity of considering new charters, and permitting new charters only when the commission finds that public convenience and necessity demand the new road. He claimed that the policy of Massachusetts is to supervise, regulate and control its public service corporations; to require the existing companies to furnish whatever accommodations the public needs, and not to admit competing organizations unless the established facilities cannot be made adequate. Mr. Coolidge said that the project is practically the same as the one which was refused a certificate by the commission several years ago, that the new road would not give faster service by the Boston Elevated Railway than the present steam railroad, and that it would tend to increase the burden of traffic already carried by the Boston Elevated Railway to and from Sullivan Square. He concluded the statement that the Boston & Maine Railroad could build two additional tracks between Boston and Lowell at a cost of $2,547,000, or less than one-half that of the new road, and stated that the total earnings of the Boston & Maine Railroad in the territory were only $700,000 a year, a sum insufficient to pay the expenses and charges of the proposed line, even if it should secure all the business of the steam road.

Counsel for Somerville, Winchester and Arlington spoke in opposition to the road. For the Lexington & Boston Street Railway C. M. Hight said that the road was not fully described in the articles of association and criticised the company for submitting the routes to the board for adjudication. He claimed that the Lexington & Boston Street Railway was built in good faith as a through line between Arlington Heights and Lowell; that its traffic would suffer serious inroads if the new line should be constructed, and that about 25 per cent of its present business is through travel. The gross earnings of that company are $150,000 and the operating expenses $119,000. If its traffic should be cut 25 per cent the results would be disastrous. Mr. Hight said that Lowell has better accommodations than other cities of the same size in Massachusetts and that the new line could not be expected to earn $1,400,000 per year, when the combined earnings of the Boston & Maine and the Lexington & Boston Street Railway are only $750,000.

James F. Jackson, counsel for the Boston, Lowell & Lawrence Electric Railroad, emphasized the good faith of the petitioners, and stated that a certificate was not granted two years ago because the promoters of the road had not investigated the possibilities with sufficient care, and had made concessions with respect to fares and service which were later found to be impracticable. A case thoroughly prepared by one of the best-known engineering organizations in the world had now been presented, and no concessions of questionable permanence have been made. The Massachusetts laws permitting the construction of electric railroads were made because of the general recognition of the attractiveness of electricity as motive power and an appreciation of the possibilities of a high-speed electric service between adjacent cities. The proposed line was to be entirely distinct from either the steam railroad or the existing street railways. To prohibit its construction would be to stay the progress of modern improvements in transportation. Mr. Jackson declared that the policy of the New York, New Haven & Hartford Railroad, which now controls the Boston & Maine Railroad, was uncertain; that it could not for a long time put into effect electrification on the lines north of Boston, even if it so desires, and that the request of President Dumaine of the Boston Railroad Holding Company that the Railroad Commission withhold these improvements for a year made it appear that the electrification of the company's lines is very uncertain. If some of the space that the local passenger traffic now takes up on the steam railroad could be released for other business by the establishment of the new line, it would be a distinct benefit to the steam railroad. Mr. Jackson urged that the railroads would plead for time if the Railroad Commission should request the railroads to electrify their lines, and stated that the board could order a railroad company to spend $20,000,000 or to electrify, as Mr. Coolidge contended. Changes at Sullivan Square would make it feasible to handle the traffic without congestion, and the addition of eight-car trains to the Boston Elevated system would permit the entrance of the Lowell and Lawrence traffic without disturbing the regular traffic of the Boston Elevated Railway.

J. W. Farley, who concluded for the petitioners, dismissed the imputations cast on the earlier hearings and the details of the project as unworthy of consideration in view of the careful preparation of the present case. He urged the progress illustrated by the plans for the road, and contended that it would satisfy a demand which the present facilities cannot meet. The hearing was then closed and the board took the matter under advisement.

Transit Affairs in New York

The beginning of work on the Fourth Avenue subway, Brooklyn, was marked by public ceremonies held at the junction of De Kalb Avenue and the approach to the new Manhattan Bridge in Brooklyn on Nov. 13 at 2:30 p. m. Chairman Willcox of the Public Service Commission formally announced that the contract for the building of the subway had been signed, and H. B. Seaman, chief engineer of the commission, handed the document to Mr. Bradley, the contractor. Mr. Clark then presented Mr. Willcox with a silver spade and that officer turned up the first spadeful of earth. As the formal breaking of the ground occurred bombs were set off. Patrick McGowan, president of the Board of Aldermen; Bird S. Coler, president of the Borough of Brooklyn, and David A. Boody, ex-Mayor of Brooklyn, were in attendance. All of the speakers dwelt upon the advantage of the subway to Brooklyn. On the evening of Nov. 13 a dinner was held at the Assembly, Brooklyn, at which the members of the Public Service Commission, members of the former Rapid Transit Commission and representatives of the city were in attendance.

Beginning at the Manhattan bridge, the subway will be several feet below the surface of the street, with the tracks lower than sea-level. Continuing for some distance at a low grade, the subway gradually rises until it is above sea-level, and comes close to the surface of the street, where a lighter form of construction is used. As the cars will nearly fill the bays they run in, the air in front will be pushed out, and fresh air will be drawn in behind from the outside. Openings will be cut in the partition walls, allowing the air from all four bays to pass out through the gratings. Emergency exits about 4 ft. square, inclined at an angle, will lead directly from the tracks to the street, where they are covered with a portable cover. The exits are between the stations, and as the partition walls are arched, where they are located, they can be used from any of the four bays. The stations, of which there are six for local trains, and two for express trains, will be similar in many respects to those in the New York suubway. Hoods will be built at the entrance and exits covering the stairs which lead to the train platforms. The local stations have platforms along the walls with stairs direct to the street, but at the express stations the platforms are in the center.

The Public Service Commission has adopted an order approving the construction of the South Shore Traction Company line through Queens Borough and over the Queensboro Bridge. The order was issued immediately after the receipt by the commission of the order from the Appellate Division following the decision of the Court of Appeals on the South Shore Traction case. Commissioner Bassett said: "The commission granted the certificate of the South Shore Traction Company to operate through Queens County and across Queensboro Bridge within two hours of the receipt of the order from the Appellate Division. At no time has the commission desired to hold up transit on the Queensboro Bridge. When the franchise to the South Shore Traction Company was granted by the Board of Estimate, the commission acted upon it within 19 days, although the Board of Estimate had had it under advisement more than a year and a half. Steps in the court procedure were expedited in every way, with the result that within five months of the date of the application to the commission, a final opinion has been obtained from the highest court of the State and the sanction of the commission to the bridge operation has been granted."

The Board of Estimate has approved the plan of the White Plains Avenue extension to the Westchester Avenue subway route. This section runs from Deer Swamp Road to Westchester Avenue.

Program for the Quarterly Meeting of the New York State Street Railway Association

A list of the topics to be discussed at the next quarterly meeting of the Street Railway Association of the State of New York, to be held in Albany Dec. 7 and 8, is now in part available. They include the following: "Remuneration for Handling United States Mail." "The Relation of State Highways and Interurban Railways," three questions on electrical subjects and three on mechanical subjects to be selected by W. J. Harvie, Utica, and H. A. Benedict, Albany. These subjects will be announced next week.

Charles R. Barnes, expert of the Public Service Commission of New York, Second District, has also been requested to suggest a topic that will be considered at the meeting. As stated last week. the quarterly meeting will be begun by an informal dinner on Tuesday evening, Dec. 7, at 8 o'clock at the Hotel Hampton. After this dinner one of the subjects mentioned above will be discussed. The sessions on Wednesday will be held at the Fort Orange Club and will begin at 10 a. m.

At the meeting of the executive committee of the association, held in Schenectady Nov. 5, a proposition was received from J. J. Lane, secretary of the New England Street Railway Club, to prepare a railway guide for the New York State electric railways, similar to that published by him for the electric railways in New England. The subject was referred to W. H. Collins, Gloversville, and H. M. Beardsley, Elmira, who will take the matter up with Mr. Lane and present a report to the association.

Decision Affecting Franchises in Ohio.—The Ohio Supreme Court, in the case of the City of Akron against the East Ohio Gas Company, has decided that a franchise, to be perpetual, must have the words "in perpetuity" written into it, and that grants in which the "in perpetuity" phrase is not included are merely indeterminate and may be ended at the will of either party.

Special Counsel for Minneapolis Six-For-a-Quarter Case.—Milton D. Purdy, former assistant to the Attorney-General of the United States and until recently judge of the United States District Court of Minnesota, has become connected with the legal department of the Twin City Rapid Transit Company, Minneapolis, Minn., for special service in association with the regular legal staff of the company for the conduct of the "Six-For-a-Quarter Case" before the United States Supreme Court, in December, 1909.

Cement Products Exhibition.—Announcement is made that at the drawing for spaces for the third annual cement show to be held at the Coliseum, Chicago, from Feb. 18 to 24, 1910, the entire floor and annex space, exceeding 50,000 sq. ft. in area, was assigned to 150 exhibitors. At the time of the exhibition the National Association of Cement Users, American Society of Engineering Contractors, National Builders' Supply Association, Illinois Association of Municipal Contractors, Illinois Lumber Dealers' Association, Illinois Masons' Supply Association and Interstate Mantel & Tile Dealers' Association of the United States will hold their annual conventions in Chicago.

Another Demonstration of the Gyroscope Car.—Louis Brennan, a description of whose model gyroscope car was published in the ELECTRIC RAILWAY JOURNAL of June 1, 1907, page 963, gave a demonstration on Nov. 10, 1909, at Cullingham with a car 40 ft. long fitted with gyroscopes. According to the cable dispatches from London, 40 persons were carried in the car up and down a straight single-rail track and around a circular track 220 yards in length. The car is 10 ft. wide and 13 ft. high to the top of the cab in which the machinery is contained. It weighs 22 tons empty and has a capacity of 10 tons. The two gyroscopes are 3 ft. 6 in. in diameter, weigh together 1½ tons and operate at the rate of 3000 r.p.m.

Power Contract in Baltimore.—The Baltimore & Ohio Railroad has closed contracts with the Consolidated Gas, Electric Light & Power Company, Baltimore, Md., to supply current for operating trains through the Belt Line tunnel. This power was formerly furnished by the Baltimore & Ohio Railroad from its own power plant on Camden Street, but the capacity of that plant has been exceeded recently. The Camden Street station will be maintained to light the Camden yards, the station and various other buildings of the railroad and supply them with power. The Maryland Electric Railways has renewed its contract with the Consolidated Electric Light & Power Company for supplying current to run trains between Baltimore and Annapolis.

Inspection Trip of University of Illinois Students.—The 53 members of the senior class in the departments of electrical engineering and railway electrical engineering at the University of Illinois made a trip of inspection to Gary, Ind., Chicago, Ill., and Lockport, Ill., Nov. 10 to 13, under the direction of four members of the faculty. Nov. 10 was spent in inspecting the electrical equipment of the Indiana Steel Company at Gary and the rolling stock of the Chicago, Lake Shore & South Bend Railway. On Nov. 11 the substations and Fisk and Quarry Street generating stations of the Commonwealth Edison Company in Chicago were visited. The shops and power house of the Metropolitan West Side Elevated Railway, the exchanges of the Chicago Telephone Company and the Hawthorne works of the Western Electric Company were inspected on Nov. 12. On Nov. 13 the party went to Lockport, Ill., to see the Lockport power house of the Sanitary District.

