

# Electric Railway Journal

A CONSOLIDATION OF

Street Railway Journal and Electric Railway Review

VOL. XXXII

NEW YORK, SATURDAY, SEPTEMBER 5, 1908

No. 14

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.

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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.  
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Single copies .....10 cents  
Combination Rate, with Electric Railway Directory and Buyer's Manual (3 issues—Feb., Aug. and Nov.).....\$4.00 per annum  
Both of the above, 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  
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*Of this issue of the ELECTRIC RAILWAY JOURNAL 9500 copies are printed.*

### The Rehabilitation of San Francisco

During the two and one-half years which have elapsed since the fire and earthquake at San Francisco, progress in rebuilding the city has been made, although at a less rapid rate than was hoped soon after the disaster. Labor strikes, exposure of municipal corruption and political dissensions have exhausted part of the energy which might better have been spent in a unified effort to re-establish promptly the industries, transportation facilities and prosperity of the

city. These adverse conditions, however, have now largely passed away, certainly so far as the railway system is concerned, and the latter is now in far better condition than ever before. The bright side of a catastrophe such as that in San Francisco is that it allows one to build anew on broad lines rather than piecemeal. Fortunately in San Francisco the electric stations suffered less severely than the cable and advantage was taken of this fact, as well as of the fire, to discard the older power except on a few steep routes. All of this work is described elsewhere in this issue and the article should prove an interesting sequel to the tales of woe and loss which followed the fire of April, 1906.

### The Passing of the Cable

San Francisco and Chicago were the last of the large cities to change from cable to electric power, and while there are still a few cable lines in service in the East as well as the far West, the years 1907 and 1908 witnessed the practical passing of this motive power for street car operation in this country. The two most important lines abroad are in Edinburgh and Melbourne. In the former a change to electricity has been delayed for local reasons, although frequently discussed. In Melbourne electricity will undoubtedly be adopted after the expiration of the existing franchises, a few years hence. Thus the motive power which was first demonstrated to be applicable to street railway conditions in San Francisco 36 years ago, and was widely adopted throughout the country between 1880 and 1890, has finally succumbed, except under a few extreme conditions of grade, to its younger rival. Will electricity suffer the same fate within the next 30 or 50 years? We think not. The chief objection to the cable was not its cost of operation, but its non-adaptability for any conditions except those of heavy city traffic. Hence it was unsuitable as the general motive power of a large system. Electricity is better adapted to wide variations in traffic than any other means of car propulsion yet discovered and therein lies its chief claim for adoption and continuance on street railways.

### A Reduction of Accidents in Chicago

The first definite statements with regard to the reductions in accidents in Chicago since pay-as-you-enter cars were put into service have just been given out by the Chicago City Railway. For the six months' period ended July 31 last the lines on which these cars are operated show a decrease of 16.2 per cent in the number of accidents with an almost entire elimination of accidents occurring at the platform steps. In connection with this reduction it may not be uninteresting to review briefly a few statistics with regard to fatalities in Chicago, in Cook



County and throughout the State of Illinois. Figures just available show that during the first six months (Feb. 1 to July 31, 1908) of operation for the second year of the rehabilitation period, the fatalities were 31.37 per cent less than for the similar period of the preceding year. This reduction is based on accurate records of all fatalities occurring on the whole property, including track work, shop work, car service, building constructions, power stations, operation and construction, etc. The pay-as-you-enter cars now in service on the main traveled lines are given credit for a goodly share of this reduction.

Considering all the fatalities on the system for the period above mentioned, the death rate was one killed to 4,173,727 persons carried. If this is compared with the six months' period of 1907, we find a marked decrease in the loss of life. The record for the period from Feb. 1 to July 31, 1907, was one passenger killed to 2,596,919 carried. An examination of the annual report of the coroner for Cook County, which records the fatalities on all electric railway lines, shows that during the year ending Feb. 28, 1907, but 183 persons were killed. Of this number only 36 were passengers and 12 were employees. By far the greater number, 135, or nearly 75 per cent, were neither passengers nor employees. A further analysis of the coroner's report for 1907 covering fatalities on all electric roads shows that of the 183 persons killed 56 were killed at crossings and of the 127 killed not at crossings, 65 or 35 per cent were accidentally killed while crossing the tracks. The latter fatalities, comprising nearly one-third of the total number killed on all the roads, occurred presumably between stopping places where the operating companies are not held strictly liable when reasonable carefulness of operation is exercised. During the year ended Nov. 30, 1907, the 145 steam railroads in Illinois killed one passenger to every 600,407 carried, and the 45 electric and elevated and surface roads in Illinois but one in 2,602,393.

### Negligence and Contributory Negligence

The law, very properly, does not award damages to an injured person in a negligence case if he could have avoided the accident by the exercise of caution. It does not demand from him an extraordinary amount of care, but requires only that which the average person might reasonably have been expected to do under the circumstances. The defense of contributory negligence, therefore, is the one usually offered in accident cases, but is by no means the only defense available. The law does not hold a person responsible for those accidents which in legal phraseology are termed the acts of God. Thus, in a recent case decided in Texas, where during a severe thunder and hail storm a telephone wire fell on a trolley wire and the current from the latter, passing through the telephone wire, killed some horses, neither telephone nor railway company was held responsible. The judge decided that both had taken all reasonable precautions to protect their circuits and the damage was directly traceable to the lightning and extraordinary convulsion of nature represented by the storm. On the other hand, it has been held that one who is engaged in an occupation which is recognized as especially hazardous to others, is responsible for damages which result even if he has exercised caution which would exculpate him under

other conditions. Thus, the keeper of a menagerie who keeps wild beasts in captivity is held liable for the injury which they cause if they get loose, even if he has taken all the precautions which ordinary thought would suggest. Between these two extremes, of course, a very large number of cases lie.

Two decisions were handed down recently in New England which illustrate the viewpoints which the courts are taking in negligence cases involving breakdown of equipment. The first was in the court of last resort in Rhode Island and the other in that of Massachusetts, and both involve an accident caused by the failure of apparatus to work. The Rhode Island case was decided June 5 and was brought by a woman who had been in a collision caused by a runaway car, due to a defective brake. Testimony showed that the motorman did everything which he could to check the car and that the brake apparatus appeared to have been in good order when the car left the car house. As the failure was without premonition or warning the court denied the claim of the plaintiff and remitted the case to the Superior Court from which it had come for a new trial on other issues.

The second case was on the Boston & Northern Street Railway and was also due to the failure of a brake to prevent a rear-end collision, in which the motorman was injured. The latter, who was the plaintiff in the suit, had previously discovered that the brake was defective and had notified the inspector of this fact, but after the latter had tested the brake and had finally made it work the motorman continued to run the car. The court held that this should have made the motorman exercise special care because he had knowledge of the imperfect condition of the equipment. It was also shown that the company had issued a rule book giving special instructions how to avoid rear-end collisions. It termed them "inexcusable accidents" and charged the motormen to keep as far from the car ahead as absolute safety required. The motorman, who had been on the line only three weeks, excused himself by saying that he had not had time to read the rules, but this was not held to relieve him from the obligation, and the fact that he kept his car close behind the one with which he later collided and that when he found that the brake would not stop the car, did not attempt to use the reverse, indicated sufficient contributory negligence to excuse the company.

### The Zone System of Fares in America

The suggestion of the Public Service Commission, First District, of New York, that a special rate be charged for joint transportation on the Metropolitan and Fifty-ninth Street lines between 116th Street and Thirty-fourth Street in New York is the first positive indorsement which we recall of the zone system for cities by any governing body in this country. To be sure, the plan suggested is not precisely the same as that used on many of the street railways abroad and often extolled by returning European travelers as the ideal method of charging for street railway transportation. In the European system the fare is graded to a large extent upon the distance traveled. The suggestion of the Public Service Commission is not so far reaching and does not contemplate a rate which for the distance traveled is less than that charged elsewhere in New York. The commis-



sion has not even announced itself in favor of a 5-cent rate for the route in question. So far it has simply asked the companies whether they could not agree upon a joint rate which would be less than 15 cents for a ride the maximum length of which is less than 5 miles. Nevertheless, as limits are proposed for rides on through cars, the order if legal would mean the establishment for this particular route of the chief characteristic of the zone system. The companies' replies were published in these columns last week and gave, among the other reasons for not complying with the request, the difficulty of distinguishing on the longitudinal lines in New York between those passengers who were entitled to ride only as far as Thirty-fourth Street south or 116th Street north, and those who had paid their fares in the usual way.

As no joint rate has yet been ordered and as the question whether the commission has the right to establish such a rate may reach the courts we shall not now discuss either the legality or the equity of any such possible ruling. It is not out of place, however, to consider in a general way the question which this condition in New York has brought up, namely, the suitability for American city conditions of the zone system in any of its various forms; that is, the plan of proportioning the charge for city transportation in some degree to the distance traveled.

If we examine the arguments in favor of the zone system we see that they have much to commend them, at least upon first inspection. In the first place railway authorities are agreed that on many of our large street railway systems a passenger who rides as far as he can for a nickel costs the company more than it receives for his fare, yet the present policy encourages the long distance riders and discourages from using the cars those who have only a few blocks to go. Again, conditions may arise when there are two or more companies in a city, as in New York, where under the American plan several fares must be charged for a comparatively short ride between two points on a direct line of travel. Is there not some logic in the plea of the public for an elimination of such inequalities and would not the companies benefit by a readjustment of rates, not on a lower unit basis, but on one which would make the charge more proportional to the cost of carrying each passenger? Finally, the uniform fare system is usually credited with distributing the population of a city over wide areas and with thus reducing the congestion of the poorer classes in tenement districts. But the most badly congested districts in New York are on the East Side, where the people do not ride at all to and from their work, but live within walking distance of their shops or factories. If we neglect from consideration the medium-sized city where a person can ride within a reasonable time for a 5-cent fare from his place of work to the suburbs and consider the large city only, the congestion problem as well as that of uniform fares assume a different aspect.

These and other arguments have been urged in favor of a graded fare and sound logical, but a closer examination of the conditions and of American customs will indicate that the successful introduction of the system would be attended with many practical difficulties.

It should also be stated that the zone system, though common in Europe, is by no means so universal there as is

often claimed. Among the prominent exceptions, in addition to most of the underground and elevated railways, are the principal surface railway systems in Berlin, most of the surface railways of Paris, the 'buses in the latter city and the surface railway systems in Leipzig, Lyons and Munich, an extra charge being made on the surface lines for transfers. By a coincidence the American monetary system contains a coin—the nickel—which corresponds with remarkable closeness to the price which the average street railway has to charge for a uniform fare. This greatly simplifies the payment of fares. It is the opinion of many European managers that if there were single coins of corresponding value in their countries the uniform fare system would be far more general abroad.

The chief objections to the establishment of a zone system of fare collection of city roads in this country lie in the added labor and cost of identifying passengers according to the distance for which they are entitled to transportation and the difficulty of changing the habits of the public in paying for passage. In Europe people are accustomed to compliance with all sorts of petty rules; police regulation is strict, and any one detected in attempting to ride farther on a railway than the distance for which he has paid is pretty apt to find himself summarily haled before a magistrate and repenting his conduct in jail. Americans are so used to the simplicity of the single fare system that they could with difficulty, if at all, be brought to put up with the annoyances and delays inseparable from a system of fare receipts, frequent inspections and other necessary accompaniments of the graded fare system. Moreover, such a plan would have to be put in service over the entire system, and also, it is needless to say, would be most confusing to strangers.

### A Reasonable Return

A fair determination of a reasonable return on an investment, discussed by R. H. Smith in the *ELECTRIC RAILWAY JOURNAL* of Aug. 22, 1908, page 513, is a problem that directly affects all who own or control capital, in either large or small amounts. The just solution of this problem concerns individuals of small means fully as much as corporations of great wealth. No fair answer to this question can fail to take into account the fact that a reasonable return is permissible to investors in such properties, provided there has not been wanton misapplication of capital, and provided, further, that the investment was made in a locality that is able to pay for the privileges afforded. If a railway should be built, for instance, at so great an expense that fares of \$1 per mile per passenger would meet only the operating expenses, and the residents of the community could not afford more than a 5-cent fare, no law could save the investors from the results of their folly.

The wisdom with which the rights of the various classes of investors should be considered is an aspect of the subject concerning which several fundamental principles do not seem to be clearly understood. The classes whose claims are worthy of full consideration may be described as promoters and investors. The position of the purely speculative, who become interested in securities for brief periods, may be disregarded without compunction because



they are able to protect themselves. Their success rests upon their ability to judge the future, and the risks which they assume in buying and selling securities on margin are taken in the hope of making large profits. Seeking unusual gain, men who engage in this business accept the accompanying inevitable chance of severe loss. With the capitalists who venture the initial investment required to establish a public utility and with the investors who afterward absorb the securities, an attitude of encouragement and friendliness should be exercised by all communities that desire the improvements without which no continued civic growth can take place.

Some odium is implied in the usual acceptance of the term promoter by the public, but this is due to a failure to separate those who perform labors of distinct value to the community from some who would bring opprobrium upon any trade, business or profession in which they might engage. The misdeeds of a few should not condemn all. A promoter seeks the field where a quick profit is most likely to be secured; he works at great expense and deserves a larger return on the construction and successful initial operation of a property than an investor whose interest or obligation in the business was acquired only after its certain success had been demonstrated.

The creation of any new property requires unusual qualities of enterprise and skill for which compensation must be allowed. If there were to-day no transportation lines in large cities and opportunities to construct them were offered, the bidding would be so keen that any but a small profit would be impossible. If the question rested only on the return which should be permitted to those who might engage in enterprises about the profitableness of which there was no doubt, public opinion would not be exercised.

The communities, however, that most need the development which a public utility corporation effects are those in which the return is uncertain because the volume of possible business cannot be measured with accuracy before operation begins. The promoters of enterprises in new or undeveloped localities must look ordinarily to the future for justification. When an investigation is undertaken which is designed to show the volume of business that an untried territory is likely to yield, it is always assumed that the introduction of new facilities will cause development. Without a reasonable assurance of such development, the large capital expenditure required would never be made; and it is ventured with a perfect understanding of the fact that some loss will probably result from operation during the period of development.

The question of a reasonable return affects the final investors seriously. These investors may be either institutions, including banks, or individuals and estates; they comprise buyers of stocks or bonds who purchase outright for permanent investment, having in view only the interest return, or for temporary investment, with a view to ultimate sale at a profit. Other things being equal, capital seeking investment goes to the market where it can obtain the largest return consistent with safety. While these considerations determine the course of the large volume of investment funds, the principal guiding consideration with respect to other funds is the desire to obtain securities which can be converted into cash quickly. Funds of this

latter nature comprise the temporary surplus of individuals, which may be required at any time, and part of the balance of banks. As the principal part of banks' funds available for investment consists of deposits, liabilities of the banks the payment of which may be demanded without notice, prudence requires that some proportion of the money be invested where conversion into cash will be an easy and quick process. A large part of the money so invested seeks the New York Stock Exchange, which affords a ready market for many active issues of stocks and bonds. On account of the advantageous feature of convertibility, the net interest return is lower on securities listed in this market than on other issues which may be just as good, but are not salable so readily. These interest rates, being affected by considerations wholly independent of the main question at issue, do not constitute that reasonable return to which the public authorities should hold the owners of bonds and stocks in utility corporations entitled.

It does not seem practicable to prescribe by commission a rate of interest which should apply in all instances, whether such rate be fixed at 4, 8 or 10 per cent or more. It is clear that neither the nominal interest return yielded by United States Government bonds, nor the interest paid by savings banks of recognized standing would suffice to encourage investment in public utilities. The return possible must be such as to invite capital and reward efficiency of management. What that return should be must be settled, it appears, in large measure by each community for itself, due respect being entertained for the dearth or plethora of funds seeking investment, the needs of the community and the rates of interest at which the capital solicited may be persuaded to accept the risks that must be taken. With many communities the sole determining question is not what rate shall be allowed the corporation, but rather at what rate capital can be induced to invest.

### Brake Rigging Variations

To be successful an electric railway management must take advantage of every opportunity to increase the efficiency of its apparatus and to attain this end experimental and research work is often necessary. W. H. McAloney, superintendent of rolling stock, Denver City Tramway Company, presents in this issue an article outlining the results of a special investigation which he has made with a view to improving braking efficiency. It was along novel lines and the results closely check with those secured some years ago in tests which led to the improvement of steam railroad braking methods. By means of a close study of braking conditions Mr. McAloney has readjusted the relative brake leverages on the four axles of certain of his cars so that an increase in braking power is obtained without any change in cylinders or applied air pressure.

When a car is being retarded by the use of brakes hung from the trucks there is a greater pressure between the wheels and the rails at the forward end of the car than at the rear of the car. In other words, the tendency for the body to move ahead while the trucks are retarded brings about a virtual transfer of a portion of the weight from one set of wheels to the other. Recognizing this transfer, it is possible to increase the braking power on the forward axles and decrease it on the rear axles,



thereby enabling a stop to be made within a shorter distance. Of course, advantage can be taken of this condition only on cars which are always operated in one direction. The most efficient leverage and braking power adjustments for the three different types of cars operated in Denver were determined after numerous tests covering about a year and show clearly that the theory stated above can be practically applied to advantage.

Braking conditions in steam and electric service, while similar in elementary principles, must be considered differently because of the additional factors introduced by the use of electric motors. It may not, therefore, be uninteresting to call to mind in substantiation of Mr. McAloney's results, certain fundamental principles and derivative explanations advanced by R. A. Parke as long ago as 1897 in a paper presented before the New York Railroad Club entitled, "The Effect of Brake-beam Hanging Upon Brake Efficiency." Mr. Parke said in part:

Investigation indicates that the amount of weight transferred from the rear to the forward truck is not ordinarily very great. The transfer is greater where car bodies have a high center of gravity, and it is also greater where the distance from center to center of trucks is comparatively short. In the case of long passenger cars this transfer of weight is proportionately much smaller than in the case of short freight cars; but inasmuch as the center of gravity of all cars under consideration is always at a not inconsiderable distance above the retarding forces applied, the transfer of weight from the rear to the forward truck is always appreciable. The greatest brakeshoe pressure which can be applied to the wheels without causing them to slide upon the rails, is thus limited by the pressure of the wheels of the rear truck upon the rails and no further consideration whatsoever need be given to the forward truck. What we have now to consider alone are the conditions existing upon the rear truck. \* \* \* During any application of the brakes, the rear truck carries the least weight and, in any case where the brake beams are suspended from the truck, the rear pair of wheels of the rear truck exerts a less pressure upon the rails than any other pair of wheels upon the car. If this fact is now clearly understood, it will be equally clear that, in order to prevent wheel sliding, a uniform brakeshoe pressure upon each pair of wheels must be limited to what is safe upon the rear pair of wheels of the rear truck.

All of these conclusions are based directly on theoretical reasoning. They also have been found to be correct by experiment. In steam railroad practice it has been customary for many years to use for freight cars a braking power of only 70 per cent of the weight, while for passenger cars 90 per cent of the light weight has been used as the calculated braking power. The center of gravity of a passenger car is low as compared with a freight car when the truck center distance is considered, while the center of gravity of freight-car trucks is high as compared with passenger-car trucks, if the length of wheel base is considered. For these reasons when a freight car is being braked there is a larger transfer of weight from the rear to the forward truck than occurs in a passenger equipment. Similarly, there is a larger transfer from the rear to the forward axle of each truck. These two factors combine to reduce the safe braking pressure on a freight car below that which can be applied on a passenger car if the same pressure of the brakeshoes is applied to each pair of wheels and this pressure kept within safe limits for the rear wheels; hence the existing ratio of 70 to 90.

The transfer of weight from the rear to the forward

pair of wheels of a truck suggests the important influence which the inclination of the brake hanger has upon the braking power. An examination of the method of hanging brakes shows that with inside-hung brakes having hangers properly inclined advantage may be taken of this transfer of weight from rear to forward axle during braking and the pressure of the shoes on each pair of wheels be fairly proportioned.

The inside-hung brake and its hanger form a toggle. If the angle of inclination of the brake hanger is parallel with a tangent to the wheel surface at the center of the brakeshoe, the pressure between the wheel and the shoe will be directly proportional to the force transmitted to the shoe by the brake beam or its substitute. If, however, the hanger is inclined away from this parallel position the resulting force caused by the friction between the wheel and the shoe serves to increase the pressure on the forward shoes and decrease the pressure on the rear shoes, even though the brake-cylinder pressure remains constant. By proper adjustment this transfer of pressure caused by the toggle-joint action may be utilized to take advantage of the transfer of weight from the rear to the forward axle of the car when inside-hung brakes are employed.