Annual Meeting of Pennsylvania Street Railway Association.—It has been decided to hold the annual meeting of the Pennsylvania Street Railway Association at Harrisburg on Dec. 1, the session to begin at 10 a. m. There will be prearranged talks on important subjects and a paper from Henry M. Stine, the secretary of the association, containing a proposed plan for legislative work. The membership of the association now numbers 43 companies. During 1909 14 new members were enrolled, as follows: Schuylkill & Dauphin Traction Company, Pittsburgh, Harmony, Butler & New Castle Railway; Philadelphia & West Chester Traction Company, Buffalo & Lake Erie Traction Company, Citizens' Traction Company of Oil City, Hummelstown & Campbellstown Street Railway, Montgomery Traction Company, Pittsburgh & Butler Street Railway, Johnstown Passenger Railway, Chambersburg & Gettysburg Electric Railway, West Penn Railways, Erie Traction Company, West Chester, Kennett & Wilmington Electric Railway, and the Carbon Transit Company.

Chicago Traction Situation Discussed.—M. B. Hereley, traction expert for the City of Chicago, addressed the Electric Club of Chicago at the weekly luncheon Nov. 10. There are 140 miles of elevated railways and 800 miles of surface street railways in the city, and Mr. Hereley thinks that Chicago needs a unified system of street railway operation. The joint ownership and operation of the five elevated railways, two surface street railway systems and several minor roads within the bounds of the municipality were advocated by Mr. Hereley. The proposed subway should not be definitely planned until the capacity of existing elevated and surface roads is ascertained with joint operation and through routing, and the subway, elevated and surface lines should be operated in conjunction. The surface roads should have the short-haul business preferably, the elevated roads the long-haul, while the subway should supplement both when their capacity is exhausted. The Union Loop should be abolished. Mr. Hereley closed by speaking of the progress of the extensive work of rehabilitating the street railways of Chicago under the direction of the Board of Supervising Engineers. He said that he thought the proposed subways would extend south to Twenty-second Street and north to Chicago Avenue.

Convention of Railway Commissioners.—The twenty-first annual convention of the National Association of Railway Commissioners was held in the hearing room of the Interstate Commerce Commission, Washington, D. C., on Nov. 16. The call for the meeting was signed by Martin S. Decker, president; O. P. Gothlin, chairman of the executive committee, and William H. Connolly, secretary. The call said in part: "In the past the association has not demonstrated its real efficiency for the reason that reports on important subjects were prepared only a few days before the convention, hastily read and agreed to by the committee, presented to the convention, and perfunctorily adopted. These reports deal with the most important concerns of business and industry and affect, as a whole, the entire movement of commerce throughout the country. They are widely circulated, and the committeemen who expend much time and labor in the conscientious discharge of their duties are entitled to expect other members to do likewise. Only the fullest co-operation by all members can accomplish the real purposes of the association."

Meeting of the Railway Business Association.—The first dinner of the Railway Business Association was held at the Waldorf-Astoria, New York, N. Y., on the evening of Nov. 10, 1909. It is intended to give annual dinners hereafter. The Railway Business Association was formed a year ago "to conserve the interests of the railways of the country and of the manufacturers of railway materials and equipment, contractors in railway constructions and dealers in miscellaneous railway supplies." Its officers are officials of various industrial companies, particularly those doing business with the railroads. Among the speakers were John C. Spooner, former United States Senator from Wisconsin; E. P. Ripley, president of the Atchison, Topeka & Santa Fé Railway; W. H. Marshall, president of the American Locomotive Company; W. C. Brown, president of the New York Central & Hudson River Railroad, and W. P. Hepburn, former member of Congress from Iowa. Geo. A. Post, president of the Railway Business Association, acted very happily as toastmaster. About 700 persons were present. Among them as guests were George Westinghouse and J. P. Morgan. Mr. Spooner in his speech made a personal reference to Mr. Westinghouse which called forth a demonstration lasting two minutes and only paused when Mr. Westinghouse bowed his acknowledgments. A similar demonstration followed a reference to Mr. Morgan, who also bowed in acknowledgment.

Financial and Corporate

New York Stock and Money Market

November 16, 1909.

The Wall Street market during the past week has been irregular and comparatively inactive on account of the continued uncertainty with regard to the money market. The copper shares have advanced, however, due entirely to the confidence felt by the trading public in the reports that an agreement or amalgamation is about to be made that will control the output and price of copper. One of the striking features of the week has been the activity and strength of the Interborough-Metropolitan issues. Both the common and the preferred advanced several points. The same strength was also apparent in Metropolitan Street Railway, which advanced 2½ points.

The money market continues at about the same rates. Quotations to-day were: Call, 4½ to 5 per cent; 90 days, 5 to 5½ per cent.

Other Markets

In the Philadelphia market, Rapid Transit continues to be fairly active, with some selling pressure. Other tractions are dull.

In Chicago, there has been practically no trading in tractions. Even Subway stock makes only an occasional appearance, and prices for it are very weak. Metropolitan Elevated is practically out of the market.

Except for Massachusetts Electric there is little doing in tractions in the Boston market. Even in these issues the trading has been limited. Prices have sagged several points.

In Baltimore, trading in the bonds of the United Railways continues with prices unchanged. During the week some blocks of the same company's stock were sold at prices around 13½.

The only traction securities sold at last week's auction in New York were 200 shares Connecticut Railway & Lighting Company common, at 74¼.

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

	Nov. 9.	Nov. 16.
American Railways Company	a45¼	a45½
Aurora, Elgin & Chicago Railroad (common)	a49¼	a49¼
Aurora, Elgin & Chicago Railroad (preferred)	a95	*95
Boston Elevated Railway	130¾	130
Boston & Suburban Electric Companies	a18½	a18½
Boston & Suburban Electric Companies (preferred)	77⅛	a77¼
Boston & Worcester Electric Companies (common)	a12½	a12
Boston & Worcester Electric Companies (preferred)	a52	a52
Brooklyn Rapid Transit Company	75½	77
Brooklyn Rapid Transit Company, 1st pref., conv. 4s	84¾	87
Capital Traction Company, Washington	a136	a136
Chicago City Railway	a190	a190
Chicago & Oak Park Elevated Railroad (common)	*2	*2
Chicago & Oak Park Elevated Railroad (preferred)	*10	*10
Chicago Railways, ptcptg., ctf. 1	a106	a102
Chicago Railways, ptcptg., ctf. 2	a35	a35
Chicago Railways, ptcptg., ctf. 3	a24	a24
Chicago Railways, ptcptg., ctf. 4s	*10	*10
Cleveland Railways	*84	*84
Consolidated Traction of New Jersey	a76½	a77
Consolidated Traction of N. J., 5 per cent bonds	a106	a106
Detroit United Railway	a67½	62¾
General Electric Company	162	163
Georgia Railway & Electric Company (common)	a100½	a100
Georgia Railway & Electric Company (preferred)	a88½	86
Interborough-Metropolitan Company (common)	20¼	23¾
Interborough-Metropolitan Company (preferred)	50¼	56¼
Interborough-Metropolitan Company (4½s)	83	83½
Kansas City Railway & Light Company (common)	a40	a40
Kansas City Railway & Light Company (preferred)	*82	*82
Manhattan Railway	142	141¾
Massachusetts Electric Companies (common)	a18½	a16
Massachusetts Electric Companies (preferred)	a83	a80
Metropolitan West Side, Chicago (common)	a17½	a16⅞
Metropolitan West Side, Chicago (preferred)	a52½	a53
Metropolitan Street Railway	*24⅜	27
Milwaukee Electric Railway & Light (preferred)	*110	*110
North American Company	79⅛	78⅛
Northwestern Elevated Railroad (common)	a20	a19
Northwestern Elevated Railroad (preferred)	a68	a68
Philadelphia Company, Pittsburg (common)	a49	48¾
Philadelphia Company, Pittsburg (preferred)	a43¾	44½
Philadelphia Rapid Transit Company	a27¾	26¾
Philadelphia Traction Company	*89½	89
Public Service Corporation, 5 per cent col. notes	*100⅛	100⅛
Public Service Corporation, ctfs	a100½	a100¼
Seattle Electric Company (common)	116	a117
Seattle Electric Company (preferred)	a104½	a103½
South Side Elevated Railroad (Chicago)	a53	a53
Toledo Railways & Light Company	*8	*8
Third Avenue Railroad, New York	19	20½
Twin City Rapid Transit, Minneapolis (common)	109½	109
Union Traction Company, Philadelphia	a53¾	52¾
United Rys. & Electric Company, Baltimore	*13¼	13¼
United Rys. Inv. Co. (common)	42	*42
United Rys. Inv. Co. (preferred)	*73¼	72½
Washington Ry. & Electric Company (common)	a47	a46
Washington Ry. & Elec. Company (preferred)	a94	a92
West End Street Railway, Boston (common)	92½	92
West End Street Railway, Boston (preferred)	103½	105
Westinghouse Electric & Manufacturing Company	85½	85½
Westinghouse Elec. & Mfg. Company (1st pref.)	*140	*140

a Asked. * Last Sale.

Annual Report of East Liverpool Traction & Light Company

In the report of the East Liverpool (Ohio) Traction & Light Company for the two years ended June 30, 1909, a comparative statement is presented of earnings from the beginning of the operations of the constituent properties by the present management, Nov. 1, 1905, to the close of the last fiscal year. It shows the following results:

	Eight months ended June 30, 1906.	Year ended June 30, 1907.	Year ended June 30, 1908.	Year ended June 30, 1909.
Gross earnings	$202,028.37	$363,551.17	$344,535.57	$342,938.45
Operating expenses	113,478.44	207,910.50	195,130.70	174,424.61
Net earnings	$88,549.93	$155,640.67	$149,404.87	$168,513.84
Add: Miscellaneous income	.....	.....	.....	49.68
Net income	$88,549.93	$155,640.67	$149,404.87	$168,563.52
Deduct: Interest and taxes	66,102.95	129,215.09	147,631.24	164,985.67
Surplus income	$22,446.98	$26,425.58	$1,773.63	$3,577.85
Operating cost per cent of earnings (excluding taxes)	56	57	57	51

Amplifying these figures the report states: "It will be noted that the total surplus income earned from Nov. 1, 1905, to June, 1909, amounts to $54,224, and that there has been a surplus earned in each year, notwithstanding the severely adverse conditions which have prevailed since the fall of 1907. In connection with the above it should be understood that the upkeep of the property has been well provided for; accidents and damages accounts kept fully paid up, and the property maintained in a high state of efficiency in all respects."

Van Horn Ely, president of the company, says in his statement to shareholders that, with the return of normal business conditions, the revenues should be largely increased by reason of the construction of the Ohio River Passenger Railway and the Steubenville & East Liverpool Railway & Light Company, with which traffic agreements were made, as stated in the first annual report. Mr. Ely states in relation to other features of the operations of the company:

"Rock Springs Park at Chester, W. Va., which is the property of the company, is kept in fine condition by the lessees and is constantly increasing in popularity. Within the last two years a large amount of money has been expended by the lessees in adding to the attractions within the park. Many of the improvements made are of a substantial and permanent character.