With outside-hung brakes constructional difficulties will not permit a proper inclination of the hangers to obtain this result. In fact, with outside-hung brakes as ordinarily constructed the brakeshoe pressure is proportionately increased upon the rear pair of wheels and lessened on the forward pair of wheels, as the application grows heavier. This result is the opposite of that desired and that attained with inside-hung brakes. We thus see that the transfer of weight as regards a truck alone may be taken care of in the brake rigging itself.

On electric motor cars a condition which the brake rigging must take into account appears if the motors are not mounted on all axles. It is evident that additional braking force must be applied to the wheels connected to an armature, and this force must be of such an amount that it will destroy the kinetic energy of rotation at the same rate that the car would be retarded if the dead weight alone had to be considered and the brakes were properly designed. This subject was discussed in detail by H. M. Prevost Murphy, in the *ELECTRIC RAILWAY REVIEW* for Nov. 23, 1907. Formulæ are available for determining this necessary addition to the braking pressure, so this condition is one that can be taken into account while designing the brake.

In the results presented by Mr. McAloney it is shown that the best braking effect is obtained when the pressure on the No. 2 and No. 3 axles is equal. This would seem to indicate that following the analogy of steam practice either the brake hangers cannot be adjusted to take advantage of the transfer of weight in the trucks alone, or that the motor armatures introduced a variable over-powerful factor. The latter condition is quite probable because the truck frames used under the Denver cars were designed with lightness in view.

The gist of this whole argument is that if the utmost advantage is to be taken of the transfer of weight due to the overturning effect of a car when the brakes are applied, a special study must be made of each class of equipment.



# THE STREET RAILWAY SYSTEM OF SAN FRANCISCO

BY J. C. LATHROP

The rapid rehabilitation of the street railway system of San Francisco, now in progress, makes the present an appropriate time to present a review of the railway conditions of the largest city on the Pacific Coast. The following statistics and historical facts will be helpful to a proper understanding of the situation:

The population of San Francisco in 1900, according to the Federal census, was 342,782, and in January, 1905, prior to the fire, was about 432,000, according to the local school census. It is estimated that the present population is nearly up to the same figure, although thousands of the former residents of the city are living in some of the outlying suburban towns and cities.

The area of San Francisco within the city limits is 47 miles.

The approximate street mileage is 850, of which about

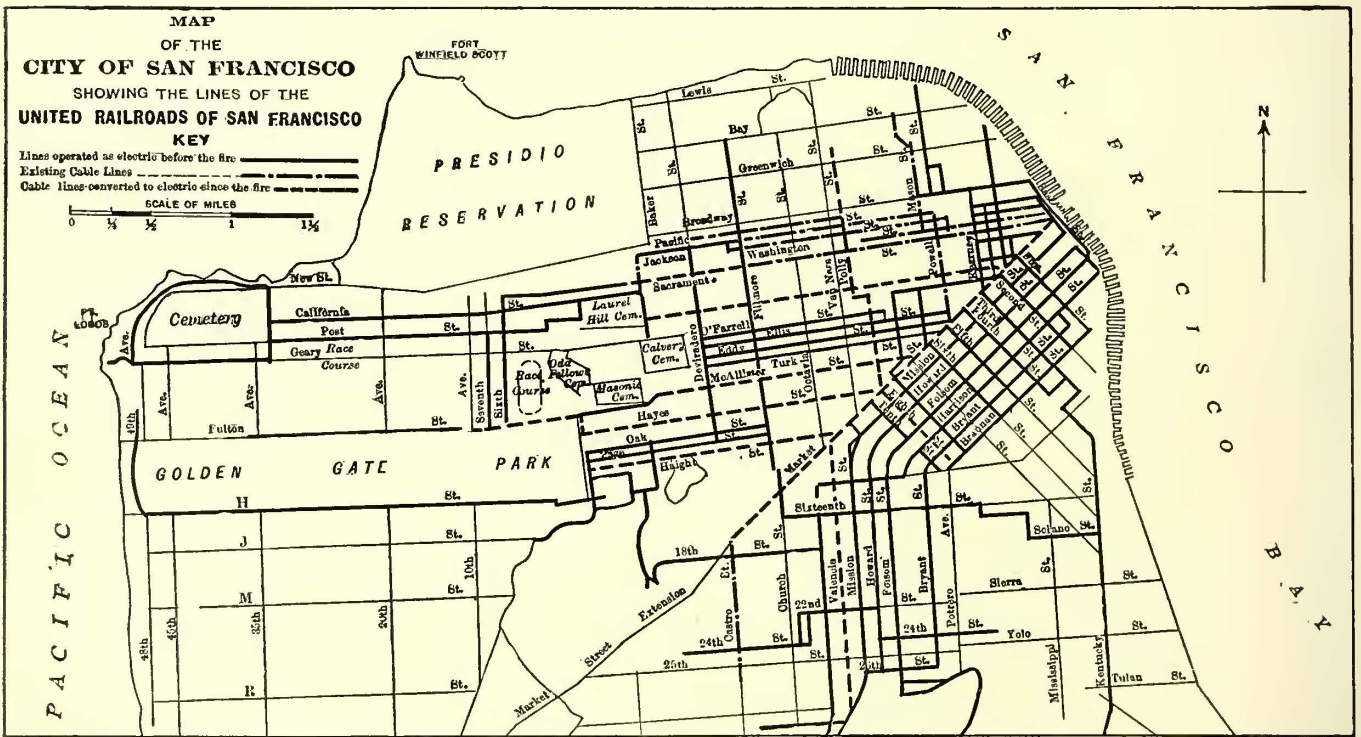
Market Street, which is the principal street of the city, runs diagonally from the northeast to the southwest and has no very steep grades. The Ferry Building, where all the ferries to Oakland, Berkeley and other points across the Bay terminate, is located at the foot of Market Street and most of the important office buildings are found on or near this street. Mission Street, another important business thoroughfare, is one block south of Market Street and runs parallel to it as far as Twelfth Street, where it turns and runs south through that portion of the city known as the Mission. The greater part of the traffic to and from the ferries is found on these two streets.

### HISTORY OF RAPID TRANSIT

The history of rapid transit in San Francisco is naturally divided into four periods.

First, from 1860 to 1873, when the only available motive power was steam or animal power.

Second, from 1873 to 1892, when the cable system was introduced and reached its highest development.



San Francisco Street Railways—Map of System in 1908, Showing Lines Converted to Electricity Since Fire

230 miles are paved, and the remaining 620 are macadamized. Street railway trackage occupies about 139 miles of street.

As is well known, the topography of the city is very rough. Almost the only portion free from exceedingly steep grades is that lying south of Market Street along the bay, which takes in most of the manufacturing and wholesale districts. Other steep grades in the city exceeding 12 per cent are as follows:

Union between Pierce and Scott.....	13.53	per cent
Union between Polk and Van Ness.....	13.53	" "
Sutter between Lyon and Central.....	13.29	" "
Devisadero between Clay and Washington.	14.10	" "
Page between Devisadero and Broderick.	12.20	" "
Haight between Devisadero and Broderick.	12.12	" "
Haight between Laguna and Buchanan...	12.12	" "

Grades are established by the city at all street intersections, which in most cases forms the grade between building lines in both directions.

Third, from 1892 to April, 1906, which witnessed the slow but sure growth of electric traction, and the falling away of the cable system to a certain extent.

Fourth, from April, 1906, to date, in which we see the almost complete abandonment of the cable system, except for certain lines whose grades have rendered the substitution of electric traction impracticable.

Prior to 1860 the only popular means of transit in the city were the various omnibuses on Mission and the lower eleven streets. However, in 1857 a charter was obtained from the Legislature by Captain Thomas Hayes for a railway on Market Street, to be operated by mules or horses, and to be known as the Market Street Railroad Company. Actual work was not begun until May, 1859, the first rails being laid on June 7. As frequently happens, however, the work was so delayed that the road did not open for travel until July 4, 1860, when an experimental trip was made.

It was soon discovered that horses and mules were inade-



quate to the service and steam was adopted, although not allowed by the charter. It proved such a success in this case that the Legislature almost unanimously legalized the change. This is thought to be the first successful application of steam as a motive power to street-railway service in any city. All material used in the construction of the road, rolling stock, etc., except the rails, was produced in California. At the time this road was built Market Street was not graded and the rails were laid on ties resting on earth ballast and in all respects similar to ordinary steam-railway construction.

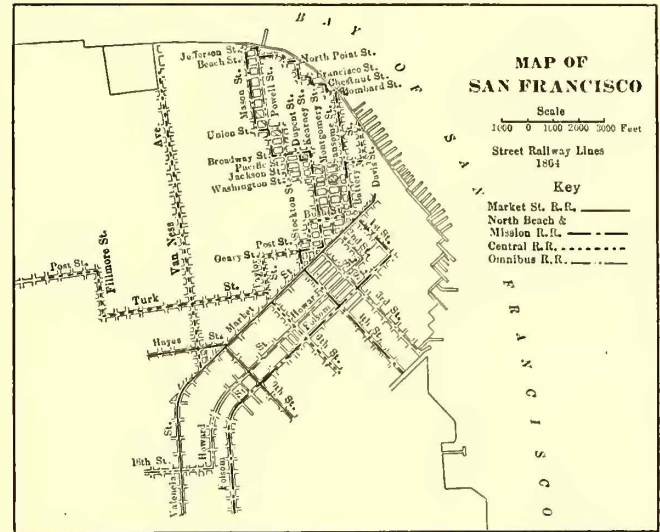
The roads in operation in 1864 are shown on one of the accompanying maps.

In the early seventies the Market Street line and others passed into the control of the Southern Pacific Railroad Company, by whom they were held for many years. In 1871 the total mileage of all roads in the city was about 45 miles of single track.

The dawn of the second period came in October, 1873, when the first cable railroad in San Francisco, and in the world, known as the Clay Street Hill Railroad, was placed in operation. The history of this successful experiment has been published in these columns and need not be repeated here except to say that the first rope was  $1\frac{3}{8}$  miles long, ran for two years, traveled 64,200 miles and raised 542,500 tons a vertical distance of 307 ft. It is interesting to note that Clay Street is to be operated as a cable line as soon as the necessary changes are made, and is likely to be the last cable railway in operation as well as the first. Although great difficulty was experienced in inducing capital to invest in the Clay Street line, and the property owners along the proposed route gave a \$30,000 subsidy, it proved a financial success

but surely electricity began to replace the cable on existing lines.

The first electric line in San Francisco was the San Francisco & San Mateo Railway. Construction on this line was started in 1891 and the road was opened for traffic in April, 1892. The line was about 21 miles long and extended through a thinly settled part of the country to San Mateo, parallel to the coast line of the Southern Pacific.

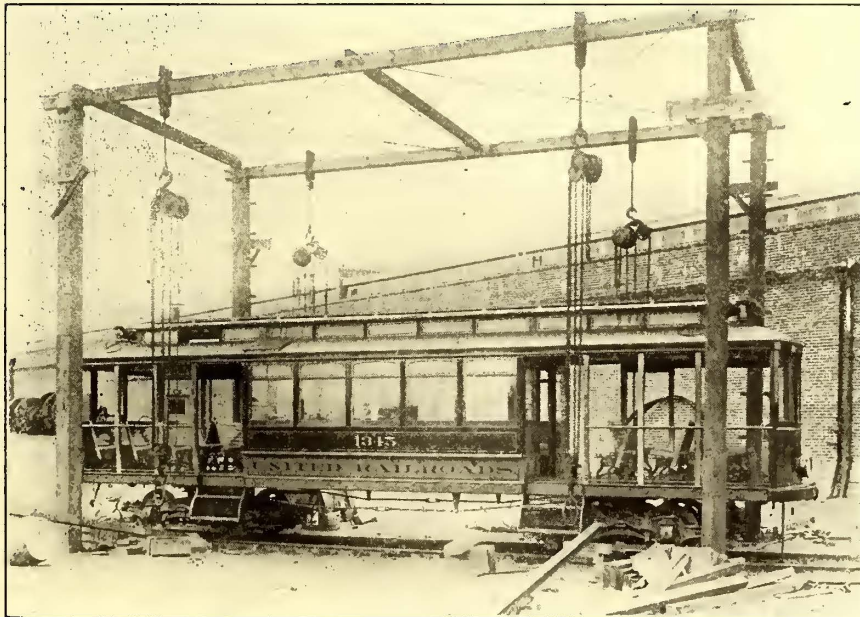


San Francisco Street Railways—Street Railways in 1864

This line was followed a few months later by the Metropolitan Railway, about 11 miles long. Very heavy grades were encountered on this line, ranging from 10 per cent to as high as 13.8 per cent.

In 1890, plans were adopted by several of the older lines to replace both horses and cables with electrical power and to construct new lines under that system. In 1893 the consolidation of many of these companies as the Market Street Railway Company hastened these plans, and from that date till 1896 the construction of electric lines was rushed, over 80 miles of single track having been constructed during those years. Later this company absorbed the Metropolitan Railway Company.

During the following six years the development of the various companies was so considerable, and the traffic so heavy and profitable that it attracted the attention of a group of Eastern financiers, who on March 4, 1902, formed a merger of several lines, both electric and cable, to be known as the United Railroads of San Francisco, and consisting of the five companies shown in Table I, with their subsidiary com-



San Francisco Street Railways—Type of Cars Adopted as Standard by the United Railroads of San Francisco Prior to the Fire

panies. This gave the United Railroads practically a monopoly in the city, the only competing lines being the California Street Cable Railway, the Presidio & Ferries Railway, and the Geary Street, Park & Ocean Railway, with a combined mileage of only 28 miles of single track, against 260 miles of single track controlled by the United Railroads.

from the start. From that time on until 1892 numerous cable lines were projected and built. Reliable data are not available as to the mileage of the cable lines at this period, but it could not have been far from 100 miles of single track.

During the third period, from 1892 till the earthquake of 1906, the development of electrical traction stopped the further construction of cable lines almost entirely and slowly

During the third period, from 1892 till the earthquake of 1906, the development of electrical traction stopped the further construction of cable lines almost entirely and slowly



Just prior to the earthquake the mileage of the various systems stood as shown in the following table:

TABLE I—STATISTICS OF STREET RAILWAYS IN SAN FRANCISCO IN 1905.

Name of road.	Miles of route.	Miles of track.	Electric.	Cable.	Horse.	Steam.
United Rds. of S. F....	138.55	260.33	204.72	52.19	3.42	...
California Street Ry....	5.37	10.74	.....	10.74	...	...
Presidio & Ferries Ry..	5.63	9.01	.....	6.00	1.76	1.25
Geary St., P. & O. Ry .	4.13	8.26	.....	8.26	...	...
Total.....	153.68	288.34	204.72	77.19	5.18	1.25

Table II gives a summary of the various consolidations which were formed at various times, and their final merger into the United Railroads of San Francisco. The dates given under the heading of Incorporated refer to the time of execution of articles of incorporation, and the time under the heading Charter refers to the length of time for which the charter was granted.

TABLE II—STATISTICS OF COMPANIES FORMING THE UNITED RAILROADS OF SAN FRANCISCO.

Name of company.	Incorporated.	Charter.
UNITED RAILROADS OF SAN FRANCISCO.....	Mar. 4, 1902	50 years
1. Market Street Railway Company.....	Oct. 13, 1893	50 years
a Market Street Cable Ry. Co.....	Mar. 24, 1882	50 years
Market Street Ry. Co. of S. F.....	June 6, 1866	50 years
b Market Street & Fairmount Ry. Co.....	Aug. 26, 1886	50 years
c City Railroad Company.....	May 14, 1863	50 years
d Potrero & Bay View Railroad Co.....	Apr. 25, 1866	50 years
e Southern Height & Visitacion Railway Co.	Aug. 15, 1892	50 years
f Park & Ocean Railroad Company.....	June 29, 1883	50 years
g Ocean Beach Railway Company.....	Feb. 5, 1885	50 years
h Ocean Beach Railroad Company.....	Feb. 20, 1887	50 years
i Central Railroad Company.....	July 1, 1862	25 years
j The Omnibus Cable Company.....	Nov. 28, 1887	50 years
Omnibus Railroad & Cable Company.....	July 26, 1882	50 years
Omnibus Railroad Company.....	July 27, 1861	25 years
k North Beach & Mission Railway Co.....	June 17, 1890	50 years
North Beach & Mission Railroad Co.....	Aug. 22, 1862	50 years
San Francisco Street Railroad Co.....	Sept. 23, 1861	50 years
l Ferries & Cliff House Railway Co.....	Dec. 12, 1887	50 years
Clay Street Hill Railway Company.....	Aug. 15, 1872	25 years
o Park & Cliff House Railway Company.....	Oct. 11, 1887	50 years
Powell Street Railway Company.....	Dec. 8, 1886	50 years
p Bay Shore & San Fran. St. Ry. Co.....	Apr. 16, 1886	50 years
1. (Later) Metropolitan Railway Co.....	Feb. 21, 1891	50 years
2. San Francisco & S. M. Elec. Ry. Co.....	May 18, 1896	50 years
3. Sutro Railway Company.....	July 26, 1894	50 years
4. Sutter Street Railway Company.....	Dec. 21, 1887	50 years
a Front St., Mission & Ocean Ry. Co.....	May 23, 1863	25 years
5. South San Fran. R. R. & Power Co.....	Mar. 5, 1903	50 years

\*Increased to 50 years by directors May 10, 1887, and by stockholders June 27, 1887.

OCEAN SHORE RAILWAY

Although the Ocean Shore Railway will be a high-speed interurban line between San Francisco and Santa Cruz, a distance of 83 miles, and therefore can hardly be classed as part of the street railway system of San Francisco, it is thought that a brief description of the essential features of this line will not be out of place in this paper.

This road has not yet been placed in service, but doubtless will be in the near future. The line follows the shore of the Pacific Ocean for its entire length and passes through a very rugged country, which has always been considered impracticable for a steam road. For this reason an unusual number of tunnels, deep cuts and high embankments were found necessary to keep the maximum grade down to 2 per cent. The maximum rate of curvature is 16 deg., except at the entrance to the San Francisco terminal, where there is a 20-deg. curve.

Electric current will be delivered to nine substations from the power station at Balboa, about 20 miles south of San Francisco, at a pressure of 33,000 volts. Owing to the dense salt fogs, common on that coast, it was not considered desirable to use a third-rail for the transmission of the line current, so the catenary type of overhead construction was adopted.

The rolling stock will consist of 30 combination passenger cars, 60 ft. long, and 10 50-ft. passenger cars. Current for the motors will be collected by means of pantograph trolleys.

The company has secured a high-speed entrance to the heart of the business portion of San Francisco, the terminal being located at Eleventh and Market Streets. It also ex-

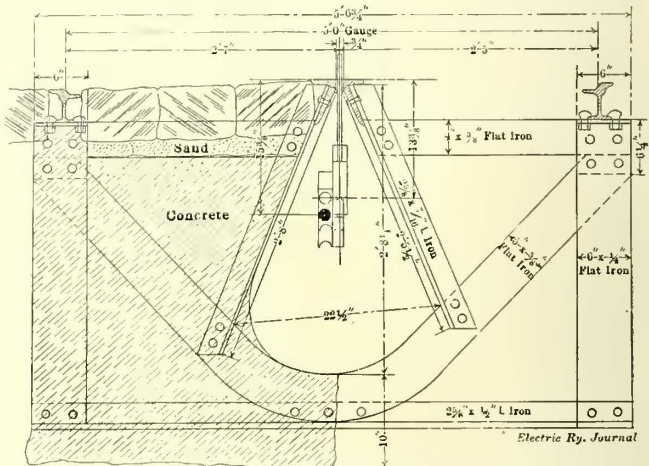
pects to run a line along the shore to the Cliff House, and from there to the Chutes.

AGITATION IN FAVOR OF THE CONDUIT SYSTEM

Before discussing the effects of the earthquake, reconstruction, etc., it will be well to consider the conditions for a time preceding that event. Since the United Railroads were organized their electric lines had been gradually extended until in 1905 the situation was about as follows:

Market Street was the main line of travel and was served by a double-track cable line. Several other cable lines ran to the ferry, but the Sutter Street and all the electric lines were obliged to transfer passengers to the Market Street line. The amount of delay and annoyance that was caused by this arrangement can well be imagined. Another source of delay was found at the ferry, where all cable cars were turned on a double-track turntable, the maximum speed of which was only sufficient to turn three cars a minute.

Numerous plans were made and discussed to remedy this condition, all of which involved the electrification of most of the cable lines. The present system was based largely upon plans made and adopted before the fire, the only difference being that the change from cable to electricity was made sooner and in less time than originally intended as all



San Francisco Street Railways—Yoke on Sutter Street, Showing Extreme Positions of Cable Grip

but one of the cable power stations were completely destroyed by either the earthquake or fire. The one that escaped was the smallest and drove the Hayes Street cable only.