"The operations of the company's coal mine have been successful. All of the coal used by this company is mined there. The mine is kept in good condition.

"The Youngstown & Ohio River Railroad has been constructed from populous towns on the north to the city limits of East Liverpool. A contract between that company and our company providing for the entrance of the new company into East Liverpool over our lines has been agreed upon. It provides satisfactory compensation for the use of our tracks. The completion of the construction of the Youngstown & Ohio River Railway line connects our properties with Cleveland, Canton and Youngstown, Ohio, on the north and many thriving and populous intervening towns. We expect increased revenues to our property from the construction of the new line.

"The prevailing business depression, which has been especially severe in the Pittsburgh district, has been reflected in decreased earnings. Special local causes of a temporary nature have at the same time contributed to the same result, and the receipts of the past two years do not show the fair earning power of the property under normal conditions.

"It is, however, pleasing to note that since Jan. 1, 1909, gross earnings have increased more than 9 per cent over the corresponding period in 1908."

Brooklyn (N. Y.) Rapid Transit Company.—A successor to the late Edward H. Harriman as a director of the Brooklyn Rapid Transit Company will be elected at the annual meeting of the company in February, 1910. It was expected that the directors would consider the question of the quarterly dividend at a meeting on Nov. 18.

Columbus, Delaware & Marion Railway, Columbus, Ohio.—Representatives of the holders of the underlying and consolidated bonds of the Columbus, Delaware & Marion Railway met in Columbus, Ohio, recently and appointed the following committee to represent them while the property is in the hands of a receiver: W. E. Burdell, president of the State Savings Bank & Trust Company, Columbus, Ohio; Caleb L. McKee, Caleb L. McKee & Company,

Columbus, and Frank S. Stalnaker, president of the Capital National Bank, Indianapolis, Ind. The bonds will all be deposited with this committee through the State Savings Bank & Trust Company, Columbus, as depositary. The bondholders feel that there is no necessity of foreclosure proceedings.

Cumberland & Westernport Railway, Cumberland, Md.—Henry L. Doherty & Company, New York, N. Y., have purchased control of the Cumberland & Westernport Railway, which has 26 miles of track and operates between Cumberland and Lonaconing, Md. The company has outstanding $625,000 of stock and $230,000 of bonds. Doherty & Company propose to improve the property and expect to operate it.

Edwards Hotel & City Railroad, Jackson, Miss.—F. G. Jones, president of the Edwards Hotel & City Railroad, and S. T. Carnes, secretary and treasurer of the company, are reported to have given an option to the American Cities Railway & Light Company, New York, N. Y., on a majority of the stock of the company.

Holmesburg, Tacony & Frankford Electric Railway, Tacony, Pa.—Henry Bain, Jr., William N. Trinkle and John C. Bell have been appointed receivers for the Holmesburg, Tacony & Frankford Electric Railway by Judge Holland in the United States Circuit Court on petition of W. Heyward Drayton, 3d, a judgment creditor. Judgments against the Holmesburg, Tacony & Frankford Electric Railway were obtained by bondholders of the Philadelphia, Bristol & Trenton Street Railway on account of default in the payment of interest on the bonds of the Philadelphia, Bristol & Trenton Street Railway, which were guaranteed by the Holmesburg, Tacony & Frankford Electric Railway. Jacob S. Disston, Henry Bain, Jr,. George B. Atlee and Bradford Frailey have been selected as a committee to represent the bondholders of the Holmesburg, Tacony & Frankford Electric Railway, and the deposit of bonds of that company with the Tacony Trust Company as depositary will be requested.

Hudson Companies, New York, N. Y.—The Hudson Companies has sold since July, 1909, $3,000,000 of a new issue of 5 per cent notes dated Aug. 1, 1909, and due Aug. 1, 1912. These notes are secured by pledge with the Standard Trust Company, New York, N. Y., the trustee under a trust dated July 21, 1909, of Hudson & Manhattan Railroad first mortgage 4½ per cent convertible gold bonds, due Feb. 1, 1957, at the rate of $1,500 par value of the bonds for each $1,000 note outstanding, the bonds deposited being part of the bonds acquired by the Hudson Companies on account of work performed. The notes are subject to redemption on any interest date upon 30 days' notice at par and interest, and are convertible at the pleasure of the holder when called for redemption or at maturity into Hudson & Manhattan Railroad first mortgage 4½ per cent convertible gold bonds at 95 per cent of the principal of the bonds. Previous note issues have borne 6 per cent interest.

Manhattan Railway, New York, N. Y.—Kingdon Gould has been elected a director of the Manhattan Railway to succeed T. T. Eckert.

Metropolitan Street Railway, New York, N. Y.—Counsel for the Metropolitan Street Railway, the New York City Railway and the Morton Trust Company, New York, N. Y., have asked the Supreme Court at Washington to dismiss the appeal of the Guaranty Trust Company from the decree of the lower court ordering the foreclosure and permitting the receivers of the property to issue certificates for the betterment of subsidiary lines. Motions on behalf of the same parties for writs of certiorari will also be taken before the Court of Appeals. The case was before the Federal Court of Appeals in the same cause. The appeals have not yet been decided and the Guaranty Trust Company has a motion pending for the advancement of its appeal. The court has taken the motion under advisement. The sale of the property of the Metropolitan Street Railway under foreclosure, which was to have been held on Nov. 15, 1909, has been postponed until Jan. 22, 1910.

Omaha & Council Bluffs Railway & Bridge Company, Omaha, Neb.—Redmond & Company, New York, N. Y., announce that the balance of the $1,500,000 of the first consolidated mortgage 5 per cent gold bonds of the Omaha & Council Bluffs Railway & Bridge Company, offered recently for subscription, have been sold.

Otsego & Herkimer Railroad, Hartwick, N. Y.—The Otsego & Herkimer Railroad, which is the successor to the Oneonta & Mohawk Valley Railroad, has organized as follows: W. Boardman Reid, president; Herbert T. Jennings, vice-president and counsel; Joseph K. Choate, general manager; C. O. Weidman, superintendent of transportation; M. J. Bogardus, purchasing agent and master mechanic; C. S. Stanton, electrical engineer.

Quebec Railway & Power Company, Quebec, Que.—Papers have been filed in Ottawa for the incorporation of the Quebec Railway, Light, Heat & Power Company, with a capital stock of $12,000,000, as a consolidation of the Quebec Railway & Power Company, the Quebec Gas Company, the Frontenac Gas Company, the Canadian Electric Company, the Seven Falls Company and some smaller properties.

St. Francois County Railway, Farmington, Mo.—W. R. Taylor and M. P. Cayer, Farmington, have been appointed receivers of the St. Francois County Railway. The company defaulted on Oct. 1, 1909, on the interest on its second mortgage bonds, of which the Central Trust Company, Chicago, Ill., is trustee.

Susquehanna Railway, Light & Power Company, Parkesburg, Pa.—The report for the fiscal year ended June 30, 1909, shows total net earnings of $612,262, derived from the following sources: Net earnings subsidiary companies accruing to Susquehanna company, $470,070; interest and dividends on securities held, $108,183; interest on loans to subsidiary companies, $28,989; interest on cash balances, $2,752; miscellaneous income, $2,368. From the net earnings there were deducted $139,051 interest on underlying bonds and $108,605 dividends on preferred stocks of underlying companies, leaving a surplus of $364,706, from which dividends of $204,610 were paid. George Bullock, the president, says in his statement to shareholders: "In view of the continued business depression in many of the cities in which our subsidiary companies are operating, the results, which show an increase in net earnings in excess of 10 per cent, are considered very satisfactory. Your directors feel justified, on account of the increase in the earnings of the subsidiary companies, in authorizing the setting up of a reasonable reserve to meet depreciation charges and amortization expenditures for the ensuing year. During the year a sum in excess of $700,000 was authorized and expended for extensions, additions and betterments to the various properties in order to meet absolute requirements made necessary by increased business. The efficiency of the properties has been greatly increased during the past year through the organization of an effective commercial department, and economies in operation secured through the co-operation of the local managers. The revival of business now under way will tend to increase our earnings during the ensuing year."

Third Avenue Railroad, New York, N. Y.—The committee of security holders of the Third Avenue Railroad selected at the meeting at the Hotel Knickerbocker on Aug. 31, 1909, and consisting of William N. Amory, Franklin G. Colby and Charles E. Goodhue, has asked the Public Service Commission of the First District of New York to reopen the general investigation of the affairs of the Third Avenue Railroad and the Metropolitan Street Railway, which was begun by the commission in 1907. The application has been referred to the committee of the whole of the commission.

Toledo & Indiana Railway, Toledo, Ohio.—The property of the Toledo & Indiana Railway will be offered for sale by C. F. M. Niles, receiver, in Toledo on Nov. 27, 1909. The upset price of the property has been fixed at $909,384.

The thirtieth annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, 29 West Thirty-ninth Street, New York, N. Y., on Dec. 7 to 10. The social entertainment will be in charge of the members resident in and about New York, under the immediate direction of a local committee appointed by them, of which William D. Hoxie is chairman. The professional papers assigned to the meeting follow: "Tests on a Venturi Meter for Boiler Feed," by Chas. M. Allen; "The Pitot Tube as a Steam Meter," by Geo. F. Gebhardt; "Efficiency Tests of Steam Nozzles," by F. H. Sibley and T. S. Kemble; "An Electric Gas Meter," by C. C. Thomas; "Tan Bark as a Boiler Fuel," by David M. Myers; "Cooling Towers for Steam and Gas Power Plants," by J. R. Bibbins; "Some Studies in Rolling Mill Engines," by W. P. Cainc; "An Experience with Leaky Vertical Fire Tube Boilers and the Best Form of Longitudinal Joint for Boilers," by F. W. Dean; "Testing Suction Gas Producers with a Koerting Ejector," by C. M. Garland and A. P. Kratz; "Bituminous Gas Producer," by J. R. Bibbins; "The Bucyrus Locomotive Pile Driver," by Walter Ferris; "Line Shaft Efficiency, Mechanical and Economic," by Henry Hess; "Pump Valves and Valve Areas and a Report on Cast-Iron Test Bars," by A. F. Nagle. In addition to these papers several reports will be submitted by the committees of the gas power section.