During 1905 the question of the substitution of the underground electric conduit system was agitated in the press and by various civic and commercial bodies. A subway on Market Street was also proposed. Interest on these matters arose to such proportions that in 1905 the Merchants' Association secured the services of William Barclay Parsons to report upon the feasibility of using the underground conduit system. Mr. Parsons' report was published in the STREET RAILWAY JOURNAL for Jan. 6, 1906, and was unequivocally in favor of overhead wires.

EARTHQUAKE AND FIRE

The earthquake in San Francisco occurred about 5 o'clock on the morning of April 18, 1906, and the direct effects were well illustrated by some photographs published soon afterwards in the STREET RAILWAY JOURNAL. In parts of the city, especially in districts which had been made by filling in with debris, the surface of the earth dropped 5 ft. or 6 ft. Due to the breaking of flues and the escape of gas through



the broken mains, numerous fires broke out in widely separated parts of the city, and as most of the water mains were broken, the fire department was wholly unable to check the spread of the flames. The area of the burned district equaled about 4 sq. miles, and the property loss is estimated at \$300,000,000. A large amount of property in the vicinity of Bryant and Eleventh Street was saved by the use of the condensing water which the United Railroads pump from the Bay through an 18-in. main to their Bryant Street Power Station.

It is hard to make a distinction between the effects of the earthquake and those of the fire. Undoubtedly some of the injuries to the track were due directly to the former, but this could have been soon repaired had it not been for the following fire which warped and bent the rails in all imaginable shapes.

The Geary Street, Park & Ocean Railway suffered less than any of the other companies, the only damage sustained by it being that to the track, both the company's power house and its rolling stock being beyond the fire limits. For this reason this company was the first cable line in the city to resume service.

The Presidio & Ferries and the California Street Cable



**San Francisco Street Railways—Reconstruction of Hayes Street, Showing Method of Pulling Yokes with Crane Car**

Railroad both had their power houses and all rolling stock destroyed by the fire.

The United Railroads were fortunate as regards rolling stock, losing but seven of 455 electric cars and 75 of 423 cable cars. Nearly all the cable cars that were burned were those stored in the car house at the corner of Mason and Washington Streets.

Of the five cable power houses operated by this company, three were completely destroyed by the fire, and a fourth, outside the fire limits, was destroyed by the earthquake. The fifth, which drove the Hayes Street rope, was uninjured as regards the machinery, although the roof and walls were badly shattered. It is stated that the damage done by the earthquake to the Market and Valencia power house could have been repaired in a few hours if it had not been for the fire.

By great good fortune all the electric power stations of this company were located outside of the fire limits. The building structures of all but the one at Bryant and Alameda Streets suffered severely from the earthquake. The roofs, walls, etc., of the various substations were badly cracked

and shattered, but the machinery was only slightly damaged in any case.

The various car barns, shops, etc., except those at Market and Valencia and at Oak and Broderick, sustained very little damage. Those at Market and Valencia were entirely destroyed, and the car house at Oak and Broderick was considerably damaged by the fall of a tall brick stack.

RESUMPTION OF SERVICE

Immediately after the fire, the only feasible method for quickly restoring service in the burned district, and, in fact, on all cable lines, was the introduction of the overhead trolley, and, therefore, the city government gave the United Railroads a franchise for that system over all cable lines on May 14, 1906. As this was done on a legal holiday it was again passed on June 4, 1906. This opened the way for a time and rapid progress was made on the reconstruction, as outlined in another portion of this paper. Since then open charges of bribery have been made. The Mayor and other city officials were found to have practised blackmail on corporations, but the only official of the company tried on the charge of bribery was acquitted.

RECONSTRUCTION BY UNITED RAILROADS OF SAN FRANCISCO

During the year following the earthquake, the United Railroads reconstructed approximately 35 miles of single track and laid in the neighborhood of 100 sets of special work, the greater portion of the latter being built up in the company's own shops at Market and Valencia Streets. This work was accomplished under exceedingly adverse conditions, among which may be mentioned the bad conditions of the streets, high wages and the inefficiency of laborers, strikes and the high price and scarcity of building materials of all kinds.

The greater portion of the reconstruction consisted of cable lines converted to electric, and had been planned by the company prior to the earthquake. This work proved much more difficult and expensive than the construction of entirely new electric lines.

Various methods of reconstruction were adopted on the different lines, differing mainly in the manner of disposing of the yokes on which the cable tracks were supported. Some of these were adopted temporarily owing to the exigencies of the situation. Thus, on McAllister Street an attempt was made to run the electric cars over the old cable tracks, but it was found that the flanges of the wheels on the electric cars would bear on the inner portion of the rail head, before the tread would bear on the outside portion of the head. Therefore, the inside portion of the head was sheared off by hand as shown on page 578. Under these conditions the track gave moderate satisfaction until the spring of 1907, when standard reconstruction was begun.

REMOVAL OF CABLE YOKES

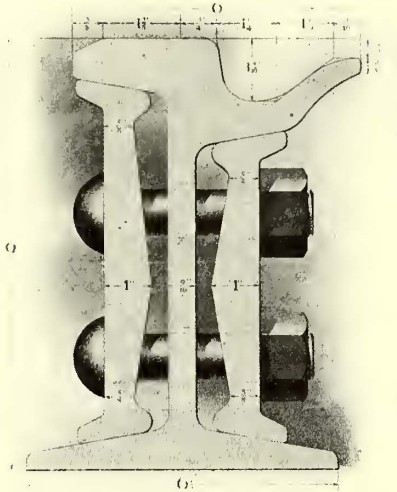
The reconstruction on Sutter Street had a number of interesting features. The gage was formerly 5 ft. 0 in. It was the first line of any length to be reconstructed, and it is one of the most important lines in the city, if not the most important. Moreover, just before the fire, in order to increase the distance between track centers, the entire structure of one track had been moved 6 in. laterally by means of jacks without injuring the concrete foundation. The Sutter Street yoke is shown on page 576, which also shows the extreme position of the cable grip used on that line. On this street the method of reconstruction adopted was to leave the yokes and substructures in place, merely cutting



away enough so that the ties, rails and pavement could be put in position. This was found necessary on account of the weakness of the yoke which would tear in pieces instead of pulling out intact. The photographic illustration on page 579 shows Sutter Street near Van Ness Avenue with the tothing in place.

The yokes on Hayes Street were made up of bent rails and were so strong that they had to be pulled out from the concrete bed intact. The method of doing this by means of a crane car is also shown. First a length of rail was attached to the yoke in such a manner that, combined with the yoke, it acted as a lever. The crane pulling on this lever broke up the concrete substructure to such an extent that the yoke could readily be pulled out and thrown aside.

On Larkin Street an attempt was made to pull similar yokes by means of jacks, as shown in another view. This proved a failure, both on account of the slowness and the difficulty found in providing suitable foundations for the jacks. It was found that the crane car pulled the yokes in the most economical and efficient manner, and that method



San Francisco Street Railways—  
Section No. 402



San Francisco Street Railways—Shearing Rails on McAllister Street

was adopted on Haight Street and all other places where the same type of yoke was found.

#### ROADBED

The same general type of roadbed was adopted for the entire city and was used on all reconstruction, modified only by the existing yokes and substructures. The section on page 579 shows both cross and longitudinal sections of the standard construction, and also shows other methods of treating the yokes which were used on short lengths.

The substructure is a combination of ties and concrete

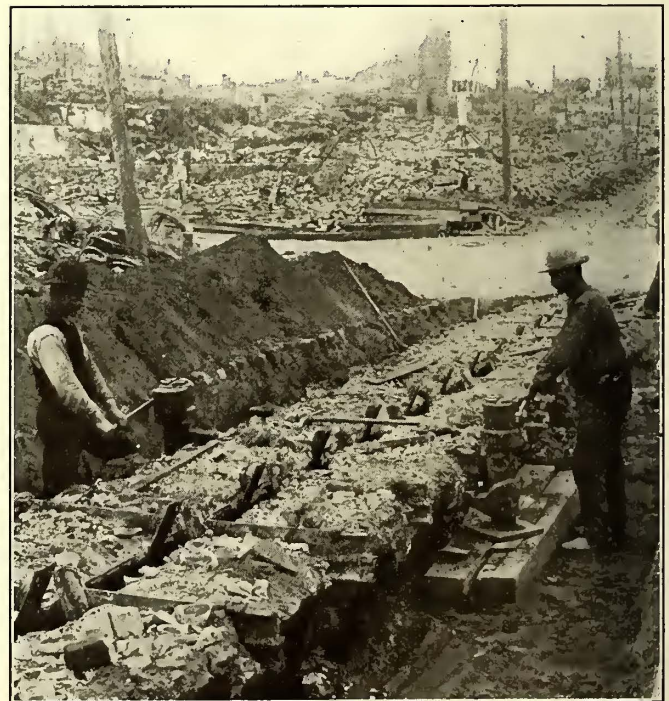
stringers, resting on 6 in. or 8 in. of broken stone or broken concrete ballast. In most cases this broken concrete consisted of the original substructures broken on the ground by means of a portable electric crusher mounted on an old flat car. This ballast is brought up flush with the bottom of the ties. The ties are spaced 2 ft. 6 in. apart, and between the ties and under each rail is a mass of concrete 6 in. thick which forms a monolith with the floor of concrete which covers the ties and supports the pavement. There are two types of paving between rails, one consisting of Belgian blocks and the other being an asphalt surface with a tothing of alternate 5-in. and 8-in. blocks inside each rail.

#### RAIL SECTIONS

The rails used in the reconstruction of the main track lines, such as Market Street, are of the Lorain No. 395 section, weighing 141 lb. per yard. On the lines of average travel the rail used is the Lorain No. 340, weighing 109 lb. per yard. On curved tracks serving average traffic a 119-lb. rail is used. In addition Lorain section No. 402, which is designed so that M.C.B. flanges can run on it and weighs 140 lb. per yard has been ordered for use on some of the downtown streets. This section is illustrated herewith. The rails are connected with 36-in. 12-bolt, "Continuous" rail joints, and these joints are bonded with four No. 0000 10-in. by  $\frac{7}{8}$ -in. bonds. The terminals are all screw-compressed to place.