Traffic and Transportation

Ohio Commission Commends Ohio Electric Railway

J. C. Sullivan, O. P. Gothlin and O. H. Hughes, members of the Railroad Commission of Ohio, who recently inspected the Ohio Electric Railway, have written to the company commenting on the excellent condition of its physical property. As mentioned on page 996 of the Electric Railway Journal of Nov. 6, 1909, the commissioners were accompanied in their trip of inspection by O. F. McJunkin, Dayton deputy inspector, and John Hussey, Columbus, inspector, and by W. Kesley Schoepf, president of the Ohio Electric Railway; J. B. Foraker, Jr., vice-president; B. J. Jones, Springfield, district manager; H. G. Gilpin, Lima, superintendent, and J. W. Edson, Van Wert, tax agent, and several business men from Cincinnati and other cities. The communication of the commission to the company said:

"The inspection has given us much satisfactory information in the matter of the construction and operation of electric railways, and many features which are incorporated by you and apparently your personal ideas, were pleasant surprises and most commendable. We are informed and believe these various lines have been constructed, or reconstructed, and are operated under your guidance and supervision, and that the expense has been largely borne by foreign capital. The commission feels that the character and condition of that part of the property inspected reflects excellent judgment in the management, and the work done and being done upon these properties indicates proper maintenance, which means enhanced value of the property itself, as well as the development and betterment of the territory traversed.

"The line from Springfield to Toledo and Fort Wayne, Ind., a distance of 203 miles, we find constructed of 70-lb. rails, 146 miles thoroughly ballasted with stone, and the balance with excellent quality gravel, all comparing most favorably with the best constructed steam lines. We commend the good judgment exercised on this line in the construction of concrete abutments and culverts and steel bridges of great carrying strength; likewise, the fact that these lines are constructed on private right of way, from 40 ft. to 100 ft. wide, instead of upon the public highway, and we understand this to be the general policy of your management, and one highly commendable.

"We note the manifestation of good citizenship and due regard to public interest shown by the proper and substantial fencing of your right of way on both sides, construction and maintenance at all public highways of easy and adequate approaches flush with rails to and across your tracks, and the erection and maintenance in good condition of cattle guards at all highways.

"The commission gave close attention to your various substations (some 15, we believe) and waiting rooms; these we found built of brick, with tile roofing, all most substantial, as well as attractive, the waiting rooms being provided with light and heat, and kept in a most sanitary condition. Your entrance into the city of Toledo over your own private right of way, at great cost, no doubt, is a most satisfactory departure in electric railway construction, and the wisdom is very manifest in keeping separate interurban and street traffic.

"We noticed with much satisfaction the elimination by subways of grade crossings within the limits of Toledo, and consider this voluntary act an innovation in railroad building on the part of your management, together with the declared purpose of the installation of full interlockers (one already being installed), as most commendable and conducive to safety, convenience and speed.

"We viewed with much interest the concrete bridge, approximately 1400 ft. long, composed of 12 arches and spanning the Maumee River at Waterville, 15 miles south of Toledo. This substantial and imposing structure, second to none, together with the substantial and most business-like construction and maintenance of the part of your properties inspected, is evidence conclusive of the good will and confidence of the management placed in the future of our great Commonwealth, and bespeaks that these properties have been builded with an eye single to lasting and successful operation, and not for barter and sale, as might be truthfully charged in some instances against other properties. We consider that electric railways could gain much information of practical benefit by going over the lines constructed under your special supervision, and carefully considering your advanced and sound ideas in the matter of construction and operation. Many of the features adopted and followed by your management must be followed by other roads if the lasting good will of the public is to be obtained and held and electric railways made a success. We feel that you are entitled to the public good will and support, and congratulate you upon the success you have made."

Hearing on Heating Cars in New York

The hearing before the Public Service Commission of the First District of New York regarding the heating of street and electric cars within the jurisdiction of the commission, of which an account was published in the Electric Railway Journal of Nov. 13, 1909, page 1018, was continued on Nov. 16. W. O. Wood, president and general manager of the New York & Queens County Railway, Charles S. Banghart, master mechanic of that company, and Frank Hedley, vice-president and general manager of the Interborough Rapid Transit Company, were in attendance. J. L. Quackenbush represented the Interborough-Metropolitan Company and the Metropolitan Street Railway as counsel.

E. G. Connette, transportation engineer of the commission, said that tests which he conducted on Nov. 12 with steel and wood cars used on the New York & Queens County Railway showed that the wood cars were about 23 per cent more efficient in retaining heat than steel cars with the same heating equipment. Still, with the wood cars, he was only able to increase the temperature 19 deg. in 72 minutes at a current consumption of 12 amp. Heaters which would fill the requirements of the proposed order regarding the temperature at which the cars should be kept should consume from 20 to 22 amp in 72 minutes. The wood cars should be equipped with twice the number of heaters of the type now in use, and the heaters in the metal cars should be increased 25 per cent in capacity. A suspension of the order for 60 days, in so far as the New York & Queens County Railway was concerned would, under ordinary circumstances, afford sufficient time for the company to change its heating equipment so it could comply with the proposed 40-deg. minimum. Mr. Connette considered the 45-deg. minimum reasonable when the temperature in the street was 10 deg. above zero and a 40-deg. mimimum when the outside temperature fell below 10 deg. above zero.

Mr. Quackenbush said that he hoped the commission would consider his request for a minimum of 20 or 25 minutes for taking readings to determine whether a company is endeavoring to comply with the order. Mr. Eustis for the commission said that the members of the commission considered the matter of a minimum of this kind reasonable, and that a communication had been received from Herbert J. Bickford, counsel of the Third Avenue Railroad, in which the case against the use of thermometers in the cars was very ably summarized. The hearing was then closed.

Vestibules in Cincinnati

The Board of Public Service in Cincinnati, Ohio, recently instructed William Wallace, city street car inspector, to report regarding the means adopted by the street railways operating in Cincinnati to comply with the law which requires all cars operated in the city to be fully vestibuled. Mr. Wallace took the matter up with the oldest men at the different divisions in order to ascertain their views, and reported to Robert Laidlaw, president of the board, under date of Nov. 1, that the motormen are satisfied with the vestibules with which cars operated in Cincinnati are equipped. The cars are completely closed, and the men say that they do not suffer from the cold. At division headquarters, from which are operated cars with vestibules that are heated and cars with vestibules that are not heated, Mr. Wallace found that the motormen select runs on lines on which cars with vestibules that are not heated are operated because vestibules which are heated cause sickness.

Regarding the cars operated in Covington, Mr. Wallace says that the vestibules are open on the right side so that the cars can load and unload from the front as well as the rear platform, and that the men there are satisfied with the vestibules. If the vestibules were closed on the right side, they could not be used by passengers, more time would be consumed in loading and unloading, and congestion at Fifth Street and Walnut Street, Fifth Street and Vine Street, and Fourth Street and Main Street would be increased 50 per cent, to the detriment of the public and the embarrassment of the company. The officials of the lines in Covington stated that they would close the vestibules if the city authorities in Cincinnati would not complain about the congestion which would result. Mr. Wallace said that the officials in Cincinnati would not tolerate any additional congestion, whereupon the officials of the company in Covington stated that if they were compelled to close their vestibules the car bodies would have to be discarded and new ones built. This appeared to Mr. Wallace to be going too far, as the rolling stock of the company operating in

Covington was in excellent condition, and he did not think that in dealing with public service corporations Cincinnati wanted to run the risk of repeating any of the follies or bickerings which had forced the street railway in Cleveland into the hands of a receiver.

New York Vestibule Hearing

At a hearing held in New York on Nov. 16 by the Public Service Commission of the First District on the subject of ordering the companies of New York City to equip all of their cars with fully enclosed vestibules, the complainants presented three witnesses, all from Albany, N. Y. Two of them were motormen who testified that in their experience the fully enclosed vestibules were superior to other types which they had previously used on the lines in Albany. Both of these witnesses admitted that they had no knowledge of the weather and traffic conditions in New York City. On the suggestion of Commissioner Bassett, who presided, the complainants promised to have at the next hearing, to be held on Nov. 23, a witness who had had experience as a motorman in New York City. The third witness called by the complainants presented an estimate on the cost of changing over one type of the Brooklyn Rapid Transit Company's cars from the partly enclosed to the fully enclosed vestibule design. At the next hearing the Brooklyn Rapid Transit Company is to present its own estimates to cover all its various types of cars.

Celebration Traffic in San Francisco

The United Railroads of San Francisco has made public the following statement showing the number of passengers carried by the company during the Portola celebration in San Francisco, which continued from Oct. 19 to Oct. 23:

	Cash Passengers.	Transfers.	Total.
Oct. 19	628,165	202,260	830,425
Oct. 20	591,114	217,619	808,733
Oct. 21	701,739	189,687	891,426
Oct. 22	592,414	246,877	839,291
Oct. 23	747,360	217,035	964,395
Total, five days	3,260,792	1,073,478	4,334,270

Accident on Canadian Line.—A passenger car and a work car collided on the British Columbia Electric Railway, Vancouver, B. C., on Nov. 10, 1909, and several passengers and employees were killed and a number of persons injured.

Uniform Fender Ordinance Advised for Berkeley, Oakland and Alameda.—The City Council of Berkeley, Cal., has asked Mayor Hodghead to confer with the Mayors of Oakland and Alameda with a view to adopting a fender ordinance that will be uniform in Berkeley, Oakland and Alameda, as the Oakland Traction Company operates in the three cities.

Vestibuled Trains Between Portland and Salem.—The Oregon Electric Railway has announced that it proposes to establish a vestibule train service between Portland and Salem in the near future. Specifications have been drawn for several observation cars and a service of four trains a day each way between the cities will be established. An observation car seating 42 passengers will be on each train. Arrangements will be made for a buffet service.

Traffic Changes in Springfield, Mass.—The traffic committee, consisting of representative business men of Springfield, Mass., met L. S. Storrs, president of the Springfield Street Railway, on Nov. 2, 1909, in the first of a series of conferences looking toward the betterment of street railway service in Springfield by a readjustment of routes and schedules. A new loop line on which pay-as-you-enter cars will be operated, and certain changes in the system of markers and destination signs were agreed upon.

Steam-Electric Freight Service at Springfield, Mass.—The Springfield & Eastern Street Railway, Springfield, Mass., and the Boston & Albany Railroad have entered into a contract which applies at Palmer and Oxford Heights, Mass., where the companies have a physical connection. On carload shipments the standard steam railroad equipment will be turned over to the Springfield & Eastern Street Railway at Palmer and handled direct, without breaking bulk, to the interior towns of Brimfield and Sturbridge. Heretofore these towns have not had any steam railroad connection. This service will be of particular advantage to coal dealers, a manufacturing company at Brimfield and East Brimfield and woollen mills at Fiskdale. Less than carload shipments will be interchanged at Palmer. The business will be handled in accordance with local rates of the Electric Express Company and no through rates will be applied. The equipment, repairs, etc., will be handled in accordance with the M. C. B. rules and claims for loss and damage to freight in accordance with Claim Agents' Association rules. The service will probably be inaugurated within the next 30 days.

London, Ont., Wants Sunday Cars.—A deputation of the Council of London, Ont., headed by the Mayor, waited upon Premier Whitney on Nov. 4, 1909, in the interest of Sunday cars. The municipal act provides that towns of 50,000 population and over shall have the option of submitting by-laws to the citizens authorizing the establishment of a street car service on Sunday, and London desires a declaration that it has the requisite number of people in order that the necessary by-law can be submitted at the municipal elections in January. The Premier replied that it would be neeessary to have documentary evidence concerning the claim of the city regarding its population. On Nov. 12 the Premier and his cabinet were waited upon by a delegation from London protesting against the Government accepting as accurate the statement furnished by the Civic assessment commissioner that the city had a population of 50,069, which would give the municipality the right to submit a by-law to the citizens providing for the running of street cars on Sunday. The Premier replied that the question to be decided by the Government was whether the request contained in the resolution of the Council asking that a census be taken of the population should be granted. If the request was allowed the Government would prescribe the manner, time and nature of such a census.

Welfare Meetings in Augusta.—The first of a series of monthly meetings of the heads of departments of the Augusta-Aiken Railway & Electric Company, Augusta, Ga., which controls the Augusta Railway & Electric Company and the Augusta & Aiken Railway, was held on Oct. 26, 1909, for the purpose of familiarizing the men with the rules of the company and the laws of the city and the State. The meeting was opened by James R. League, general manager, who stated plainly and briefly the object of the meeting. Mr. League was followed by one of the local counsel, who discussed the legal features of cases with which conductors and motormen have to deal in performing their duties. W. H. Bagby and E. E. Mitchell, division superintendents, then consumed about 20 minutes in a talk to the men. John H. Adams, chief engineer, and R. P. Mayo, claim agent, also spoke for 10 minutes each. In order that all the men could attend, the meetings were arranged by the superintendents at different hours during the day, three sessions being held. After having checked off the men, it was found that only two had not attended the sessions. Hereafter the meetings will be held once a month, and the men will be given to understand that they will not be detained from their work longer than one hour. It is intended to have the heads of all departments address the men and also to have the heads of departments of companies in other cities visit Augusta for the purpose of discussing problems with which they have to contend in their respective cities and considering subjects of mutual interest.

Second Annual Conference in Indiana to Consider Railway Accidents.—In response to a call by the Indiana Railroad Commission the second annual conference of division superintendents, engineers, conductors and dispatchers was held in the Senate Chamber at the State Capital, Indianapolis, Ind., on Nov. 10. It was decided that the committee to consider the accidents investigated by the commission during the past year be composed of one division superintendent, one engineer, one conductor and the chief inspector of the commission and that the committee report recommendations with a view of lessening and preventing accidents. J. W. Woods, chairman of the commission, reviewed the work of the commission during the year. He declared that the responsibility of a railroad for an accident does not end with the payment of a claim to a victim of an accident or to the surviving heirs. Mr. Wood next cited the statistics of fatal railway accidents in Indiana for 1908 and 1909, and called attention to the fact that the number of employees killed had been reduced from 105 in 1908 to 80 in 1909. The number of trespassers and travelers on highway crossings killed was 162, and injured 251, thus confirming his advocacy of grade separation. Four passengers were killed, but only one of these deaths was the fault of the railroad. Commissioners McClure and Dowling followed Mr. Woods. Mr. McClure said too much attention could not be given to the improvement of tracks and equipment. It was a matter of gratification to him that at least two railroads and one electric railway had entered upon the work of double-tracking their lines. He advocated the separation of railroad and highway crossing. At the afternoon session increased precaution was declared to be necessary in safeguarding crossings of steam and electric lines to prevent the contact of the high-tension wires with telephone and telegraph wires.

Personal Mention

Mr. C. K. Scott has been appointed superintendent of the Salem (Ohio) Electric Railway, to succeed Mr. H. N. Draper.

Mr. P. H. Smith has been appointed electrical engineer of the Butler (Pa.) Passenger Railway, to succeed Mr. George D. Nicoll.

Mr. H. S. Rykert has been appointed general superintendent of the Dixon, Rock Falls & Southwestern Electric Railway, Tampico, Ill.

Mr. J. A. Dyren has been elected secretary of the Hudson River & Eastern Traction Company, Ossining, N. Y., to succeed Mr. C. H. Werner.

Mr. Thomas Armstrong has been appointed superintendent of the Center & Clearfield Street Railway, Philipsburg, Pa., to succeed Mr. H. J. Beck.

Mr. W. H. Greenough has been elected president of the Sunbury & Selingsgrove Electric Street Railway, Sunbury, Pa., to succeed Mr. L. G. Brown.

Mr. H. P. Scott has resigned as general shop foreman of the Chicago, Lake Shore & South Bend Railway, Michigan City, Ind., effective on Dec. 1, 1909.

Mr. John St. John has been appointed engineer of the power station of the Milwaukee Northern Railway, Cedarburg, Wis., to succeed Mr. J. Rookus.

Mr. E. R. Bliss, general counsel of the Chicago (Ill.) City Railway, has been elected a director of the Metropolitan Trust & Savings Bank, Chicago, Ill.

Mr. A. A. Ainsworth has been appointed engineer of the power station of the Ottumwa Railway & Light Company, Ottumwa, Ia., to succeed Mr. W. H. Grant.

Mr. Albert Stevens has been appointed engineer of the power station of the Pittsburgh & Butler Street Railway, Pittsburgh, Pa., to succeed Mr. C. J. Miller.

Mr. G. A. Schmitz has been elected vice-president of the Newport News & Old Point Railway & Electric Company, Hampton, Va., to succeed Mr. John Blair MacAfee.

Mr. W. Z. Earle has been appointed chief engineer of the St. John (N. B.) Railway, to succeed Mr. Thomas Irwin, who is in charge of the power station of the company.

Mr. D. G. Wallace has been appointed superintendent of the power station of the Bloomington & Normal Railway & Light Company, Bloomington, Ill., to succeed Mr. George W. Wilmarth.

Mr. A. F. Rolston has been appointed superintendent of motive power of the Columbus, Delaware & Marion Railway, Columbus, Ohio, and the Marion Railway, Light & Power Company, Marion, Ohio.

Mr. H. H. Stephenson has resigned as traffic manager of the Toledo Urban & Interurban Railway, Toledo, Ohio, to become traffic manager and auditor of the Lake Erie, Bowling Green & Napoleon Railway, Bowling Green, Ohio.

Mr. T. M. Ellis, general manager of the Rockford & Interurban Railway, Rockford, Ill., which is controlled by the Union Railway, Gas & Electric Company, has been elected second vice-president of the company and Mr. Chester P. Wilson has been elected to succeed him as general manager.

Mr. T. J. Hanlon, Jr., assistant superintendent of the Pensacola (Fla.) Electric Company, has been appointed superintendent of the railway department of the company and Mr. R. M. Harding has been appointed superintendent of the lighting department to succeed Mr. E. H. Howard as general superintendent.

Mr. E. G. Howard has resigned as general superintendent of the Pensacola (Fla.) Electric Company and Mr. T. J. Hanlon, Jr., and Mr. R. M. Harding, assistant superintendents, have been appointed superintendent of the railway department and superintendent of the lighting department of the company, respectively.

Mr. Bruce E. Loomis, who as manager of the Underwriters' Electrical Bureau, New York, N. Y., has been instrumental in introducing a great many improvements in the fire protection in a large number of electrical properties, has severed his connection with that organization. Mr. Loomis has not yet announced his future plans.

Mr. F. M. Du Bois has been appointed master mechanic of the Hartford & Springfield Street Railway, Warehouse Point, Conn., to succeed Mr. William F. McCoy, whose appointment as master mechanic of the Pittsfield (Mass.) Electric Street Railway was noted in the Electric Railway Journal of Oct. 30, 1909, page 956. Mr. Du Bois began his railway career with the Syracuse (N. Y.) Rapid Transit Railway, serving with that company 17 years, and finally becoming master mechanic.

Mr. T. R. Cummins, formerly engineer of maintenance of way of the Chicago, Lake Shore & South Bend Railway, has become associated with Marwick, Mitchell & Company, New York, N. Y., chartered accountants, and will devote his time to the valuation of engineering properties. Mr. Cummins was for seven years with the Illinois Central Railroad and for 2½ years with J. G. White & Company, Inc., and for a time served as first grade assistant engineer with the Isthmian Canal Commission at Panama.

Mr. Chester P. Wilson has resigned as general superintendent of the Des Moines (Ia.) City Railway and the Inter-Urban Railway, Des Moines, to become general manager of the Rockford & Interurban Railway, Rockford, Ill., which is controlled by the Union Railway, Gas & Electric Company. Mr. Wilson was for about five years prior to January, 1909, superintendent and purchasing agent of the Lackawanna & Wyoming Valley Railroad, Scranton, Pa., and previously was connected with the Milwaukee Electric Railway & Light Company, Sioux City (Ia.) Railway, and the Camps Bay, Cape Town & Sea Point Tramway, Cape Town, South Africa.

Mr. Charles J. Laney has been appointed traffic manager of the Toledo Urban & Interurban Railway, with offices at Findlay, Ohio, to succeed Mr. H. H. Stephenson, who has become traffic manager and auditor of the Lake Erie, Bowling Green & Napoleon Railway, Bowling Green, Ohio. Mr. Laney has been connected with the Toledo Urban & Interurban Railway for two and a half years as assistant general freight agent, the duties of which office have been combined with those of traffic manager. Before becoming connected with the Toledo Urban & Interurban Railway Mr. Laney served in the freight department of the Toledo & Ohio Central Railway and the Wabash Railroad.

Mr. J. P. Clark, second vice-president and general manager of the Michigan United Railways, Lansing, Mich., has announced a number of changes in the personnel of the company, resulting in a general readjustment of the duties of the officers of the transportation department. Mr. B. F. O'Mara, who has been superintendent of the eastern division of the company, with offices in Jackson, will take charge of the lines in Kalamazoo and the betterment work which the company has in contemplation. Mr. J. L. Millspaugh, who has been superintendent of the western division of the company, with offices in Kalamazoo, will assume charge of the interurban line between Jackson and Lansing and will act as assistant in supervising operation in Jackson City. Mr. A. H. Mann will continue as superintendent of the lines in Lansing.

Mr. John T. Huntington, whose appointment as general manager of the Green Bay (Wis.) Traction Company was noted on page 956 of the Electric Railway Journal of Oct. 30, 1909, has operated a number of city and interurban railways and electric lighting plants in Ohio, Illinois and Kansas, covering a period of about 15 years. At Green Bay Mr. Huntington will manage more than 40 miles of city and interurban lines for the Green Bay Traction Company and the property of the Green Bay Gas & Electric Company, which furnishes gas for lighting and cooking, and electric current for lighting, power, etc. Interests controlling these companies are developing water-power on the Peshtigo River, about 60 miles north of Green Bay, where eventually 15,000 hp will be developed and transmitted to Green Bay at 60,000 volts for general distribution.

Mr. A. D. B. Van Zandt, who presented the paper "Publicity" at the meeting of the Central Electric Railway Association held in Indianapolis, Ind., on Nov. 18, 1909, is publicity agent of the Detroit (Mich.) United Railways. After a few years of school teaching and a short experience in newspaper work in Ontario, Mr. Van Zandt became a reporter on the Detroit *Tribune* and later was made city editor. The Detroit *Evening News* is owned by the same interests that control the *Tribune,* and Mr. Van Zandt was subsequently transferred to the city desk of the *News.* He resigned from the *News* to organize the local and State staff of the *United States Daily* and four years ago became connected with the Detroit United Railways and subsidiary companies in charge of advertising and matters covered by the newspapers affecting the relations of the company with the public.