#### SPECIAL TRACK WORK

Soon after the fire it was seen that some system of special



San Francisco Street Railways—Reconstruction of Larkin Street, Showing Method of Pulling Yokes

work standards should be worked up, as, due to the change in motive power, many changes in car routes would be made by the operating department. Therefore, a complete set of standards were developed, consisting of two divisions, one with a plain central radius of 42 ft. 7½ in. for the narrow streets north of Market, and the other with a plain central radius of 50 ft. 1½ in. for the wide streets south of Market. The above standards apply, of course, only to those streets intersecting at an angle of 90 deg. The arms of all frogs, switches, mates, crossings, etc., are made of the same length



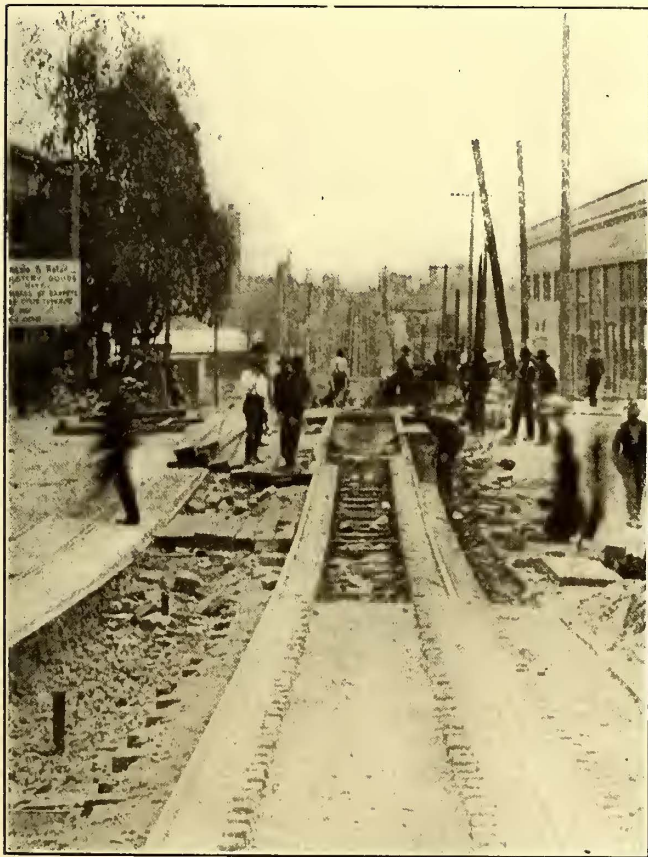
in all layouts and an attempt has been made to draw up all probable layouts and to keep as many pieces alike as possible. Each piece is designated by a piece letter and a piece in one layout is expected to interchange with one bearing the same letter in another without cutting. All special work will be made of Lorain guarantee cast steel, but during the year following the fire, a large amount had to be made up in the company's shop for temporary use.

In the case of special work required for Market Street or other streets intersecting at other than 90 deg., a special drawing must be made up, but even in these cases a number of the standard pieces can often be used to practical advantage.

Vertical curves in San Francisco are in some cases of very small radius. Especially is this true of the cable tracks, several of the curves having a radius of from 200 ft. to 250 ft. A plain circular curve is employed in all instances.

POWER STATIONS OF THE SMALLER ROADS

Before the fire the cars of the California Street Railroad Company were operated by cables from a power station at California and Hyde Streets. This station was badly dam-



San Francisco Street Railways—Reconstruction of Sutter Street, Showing Tothing in Place

aged, but as soon as possible after the fire the work of reconstruction was begun. The structure was rebuilt and the engines repaired and refinished.

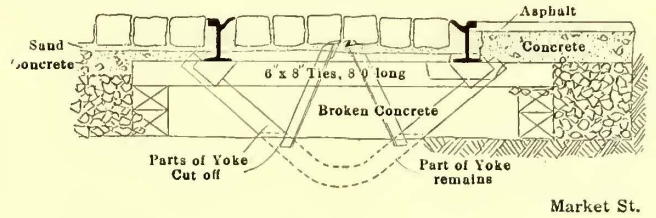
The Presidio & Ferries power station, located on Union Street, between Hyde and Larkin, was completely destroyed, together with all the cable cars, and the company, after many months' consideration, decided to reconstruct as an electric line, the cars and power being purchased from the United Railroads.

The Geary Street power station was unharmed, and as

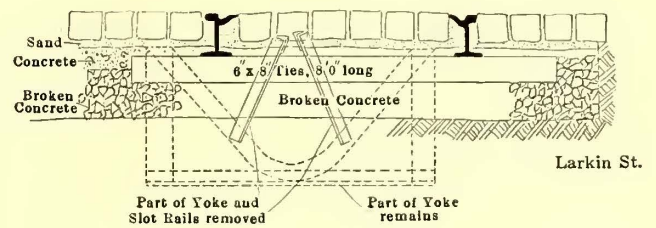
soon as the tracks, etc., could be put in shape, regular service was resumed.

CABLE POWER STATIONS OF THE UNITED RAILROADS

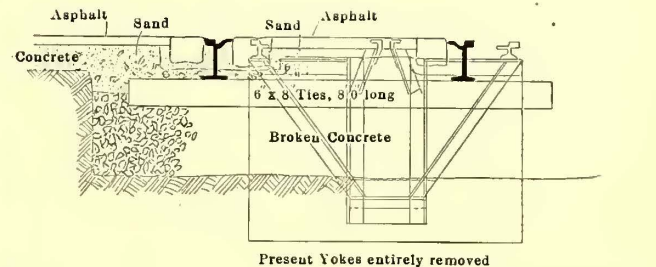
The United Railroads owned five power stations, of which the largest was at Market and Valencia Streets. This plant was injured to no very great extent, but has been replaced owing largely to the decision to change the system of power distribution. The cable power station of the United Railroads at Mason and Washington Streets was entirely destroyed, but as the lines served from this station contained



Market St.



Larkin St.



Sacramento St.

Electric Ry. Journal

San Francisco Street Railways—Cross Sections of Reconstructed Track on Market Street, Larkin Street and Sacramento Street

very steep grades it has been rebuilt as a cable station. The Sutter and Polk power station was also destroyed, but it has not been rebuilt, as its lines have been reconstructed for electric power. The McAllister Street station, also badly wrecked, will not be rebuilt.

ELECTRIC POWER STATIONS OF THE UNITED RAILROADS

The electric power used by the United Railroads is generated in steam, gas engine and hydraulic power stations, only the first, however, being operated by the company.

The company owns and operates two steam power plants, known as the North Beach and Bryant Street stations. All power required which is not furnished by these stations is purchased under contract from the California Gas & Electric Corporation, which owns and operates numerous hydraulic power stations in the mountains supplemented by a gas-engine plant near the city. Power from all the above stations, with the exception of Bryant Street, which is a direct-current plant, is delivered to four substations, known as Turk and Fillmore, Bryant Street, Geneva Avenue and Millbrae, where it is stepped down, converted and sent out on the line at about 550 volts.

The North Beach power station is the most important station of the United Railroads, and is a comparatively



modern installation, being completed during the summer of 1903. It was illustrated and described in the STREET RAILWAY JOURNAL for April 18, of that year, and has a normal capacity of 8000 hp with a maximum capacity of 10,000 hp for short periods of time. Recently another unit has been installed in this station. Three-phase current is generated at 13,200 volts and is transmitted to the various substations over two sets of transmission lines, each set consisting of three No. 000 solid, triple-braided waterproof wires.

The fuel used under the boilers is California crude petroleum, and this is stored in a 30,000-bbl. tank, this tank being connected to the storage tanks of the Associated Oil

212 deg. Fahr., per pound of coal. Provision was made in the boiler foundations for ash pits, etc., for burning coal, but up to date the price of oil has been such that it proves more economical than coal.

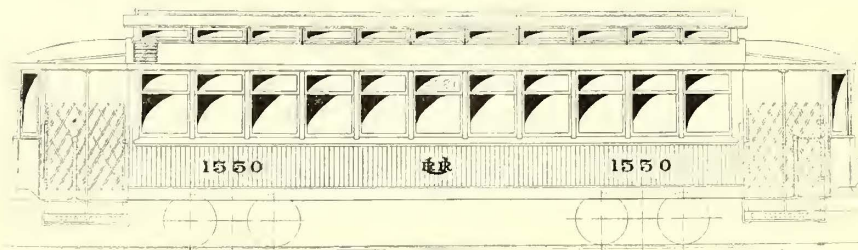
Four Green fuel economizers are used in the boiler room which raise the temperature of the feed water an average of about 105 deg. Fahr.

The engine room is equipped with two 4000-hp marine type, triple expansion, condensing engines, each direct connected to two 22-pole, 1200-kw, 136-r.p.m., 13,200-volt, 25-cycle, three-phase General Electric revolving-field alternators. These engines were built by the Union Iron Works, of San Francisco. The steam consumption is about 13.5 lb. per ihp, and the load is extremely variable, ranging from 2000 hp to the maximum capacity, which is about 25 per cent overload, or 10,000 hp.

This station has been subjected to extremely hard service since the earthquake. At times, on account of strikes, it has been run short-handed and with inexperienced men.

Directly after the earthquake, which damaged the building, but did not wreck the machinery, numerous plans were made for a large, new, modern power station on the same site, but they were abandoned because it was found that power could be purchased from the California Gas & Electric Corporation at a lower price than it could be generated by steam.

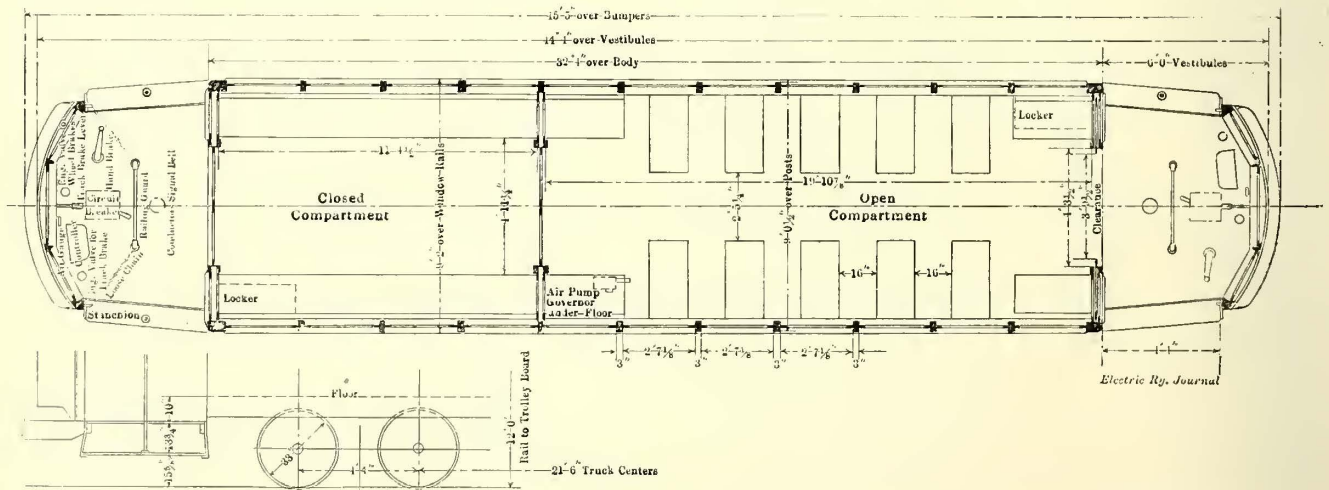
In addition to the North Beach power station the company has one other small power station at Bryant Street, which is also being used as a substation, and several other substations. All of these stations were more or less affected



San Francisco Street Railways—Side Elevation of the New Standard Cars of the United Railroads of San Francisco

Company by an 8-in. wrought-iron pipe 8000 ft. long. An auxiliary 5-in. pipe runs to the dock so that if necessary oil can be pumped from barges directly to the tank.

Two auxiliary feed tanks of 20,000-gal. capacity each are provided from which the oil is pumped directly to the furnaces by the National Oil Company's systems. The two feed tanks are used alternately for supplying the furnaces. While one is being emptied the other is being filled, thus insuring a constant supply of oil. An additional safeguard is provided by having the piping so arranged that the furnaces



San Francisco Street Railways—Plan of the New Standard Cars for the United Railroads of San Francisco

may be fed by gravity directly from the main tank, just as the smaller tanks are filled.

The boiler room is equipped with eight 500 hp Babcock & Wilcox water-tube boilers, arranged in four batteries of two boilers each, making a total of 4000 rated hp.

One pound of the oil used contains about 18,500 b.t.u., and will evaporate 14.8 lb. of water from and at 212 deg. Fahr. The oil consumption is at the rate of 0.28 gal., or 2.24 lb. per kw-hour, which equals 1.68 lb. per hp-hour. The corresponding coal consumption would be 3.52 lb. per kw-hour, with a boiler efficiency of 78 per cent and a grade of coal giving an evaporation of 9 lb. of water, from and at

by the earthquake or fire, but have been put in good condition.

A list of the substations of the company with their equipment is given on page 581.

OTHER SYSTEMS OF POWER SUPPLY

In addition to its own system of power supply the company purchases its power from the California Gas & Electric Corporation, which possesses seven hydraulic power stations, and from which a total of 20,350 kw are available for the lines of the United Railroads. In addition to these hydraulic stations, the California Gas & Electric Corporation has installed as a reserve or auxiliary plant, to be used at



times of low water, or in case of accidents, a gas-engine plant consisting of three 54-hp gas engines. The gas used is made from crude oil and is similar to the illuminating gas now distributed in California. The gas made by this process ranges from 610 to 660 b.t.u. per cubic foot.

The San Francisco engines were made by the Snow Steam

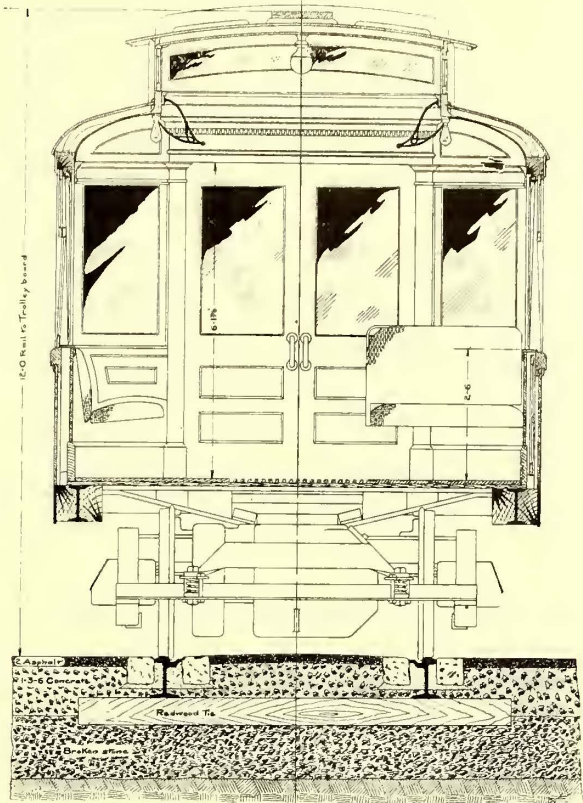
other will be built at the present time. It may be noted here that in the original design of the station structure the east end was made of temporary construction to allow of a future extension.

TABLE III.—SUBSTATION EQUIPMENT OF UNITED RAILROADS.

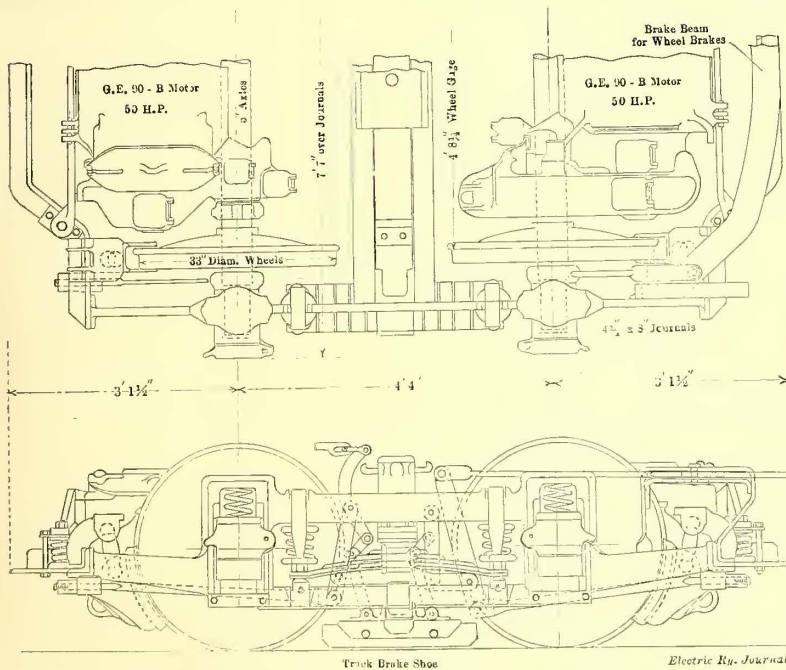
STATION	Turk and Fillmore	Bryant St.	Geneva Ave.	Millbrae
No. of Units.	6-750 kw. rotaries.	5-1000 kw. rotaries. 4-400 kw dc generators.	3-500 kw. rotaries.	2-500 kw. rotaries.
Additional Units proposed.	2-1500 kw. rotaries 1-750 kw. rotary.	1-1500 kw. rotary.	2-750 kw. rotaries.	1-750 kw. rotary.
Present total Capacity	4,500 kw.	8,200 kw.	1,500 kw.	1,000 kw.
Proposed total Capacity	8,250 kw.	9,700 kw.	3,000 kw.	1,750 kw.
Maximum High Swing, May, 1906 to May, 1907.	7,250 kw.	sub 5500 kw p.h. 5000 kw.	2,400 kw.	1,200 kw.
Date	April 14, 15, 16, '07.	Oct. 25, '06. Dec. 11, '06.	Apr. 11, '07.	Apr. 13, '07.
Percent Overloaded.	61.1%	28.2%	60%	20%

Output of all stations at present . . . . . 15,200 kw.  
Output of all stations with proposed additions . . . . . 22,700 kw.  
22,700 ÷ 615 = 37 kw. per car.

Pump Works and have cylinders 42 in. diameter, with 60-in. stroke. Each of these engines is direct connected to a 3200-kw generator built by the Crocker-Wheeler Electric Company, of Ampere, N. J. These generators deliver three-phase, 25-cycle alternating current, the same as the



San Francisco Railways—Cross Section of the New Standard Cars for the United Railroads of San Francisco



San Francisco Street Railways—Side Elevation and Half Plan of the New Standard Trucks for the United Railroads of San Francisco

North Beach station of the United Railroads, to the substations of the company.

The company is now building an addition on the east end of the power house to provide for two more engines like the first. One of these has arrived and will be installed as soon as the building is ready. The foundation only for the

The three engines are symmetrically placed in three quarters of the engine room, the fourth being occupied by two Stanley cycle changers rated at 4000 kw. These machines have proven very efficient, handling as high as 6000 kw for an hour and a half continuously.

The three-phase current from the hydraulic stations is received here over 7/8-in. aluminum cables at a pressure of 60,000 volts at 60 cycles. It is first transformed to 11,000 volts at 60 cycles, then passes through the cycle changers and is changed to 25 cycles at 13,200 volts, leaving the station in multiple with that from the gas-engine generators.

The station, in addition to a motor-driven exciter set, is equipped with a small battery, with a capacity of 800 amp for one hour at 110 volts. This is intended to be used in starting the gas engines in case no current came in from any other source and it is kept charged at all times. This station is tied up to Station A, the main steam generating station of the corporation, and current passes back and forth either way as may be necessary.

ROLLING STOCK

Due to the mildness of the climate at all seasons of the year the general type of car most in favor in San Francisco, and, in fact, in all parts of California, is what is known as the "California" type. This is a car having a part of the seats in the open air and part enclosed. One of the latest



designs is shown on page 580. In 1905 this car was adopted as standard by the United Railroads. Complete with trucks and all equipment it weighs 40,000 lb. It has seating capacity for 42 passengers, and a normal full-load capacity of 100 passengers, although 140 have been crowded on at times. Four 40-hp motors having a gear ratio of 16 to 67 are used on these cars. The car is equipped with the National Electric Company's air brakes for the wheels and with hand levers for both track and wheel brakes.

Immediately after the fire, on account of the change from cable to electricity on so many lines, additional rolling stock was urgently needed. Rolling stock ordered for other companies was generously placed by the latter at the disposal of the United Railroads, and in this way the company secured 50 cars from the Chicago City Railway and 11 from the Philadelphia & Western Railway.

While these cars were a great help, as far as they went, it was necessary to make further provision for increased traffic. Therefore, a new standard car, in many respects much like the Chicago car, was designed and orders were placed for 100 cars of this type.

General plans, sections, clearances, etc., of these cars are shown on pages 580 and 581. Each of these cars is equipped with four 50-hp motors, and both air and hand levers are used on both track and wheel brakes. These cars proved very satisfactory in service and will probably continue standard for some time to come.

#### ENGINEERING

The reconstruction work for the United Railroads was generally planned and supervised by Ford, Bacon & Davis, consulting engineers, of New York, and the work was executed by the chief engineer of the United Railroads, who part of the time was Harry Hartwell and later was Albert Carr. Thanks are due the above engineers, and to W. D. Chamberlin, mechanical engineer, for assistance in the collection of data from which the above article was prepared.