NEW PUBLICATION

The A B C of Railroad Signaling. By W. H. Elliott. Chicago, 1909: Mackenzie-Klink Publishing Company; 75 pages, illustrated. Price, $1.00.

This book is based on a lecture delivered before the Harvard School of Business Administration by W. H. Elliott, signal engineer of the New York Central & Hudson River Railroad. It is a very readable introduction to the railroad signaling practice of American steam railroads, and despite its brevity few essentials have been omitted.

Construction News

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

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

RECENT INCORPORATIONS

***Covington & Big Bone Railway, Covington, Ky.**—Incorporated to build an interurban electric railway from Covington to Big Bone Springs, a distance of about 22 miles. The company has secured franchises and rights-of-way through the territory it will traverse. Capital stock, $150,000. Incorporators: M. J. Crouch, J. J. Weaver, J. W. Kennedy, Orlando P. Schmidt, R. S. Holmes, Louis Fritz, William Riedlin, Joseph Feltman and A. W. Koch.

***Cincinnati, Harrison & Indianapolis Traction Company, Cincinnati, Ohio.**—Incorporated with a nominal capital stock of $10,000 to build an electric railway between Cincinnati and Harrison, with the idea of ultimately extending it to Indianapolis. The old Westwood steam road will be used, but 14 miles of new construction will be required. The line will touch Bridgetown, Dent and Miamitown. A. K. Nippert, Charles E. Roth and Will L. Finch are interested.

***Citizens Traction Company, Oklahoma City, Okla.**—Chartered in Oklahoma to build an electric railway from Oklahoma City to Shawnee through Oklahoma, Pottawatomie, Lincoln, Cleveland, McLain, Garvin and Murray counties, and later possibly a line between Oklahoma City and Sulphur. Capital stock, $300,000. Directors: L. E. Patterson, W. F. Harn and J. H. Winans, Oklahoma City; Homer S. Hurst, Holdenville, and Alfred Hare, Shawnee.

Corpus Christi Street & Interurban Railway, Corpus Christi, Tex.—Incorporated to build a belt line in and around Corpus Christi. Capital stock, $100,000. Incorporators, Daniel Hewitt, V. S. Heinly and Earl C. Heinly, all of El Paso. [E. R. J., Oct. 23, '09.]

FRANCHISES

Stockton, Cal.—Application has been made to the City Council by the Stockton Terminal & Eastern Railroad for a franchise over streets within the city limits. The company has also applied for a franchise over Front Street in Linden. It is the plan to build a railway through Waterloo, Linden, Bellota and Jenny Lind and tap the Stockton water front, a distance of 27 miles. Gasoline motor cars will be operated. R. N. Griffith, president. [E. R. J., Nov. 7, '08.]

Ashton, Ill.—The Chicago, De Kalb & Western Railway, Chicago, has applied to the City Council for an electric railway franchise in Ashton.

Lafayette, Ind.—The Commissioners of Tippecanoe County have granted a 55-year franchise to the Indiana & Northern Traction Company for the construction of an electric railway from the battleground north to the county line. The franchise obligates the company to complete the line as far north as Reynolds within two years. The company was incorporated in 1903 with a capital stock of $500,000. Headquarters, Marion. Among those interested are: George A. H. Shiedler, B. F. Burk, E. H. Neal, Marion, and George Breed, Philadelphia, Pa.

Logansport, Ind.—The Indiana Northwestern Traction Company has been granted an entrance to Logansport on Bales Street with a 75-year franchise. The company reports having secured franchises through White, Jasper and Newton Counties for a north line, and has an application on file with the Commissioners of Tippecanoe County for a south line. The company has also been granted a franchise for its line through Remington. [E. R. J., Nov. 6, '09.]

Lake City, Ia.—The City Council has considered the ordinance granting a franchise to the Des Moines & Sioux City Railroad, Des Moines, and has ordered a special election to be held in December, at which time the proposition will be voted upon. [E. R. J., Oct. 30, '09.]

Lawrence, Kan.—The City Council has granted to the Kansas City & Kansas Southwestern Railroad, Kansas City, Mo., an extension to its franchise until April 1, 1910, in which to begin work on the proposed railway. The plans of the company include the construction of electric railways between Kansas City and Topeka, by way of Tonganoxie and Lawrence, and the building of a railway from Lawrence to Independence, Kan. W. Laming, president. [E. R. J., Jan. 23, '09.]

Burlington, Ky.—The Boone County Fiscal Court has granted a franchise to the Cincinnati, Louisville, Lexington & Maysville Traction Company, Dry Ridge. [E. R. J., Oct. 9, '09.]

Kalamazoo, Mich.—The Grand Rapids (Mich.) Electric Railway, through its president, Jerry W. Boynton, has applied to the City Council for a 30-year franchise to operate an electric railway in the city limits, with the consideration that all its lines are completed within one year from the passage of the ordinance. The company plans to build an electric railway from Bay City to Grand Rapids and thence to Kalamazoo. It is also proposed to extend the line easterly from Kalamazoo to Battle Creek, thence southerly to Coldwater and Montgomery and Camden; thence to Pioneer, Ohio, to connect with the Toledo & Western Railway, now operated between Toledo and Pioneer, Ohio. [E. R. J., March 6, '09.]

Anoka, Minn.—An ordinance has been passed granting an electric railway franchise to the Anoka-Minneapolis Suburban Railway Promotion Company. The railway will extend from Anoka to Minneapolis. C. J. Swanson, Minneapolis, is interested. [E. R. J., May 29, '09.]

New York, N. Y.—The Board of Estimate and Apportionment has granted a franchise to the New York & Queens County Railway to operate passenger cars on two tracks of the Queensboro Bridge as an extension to the existing lines in Queens.

New York, N. Y.—The Public Service Commission of the First District has approved the franchise granted by the Board of Estimate to the South Shore Traction Company to construct a line in Queens and run cars across the new Queensboro Bridge.

Columbus, Ohio.—The Ohio Electric Railway and Indianapolis, Columbus & Eastern Traction Company on Nov. 8 notified the City Council that they had accepted the seven-year extension of their franchises granted last July. The acceptances close the contract that the railways have with the city to build an interurban station at Third and Town Streets and the companies are granted permission to lay tracks in Town Street and given the seven-year extension of former franchises.

Florence, S. C.—The City Council has granted a 50-year franchise to John L. Barringer, P. A. Willcox, William J. Brown and S. S. Ingman for the use of all the streets of the city for the building of an electric street railway. The plan is to build a street railway throughout the city and then to run it to Darlington via the Muse Bridge on Black Creek, near which place an amusement park will be built. [E. R. J., July 17, '09.]

Aberdeen, S. D.—The City Council has granted the Aberdeen Street Railway a 20-year franchise. The company is to build 4 miles of track by Dec. 1, 1910. [E. R. J., Aug. 22, '09.]

Salt Lake City, Utah.—The Salt Lake & Los Angeles Railway has asked the County Commissioners for a 50-year franchise from Salt Lake City to Saltair for the purpose of double-tracking and electrifying that line. The matter was referred to the committee on roads and bridges for consideration.

Spokane, Wash.—The Washington Water Power Company has applied for a franchise and a revocation of a franchise in the northeastern part of the city in order to straighten out its line. The revocation calls for the elimination of the present line on Lidgerwood Street between Eighteenth and Liberty Avenues and on Eighteenth Avenue between Nevada and Lidgerwood Streets.

Walla Walla, Wash.—The Northwestern Gas & Electric Company has asked for an extension of its franchise in Walla Walla City, covering its three activities, electric power and lighting, street railway and gas. The extension is asked to make the present franchise correspond with the new $5,000,000 bond issue, which is to run for 25 years. It is stated that the company has under advisement the construction of electric railways to Wallowa, Ore., and Dayton, Wash. This latter, it is said, will be the electrification of the Northern Pacific Railroad from Walla Walla to Dayton.

TRACK AND ROADWAY

Calgary (Alta.) Municipal Railway.—The electors have passed a by-law authorizing an expenditure of $40,000 to be used for extensions and improvements to the local street railway.

Interurban Railway, Helena, Ark.—This company proposes to build at present only 4 miles of the projected street railway from Helena to West Helena. This will require two wooden bridges, each 26 ft. long. R. L. Leonard has the contract for earthwork and C. H. Purvis is engineer in charge, both at Helena, Ark. Connections will be made with the Missouri & North Arkansas Railroad and the Missouri Pacific Railway. E. C. Horner, president and John S. Horner, secretary and treasurer. [E. R. J., Nov. 6, '09.]

Meriden, Middletown & Guilford Railway, Meriden, Conn.—This company has awarded a contract to F. Arrigoni &

Bros., for the building of a section of its proposed electric railway from Durham to Middletown. Francis Atwater, president. [E. R. J., Nov. 13, '09.]

Paris & Northern Railway, Danville, Ill.—W. M. Bridgett, president of this company, which contemplates building an electric railway between Paris and Danville, writes that matters are still in a preliminary stage. At present the company is at work securing the right-of-way. The line, as projected, will be 22 miles long. Capital stock, authorized and issued, $5,000. Officers: W. M. Bridgett, president and purchasing agent; Geo. G. Rowland, vice-president; Charles Troup, secretary; L. C. McGee, treasurer; W. H. Martin, chief engineer, all of Danville. [E. R. J., Sept. 25, '09.]

Yorkville & Morris Railroad, Yorkville, Ill.—A. G. Palmer writes that construction of this proposed 23-mile railway will not be resumed until next spring. About 3 miles of track have been constructed out of Yorkville. This track is eventually to be extended to Ottawa, via Wedron, and Sheridan. By option and contract, Mr. Palmer has secured all stock from an old charter dated Oct. 20, 1901, which has been turned over to this new company. McKeen motor cars will be operated. It is proposed to erect the repair shops at Yorkville. Capital stock, authorized and issued, $500,000. Hugh G. Palmer, Box 305, Aurora, Ill., president and chief engineer. [E. R. J., Sept. 4, '09.]

Delphi, Flora & Burlington Traction Company, Delphi, Ind.—E. W. Bowen advises that this company was organized about six weeks ago for the purpose of building an interurban railway between Delphi, through Flora and up to Burlington, a distance of 22 miles. The electors of Deer Creek, Monroe and Burlington Townships of Carroll County on Nov. 9 voted a subsidy tax amounting to $68,475 in aid of the construction of the line. Directors: James C. Smock, Martin G. Haun, Wm. Donlin, Frank S. Blythe and E. W. Bowen. [E. R. J., Nov. 6, '09.]

Cincinnati, Madison & Western Traction Company, Indianapolis, Ind.—The election held in Saluda and Republican Townships a few days ago, on the question of voting a 2 per cent subsidy tax in aid of the Cincinnati, Madison & Western Traction Company, resulted in Saluda Township giving a majority in favor of the subsidy. Republican Township, which previously voted a tie, gave a majority of 62 against the subsidy. [E. R. J., Oct. 16, '09.]

South Bend & Logansport Traction Company, South Bend, Ind.—Construction was begun on Nov. 10 at Plymouth on the proposed electric railway which is to connect South Bend and Logansport. Work was begun under the direction of the Butterfield Construction Company, Goshen, general contractors for the company. [E. R. J., Oct. 23, '09.]

***Muscatine, Ia.**—A meeting was recently held in Buffalo at which plans were formulated for the construction of an electric railway to connect Muscatine with Rock Island, via. Buffalo Prairie, Andalusia, Drury and Edgington Townships. Preliminary surveys will be made at once. The following were elected officers of the preliminary organization: Dr. E. L. Marston, president; A. W. Elliott, vice-president; Dr. B. V. Marquis, secretary; George Rausch, treasurer.

Detroit, Lansing & Grand Rapids Railway, Detroit, Mich.—This company announces that it is preparing to start construction about March 1 on the proposed railway which is to be extended from Detroit to Grand Rapids via Lansing. The contract for surveying the right-of-way has been awarded to P. C. Johnson, Chicago, Ill. The motive power will be electricity. Headquarters, 706 Union Trust Building, Detroit, Mich. [E. R. J., Sept. 11, '09.]

***Mankato, Minn.**—It is reported that J. D. Browning, K. C. Buckeye, Joliet, Ill., and B. C. Wooley, Sioux City, Ia., are investigating the feasibility of building an interurban railway to connect Mankato with St. Paul and Minneapolis.

Interstate Railway, Kansas City, Mo.—This company has served a notice on Judge J. G. Park of the Circuit Court of an appeal taken in the injunction suit brought against the Missouri River & Cameron Railway from his court to the State Supreme Court. Two months ago the Interstate Railway secured a temporary injunction against the Missouri River & Cameron Railway restraining the latter from building the proposed electric railway between St. Joseph and Kansas City. Last week the restraining order was dissolved. [E. R. J., Nov. 6, '09.]

Nebraska Transportation Company, Omaha, Neb.—It is announced that this company plans to begin work on the new electric railway between Omaha and Fremont about March 1, 1910. The line is to cross the Elkhorn River near Elk City, about 12 miles east of Fremont, and the power plant of the line will be erected on the banks of the river, according to present plans. Already about 20 miles or right-of-way has been secured. C. W. Baker, president. [E. R. J., Oct. 2, '09.]

***Reno, Nev.**—It is stated that surveys have been completed for an electric railway connecting Ely, East Ely, Smelter, Riepetown and the mines of Ely, and construction work will soon commence. G. L. Rickard is said to be interested.

Rockland Railroad, New York, N. Y.—Announcement is made that this company, which proposes to build an electric railway to connect Tappan, Suffern, Stony Point and Nyack, will be ready to take construction work on the line early next spring. It will be approximately 49.12 miles long. Other cities through which the line will pass are Englewood, Closter, New City, Haverstraw, Spring Valley and Pear River. No contracts have been let as yet. Headquarters, 165 Broadway, New York. Arthur C. Miller, second vice-president and general manager. [E. R. J., Sept. 4, '09.]

Findlay-Marion Railway & Light Company, Columbus, Ohio.—A number of men interested in this company met in Columbus a few days ago and discussed the proposition to construct the proposed line at an early date. The estimated cost of building the 46 miles of road is $1,250,000. While the capital stock stands at $250,000, it is possible that it will be increased to an amount that will cover the cost. New York capitalists are said to be ready to take the bonds and build the railway. A construction company will probably be organized for this purpose. G. W. Meeker, Columbus, is one of the projectors of the line. Traffic arrangements have been made with the Columbus, Delaware & Marion Railway for entrance to Columbus and the Toledo, Bowling Green & Southern Railway for connections with Toledo. [E. R. J., Feb. 13, '09.]

Massillon, Wooster & Mansfield Traction Company, Mansfield, Ohio.—J. A. Shaidnagle, a director of the company, states that eastern capitalists have agreed to take the underwriting of the company's bonds to the extent of $3,000,000 and that the line will be built between Massillon and Mansfield, with a branch to Barberton by way of Turkey Foot Lake. [E. R. J., Jan. 16, '09.]

Hocking-Sunday Creek Traction Company, Nelsonville, Ohio.—Warren Badger, chief engineer, writes that this company plans to complete 14 miles of single track during the coming year. One mile of track has been completed and 3 miles are under construction. It will be a gasoline-motor system extending from Nelsonville to Athens and Glouster. Three cars will be purchased from the McKeen Motor Car Company. [E. R. J., July 24, '09.]

El Reno (Okla.) Interurban Railway.—This company has awarded a contract for the completion of its electric railway into El Reno from Yukon to the Adams Construction Company, El Reno. Work has already been started. It is proposed to connect El Reno and Oklahoma City, a distance of 25.5 miles. [E. R. J., April 24, '09.]

Hamilton, Waterloo & Guelph Railway, Hamilton, Ont.—This company has given notice of application to the Dominion Parliament for an extension of time for the completion of its railway, and for power to extend the line from Hamilton to Toronto or, in the alternative, enter into an arrangement with the Hamilton Radial Electric Railway for running rights over its line to Toronto, when that company builds its proposed extension from Oakville to Toronto.

***Toronto, Ont.**—The proposed subway for Toronto was discussed at a private meeting of the special civic committee on Nov. 10. J. W. Moyes, who is preparing his report, was present at the discussion, and gave a brief outline of what is proposed in his report, which will not be ready for a while. The plan is to construct a subway on Yonge Street from the Bay to St. Clair Avenue beyond the north limit of the city, and also one on Front Street near the lake front connecting the Union Station with St. Lawrence Avenue on the east. The whole system will be about 4 miles in length. It is intended to connect the northern and northwestern section with the local street railway and if the operation of the subway proves successful extensions will follow.

Oregon Electric Railway, Portland, Ore.—This company has certified to the State that it proposes to build the following extensions: From Salem to Roseburg on the main line; a branch to leave the main line somewhere between Portland and Tualatin, and operating to a point on Tillamook Bay; a branch line from Albany extending to Cascadia; a branch line paralleling the main line only on the west side of the Willamette River, leaving the main line somewhere between Portland and Wilsonville and running into Eugene, and an east and west line from Dallas through Salem to Mill City.

Crook County Water, Light & Power Company, Prineville, Ore.—This company has awarded to Fred A. Rice the contract for the completion of a survey for an electric railway from Opal City to Prineville. It is the intention of the company to generate the power for the railway at Oden Falls, where contracts have already been awarded for the construction of the power plant. [E. R. J., Feb. 27, '09.]

Duquesne & Dravosburg Street Railway, Duquesne, Pa.—Grading has been started on the right-of-way of this company's line between Duquesne, Dravosburg and McKeesport. John W. Spering, Duquesne, has the contract for the bulk of the construction work which will be necessary. [E. R. J., March 13, '09.]

***Shelbyville, Tenn.**—W. C. Frost, of Nashville, Tenn., wishes to communicate with reliable railroad builders who might become interested in a plan for an electric railway between Shelbyville and Fayetteville, Tenn., of 30 miles. It is stated about 75 per cent of the grading is completed and residents offer to take $100,000 in stock. It is estimated that it will cost $200,000 to build the road.

Washington Traction Company, Walla Walla, Wash.—This company advises that work will be started within the next few weeks on the projected railway which is to connect Dayton, Wallula, Waitsburg, Dixie, Walla Walla, Milton and Pasco. It will be 143 miles in length. A site for the proposed power station has not yet been selected. The repair shops will be built at Walla Walla. Gilbert Hunt, Walla Walla, president.

Washington-Oregon Traction Company, Walla Walla, Wash.—It is announced that this company is about to award contracts for the construction of the projected electric railway between Walla Walla and Pendleton, Ore., 53 miles. It is possible that work will be started by Dec. 1. The power plant and repair shops will be located at Walla Walla. The company expects to furnish power for lighting and industrial purposes. Capital stock, authorized, $1,500,000. Officers: S. Drumhiller, president; E. S. Isaacs, secretary; John Smith, treasurer; W. S. Matthias, acting general manager. [E. R. J., July 3, '09.]

Potomac Valley Railway, Wheeling, W. Va.—L. S. Kirker advises that this company has done considerable construction on its proposed electric railway, but work has now been discontinued. It is planned to resume work next spring. It will connect Bloomington, West Virginia, Junction, Luke, Md.; Keyser, Piedmont and South Keyser, W. Va. Capital stock, authorized, $300,000. Officers: Joseph J. Benter, Edgewood, president; Chas. H. Geiger, Wheeling, secretary and treasurer; L. S. Kirker, P. O. box 426, Wheeling, chief engineer. [E. R. J., Sept. 26, '08.]

SHOPS AND BUILDINGS

San Bernardino Valley Traction Company, San Bernardino, Cal.—This company is preparing plans for the erection of a new building to the east of its car house on South E Street, San Bernardino, in which will be located the carpenter and paint shops.

West Side Electric Street Railway, Charleroi, Pa.—This company is engaged in erecting a new car house in Charleroi. The structure will be 30 ft. x 200 ft. and will be built of brick.

Northern Texas Traction Company, Fort Worth, Tex.—The J. W. Slaughter Construction Company is engaged in erecting a building for this company to be used as a terminal station in Dallas. The building will contain a waiting room, baggage room, ticket office and office for the city passenger agent.

Seattle, Renton & Southern Railway, Seattle, Wash.—This company has filed plans for a two-story fireproof car house, 73 ft. x 109 ft., to be erected at 5039 Ranier Avenue. The building is to cost $8,000. C. H. Anderson, architect.

POWER HOUSES AND SUBSTATIONS

Athens (Ga.) Electric Railway.—This company has secured control of Barnett Shoals, near Athens, and will in the near future develop 4000 hp and transmit it to Athens.

Beaver Valley Traction Company, Beaver Falls, Pa.—This company is said to have authorized an expenditure of $10,000 for additional power plant and storage battery equipment.

Galveston-Houston Electric Railway, Houston, Tex.—This company, which is building an electric railway between Galveston and Houston, will erect its main power plant at Texas City, on the water front of Galveston Bay, about 3 miles from the main line of the interurban. The first installation of 1500 kw will consist of turbo-generators of 1000 kw and 500 kw capacity. Specifications have not been drawn up yet nor has any date been set to open bids for equipment.

Manufactures & Supplies

ROLLING STOCK

Dominion Power & Transmission Company, Hamilton, Ont., it is reported, will shortly buy 10 new cars for city service.

People's Street Railway, Nanticoke, Pa., expects to purchase one or two double-truck semi-convertible cars in the near future.

Indiana Union Traction Company, Anderson, Ind., has purchased one 21-ft. car body from the Dorner Railway Equipment Company.

Columbus, Delaware & Marion Railway, Columbus, Ohio, which is in receiver's hands, has been authorized to buy five new cars for use in Delaware and Marion.

Hagerstown (Md.) Railway, reported in the ELECTRIC RAILWAY JOURNAL of Nov. 13, 1909, as being in the market for rolling stock, will not purchase any cars at this time.

Montreal (Que.) Street Railway has purchased one second-hand Ruggles rotary snow plow from Wendell & MacDuffie Company, New York, N. Y.

Interborough Rapid Transit Company, New York, N. Y., has purchased 20 all-steel work cars about 33 ft. long from the Ralston Steel Car Company, Columbus, Ohio.

General Electric Company, Schenectady, N. Y., placed an order with Wendell & MacDuffie Company, New York, N. Y., for one special narrow-gage McGuire-Cummings sweeper to be used in the company's yards.

Muskegon (Mich.) Railway & Light Company has purchased two 21-ft. car bodies mounted on Brill 21-E trucks from the Dorner Railway Equipment Company. The cars are equipped with Westinghouse No. 49 motors.

Northern Ohio Traction & Light Company, Akron, Ohio, mentioned in the ELECTRIC RAILWAY JOURNAL of Oct. 9, 1909, as being in the market for 15 cars, will purchase six interurban, five double-truck city and four single-truck city cars.

Covington & Southwestern Railway, Kingman, Ind., a road under construction, has purchased from the Dorner Railway Equipment Company, Chicago, one 21-ft. car mounted on Brill 21-E trucks and equipped with GE-800 motors.

Corsicana (Tex.) Transit Company has just placed an order with The J. G. Brill Company for two double-truck, semi-convertible cars. These cars are to replace those lost by fire, as mentioned in the ELECTRIC RAILWAY JOURNAL of Oct. 9, 1909.

Shore Line Electric Railway, New Haven, Conn., is having 12 cars built by the Jewett Car Company, and a number of other cars will be purchased. Mention of this contemplated purchase was made in the ELECTRIC RAILWAY JOURNAL of Sept. 18, 1909.

North Jersey Rapid Transit Company, Paterson, N. J., mentioned in the ELECTRIC RAILWAY JOURNAL of Nov. 6, 1909, as being ready to purchase some interurban cars, has placed an order with the Jewett Car Company to build six 30-ft. car bodies. Peter Smith 3-C heaters will be used on these cars.

Wabash & Northern Indiana Traction Company, Warsaw, Ind., mentioned in the ELECTRIC RAILWAY JOURNAL of Oct. 30, 1909, as contemplating the purchase of nine 50-ft. interurban cars, has placed an order with the Jewett Car Company for seven cars through the Miami Valley Construction Company of New York. Peter Smith 2-C heaters were specified. Several more cars will be ordered early next year.

Yakima Valley Transportation Company, North Yakima, Wash., has placed an order with the Niles Car & Manufacturing Company for one 45-ft. interurban combination passenger, smoking and baggage car, one 45-ft. express and baggage car and one 40-ft. construction car. The passenger car will be equipped with Hale & Kilburn rattan seats, Peter Smith hot-water heaters, Stanwood steps, water-flushed toilets and General Electric air brakes.

Long Island Railroad, Long Island City, N. Y., has closed an order with the American Car & Foundry Company for 15 combination baggage and passenger cars, 65 ft. long, and is also having the Standard Steel Car Company build 15 baggage cars, 64 ft. 5¾ in. long. All this rolling stock will be equipped for electric operation. With the 100 cars mentioned in the ELECTRIC RAILWAY JOURNAL of July 10, 1909, the order for motor cars is now complete, making a total of 130 cars, for which the company was originally in the market.

Buffalo & Lake Erie Traction Company, Buffalo, N. Y., has ordered two motor express car bodies from the Cincin-

nati Car Company. The cars will have one large sliding door in the center on each side of the car. Other details specified follow:

Bolster centers...29 ft. 6 in.	Control system. GE type "K"
Length of body..50 ft.	Couplers .....Janney
Width over sills.. 8 ft. 8½ in.	Fenders or wheelguards, pilots
Sill to trolley base. 9 ft. 1 in.	
Height, rail to sills.....41 in.	Hand brakes....two Peacock
Body .....wood	Heaters.....caboose stove
Interior trim..pine sheathing	Headlights.....GE arc
Underframe .....composite	Roofs.....Monitor deck
Air brakes.....West. SME	Sanders.....two pneumatic
Bolsters, body..built-up steel	Trucks.....Am. Loco. Co.
Bumpers, 8 in. x ½ in. steel plate	Lamps.....4-Tornado oil tail

The company has also ordered one double-shear electric snow plow from the Cincinnati Car Company which is similar to the one built for this company last year, all the details of which follow:

Bolster centers.....20 in.	Fenders or wheelguards, steel broom
Length of body.....40 ft.	
Width over sills.....8 ft. 6 in.	Headlights.....GE arc
Body .....wood	Journal boxes, Stand. Motor Truck
Interior trim..pine sheathing	
Underframe .....wood	Roofs .....flat
Air brakes. West. straight air	Sanders.....two air-operated
Bolsters, body..built-up steel	Trucks..Stand. Motor Truck
Bolsters, truck, Stand. Motor Truck	Wheels.....34 in. diameter
Brakeshoes, A. S. & I. R. Ass'n Std.	Shear at each end to have adjustable nose operated by air.

TRADE NOTES

Perry Ventilator Corporation, New Bedford, Mass., received an order to furnish the ventilators for the new cars being built for the Oklahoma Railway.

H. M. Byllesby & Company, Chicago, Ill., have secured the services of L. M. Boisen as power engineer. Mr. Boisen was formerly with the Grand Rapids & Muskegon Power Company.

Lackawanna Bridge Company, Lackawanna, N. Y., has elected John H. Nichols, formerly assistant general sales agent of the Lackawanna Steel Company, to the office of vice-president.

American Car & Foundry Car Company, St. Louis, Mo., is contemplating the erection of a one-story building in connection with its Detroit plant, 60 ft. wide and 1000 ft. long, of brick and concrete.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., announces that C. E. Allen, formerly connected with the General Electric Company, has entered its employ in connection with the sale of transformers.

Detroit Graphite Company, Detroit, Mich., will have its Philadelphia office in the Land Title Building managed by DeWitt C. Smith, who was formerly manager of the paint department of the Joseph Dixon Crucible Company, Jersey City, N. J.

George W. Hoffman, Indianapolis, Ind., sole proprietor and manufacturer of U. S. Metal Polish and other specialties, died at his home on Friday, Oct. 22, 1909, after a short illness. His business will be continued by his widow.

O. M. Edwards Company, Syracuse, N. Y., has appointed W. C. Bradbury, of St. Louis, Mo., as its manager in the territory near St. Louis and also the Southwestern States. E. T. Chaffee, formerly Eastern manager of the sales department, has been appointed general sales manager.

Pressed Steel Car Company, Pittsburgh, Pa., and the Western Steel Car & Foundry Company will remove their offices for the Southern district on Dec. 1, 1909, from Atlanta, Ga., to the Munsey Building, Washington, D. C. L. O. Cameron will be in charge as manager of sales.

Stone & Webster Engineering Corporation, Boston, Mass., has been engaged by the General Electric Company, Schenectady, N. Y., to construct a reinforced concrete shop building at the Schenectady works. The building will be 80 ft. x 400 ft., but the plans have not yet been completed.

Cincinnati Car Company, Cincinnati, Ohio, is erecting a building 110 ft. x 255 ft. for the construction of all-steel underframes and semi-steel or all-steel car bodies. The company has under consideration the matter of making additions to its plant calculated to double its present output.

T. H. Symington Company, Baltimore, Md., has placed E. H. Symington at its Rochester (N. Y.) plant as works sales manager. Mr. Symington formerly was manager of the Western sales department of this company, and was located at Chicago. Owing to an injury he has been absent from duty for the past three years.

George W. Jackson, Inc., Chicago, Ill., which has carried out many important engineering undertakings in and about Chicago, including the construction of more than 50 miles of freight tunnels and the foundations and part of the approaches to the $20,000,000 terminal of the Chicago & North Western Railway, has recently organized a railway construction department, which will build electric and steam railways. During the present year George W. Jackson, Inc., has completed the superelevation of the tracks of the Chicago & Oak Park Elevated Railroad at and near the intersection of that line with the 10-track elevated roadway leading to the new terminal station of the Chicago & North Western Railway. This included raising the double-track structure of the Chicago & Oak Park Elevated Railroad, operating on West Lake Street, for a distance of approximately 3500 ft. In conjunction with this elevation a bridge span 155 ft. long and 55 ft. wide was inserted in the elevated structure where it passes over the steam railroad tracks. All this work was carried on without disturbing traffic on the elevated road owning the structure or the surface roads in the street below.

ADVERTISING LITERATURE

Chisholm & Moore Manufacturing Company, Cleveland, Ohio, has issued a catalog of its hoists.

Frank Ridlon Company, Boston, Mass., has issued its list of second-hand electrical machinery for November, 1909.

Handlan-Buck Manufacturing Company, St. Louis, Mo., has issued a catalog of its railroad lanterns and switch, semaphore and train lamps.

St. Louis Malleable Casting Company, St. Louis, Mo., has issued catalog No. 200 of its malleable pole and line hardware and other electrical specialties.

John A. Stewart Electric Company, Cincinnati, Ohio, has issued a special list of electrical and steam machinery for immediate delivery, dated October, 1909.

Pettingell-Andrews Company, Boston, Mass., in the November issue of its house organ, *Juice*, publishes short articles on "The Development of the Knife Switch" and "The Grounded Secondary" and also describes Crown trolley wheels, Sheraduct and a number of other specialties.

New York Pole Company, New York, N. Y., has issued a publication entitled "Old Tubular Poles Made New," in which the company's process of reinforcing metal poles which was the subject of an article in the Electric Railway Journal of April 3, 1909, is described and illustrated.

Flood & Conklin Company, Newark, N. J., has issued a booklet entitled "The F. & C. Line. 'It Goes Everywhere,'" in which is contained a careful description of the Flood & Conklin Company's systems of surfacers for wood and metal railway cars with suggestions about effective methods of applying them.

Niles-Bement-Pond Company, New York, N. Y., has issued a publication in which its machine tools and cranes for electric railway repair shops are described and illustrated. The aim of the publication is to show the varied uses of the Niles-Bement-Pond wheel lathe and a number of other machines applicable to street railway work.

Coleman Fare Box Company, Buffalo, N. Y., has issued a publication entitled "Why is the Coleman Fare Box a Necessity on the Pay-as-You-Enter Car?" The method of collecting fares and handling transfers is described and the application of Coleman fare boxes to pay-as-you-enter cars is illustrated. A list of 20 reasons is given for the superiority of the Coleman Fare Box.

U. S. Wood Preserving Company, New York, N. Y., has published a four-page folder in which is reproduced a letter from the Metropolitan Street Railway, New York, N. Y., signed by W. T. Dugan, engineer of maintenance of way, in which the experience of that company with wood paving is related. The letter is addressed to the chairman of the Eastern Market Street Business Men's Association, Philadelphia.

Buda Foundry & Manufacturing Company, Chicago, Ill., has issued a publication entitled "Solving the Motor Car Question." This company has recently taken over the manufacture of two types of cars formerly made by the Stover Motor Car Company. It has illustrated and described briefly in the publication its No. 14 motor car, a regular work car for section use, with a single seat, with two seats and with two seats and a canopy; its Buda 10-hp engine; its Buda 10-A motor velocipede; its Buda 12-A motor velocipede; its six-passenger inspection car, and its six-cylinder 25-passenger car. This is a car intended especially for service on branch lines and at times when traffic over main lines does not warrant the full service. The company has issued a special booklet descriptive of this car which gives complete specifications.