### BINARY VAPOR ENGINES

BY W. H. BOOTH

A few years ago there appeared in England an invention from which great results were promised. This invention consisted in mixing with the water in a steam boiler a liquid of less specific heat than water and also of lower boiling point. The liquid was condensed with water in a surface condenser and pumped back into the boiler. Obviously the intention was that a sufficient quantity of the special liquid to provide a complete cycle from the boiler round to the engine, condenser and feed pump would always remain in circulation. As quickly as the feed pump redelivered the liquid to the boiler it would be re-evaporated and would drive the engine, condense and hurry round to the boiler, again to be converted into working vapor.

Since the special liquid evaporated at a temperature so much less than water it might be supposed that nothing but the vapor of the liquid would pass over. But the laws of mixed vapors would presumably insure a certain relative proportion of water vapor also. The inventor, it may be supposed, hoped thus to produce as much working steam with less expenditure of heat, since the easily vaporizable liquid circulated rapidly and apparently produced a greater rate of evaporation. Thus, if the heat of vaporization was only one-half of that of water, each 2 lb. of the liquid would only absorb the same heat as 1 lb. of water, and the same quantity of coal might appear to be boiling off a larger weight of liquid. Presumably also a given boiler pressure

would be attained at a less temperature than if water was used in the boiler.

Be all this as it may, the error in these ideas comes into play in the assumption that the working agent in a steam engine is water vapor. This is not so. The working agent is heat. Water or other vapor is but the agent through which heat makes its effects manifest. The liquid used in the invention described was ethylene di-chloride or Dutch liquid—one of the heavy hydrocarbon series with a heavy molecular weight and a high specific gravity. These liquids occupy but little space and when their vapors expand the pressure drops rapidly because in doing work a large quantity of liquid must condense to provide the latent heat and the latent heat of these liquids is low.

As a guide to a comparison of these various hydrocarbons this particular liquid has the following characteristics: Its chemical composition is  $C_2H_2Cl_2$ , molecular weight 98, specific heat 60 deg. C., 0.31, whereas water is  $H_2O$ , 18 and 1.0. The latent heat of vaporization is 85.4 calories per gramme, where water has 596.8. The energy of gasity is 3607.3, against water 25,209.1 per gramme, these last figures being in meg-ergs. They are at least comparative. On the other hand, a vapor tension of 760 mm of mercury or 1 atmosphere is exerted at a temperature of only 57.693 deg. C., where water requires 100 deg. C.

This fact, of course, underlies the whole idea of the use of liquids of low boiling points in binary vapor engines, but the case under observation seems to be the only one where the secondary vapor was used in the same boiler and allowed to make its way round and round as quickly as it pleased. Binary vapor engines are usually so arranged that the secondary vapor is evaporated by the heat of the exhaust of the first vapor. So far as they do this they should apparently be capable of giving at least a theoretical economy. But it is clear that if the primary liquid is water the heat of the exhaust should be that of the low-pressure valve chest rather than of the low-pressure exhaust, the temperature of which is that of the condenser. Castell-Evans' tables of vapor tensions of the organic liquids are also indicative of difficulty in respect of the condensation of the secondary vapor. Many of these possible secondary vapors give an atmosphere of pressure at 60 deg. C. They give a high pressure at ordinary temperatures of water available for cooling, so that any commercial success from binary vapor engines should be best possible in winter when there may be abundant cold water. Binary vapor engines might be found economical on the Great Lakes, especially Superior, where the water is cold all the year.

### DEVELOPMENTS IN THE LYKENS VALLEY

The plans of the Lykens Valley Construction Company as now outlined are the construction of an electric railway to connect Millersburg, Pa., with Hegins, Pa., and from that point to divide into two routes, one extending to Ashland and the other to Pottsville. The line will connect at Berrysburg with an extension to be built by the Schuylkill & Dauphin Traction Company, which has recently leased the Lykens & Williams Valley Street Railway for 999 years. W. E. Harrington, formerly president of the Pottsville Union Traction Company, of Pottsville, only absorb the same heat as 1 lb. of water, and the same Pa., and previously general manager of the Camden & Suburban Railroad Company, is president of the Lykens Valley Construction Company and general manager of the Schuylkill & Dauphin Traction Company. Among others who are associated with Mr. Harrington are John H. Williams and J. W. Moyer, of Pottsville.



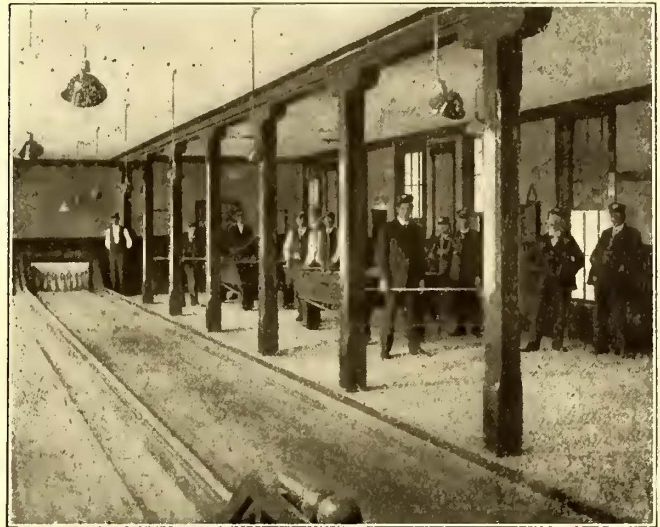
**CLUB ROOMS FOR THE PORTLAND RAILWAY**

The Portland Railway, Light & Power Company, Portland, Ore., has recently furnished at its Piedmont car houses a suite of clubrooms for trainmen. The accompanying illustrations show the general arrangement and floor dimensions of the various rooms. The Piedmont clubrooms are the first to be thrown open to the railway employees, but later on it is planned to build adjacent to other car houses separate buildings with still more complete accommodations for the railway employees.

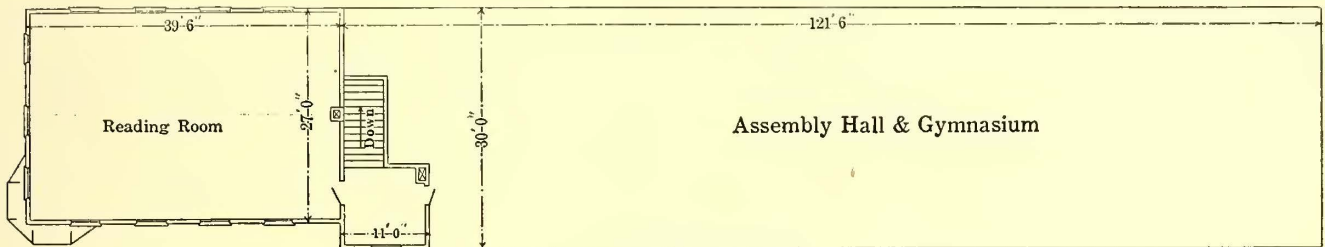
The Piedmont clubrooms occupy an addition to one side of a large brick car house. The addition is a timber structure painted white and presenting a neat appearance. A basement has been excavated in which are the heating plant, bath and toilet accommodations. The first floor at the front is occupied by the superintendent who has a bay window in his office so that he may easily view the entrance to the car houses. At the rear of the superintendent's office is the trainmen's room, 25 ft. x 27 ft., and extending to the rear of this is a smoking and recreation room, 83 ft. x 27 ft. In the recreation room are two bowling alleys and two pool tables. A halftone engraving illustrates the general appearance of the interior of this room. In the rear of this room is a small work shop with furnace and sand house.

fort of the trainmen and offer special inducements for them to spend their idle hours at the clubhouse. The rooms have already proved very popular.

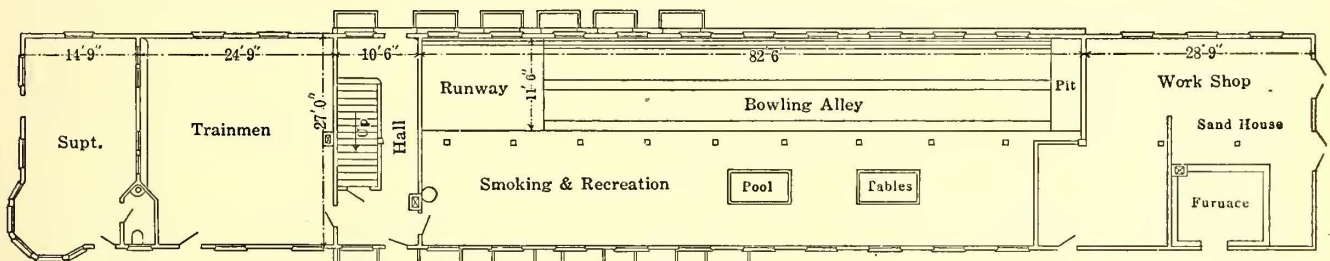
The Portland installation is a good example of what can



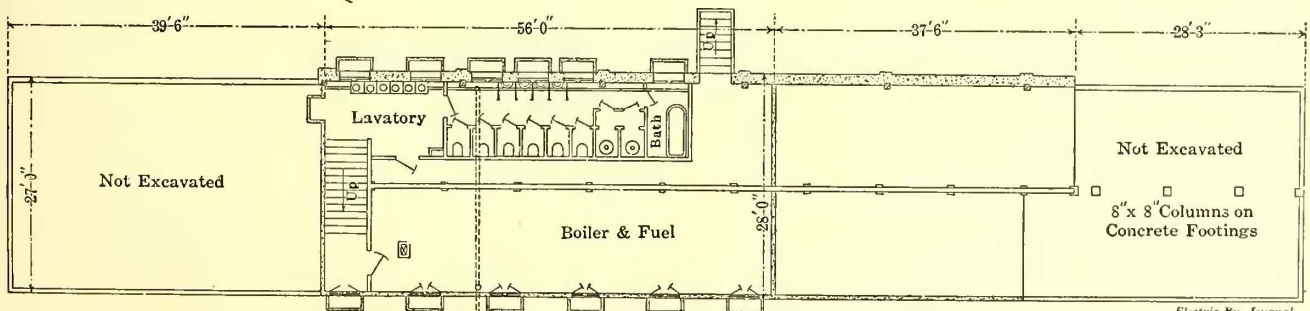
Portland Clubrooms—Interior of Smoking and Recreation Room



Second Floor Plan



First Floor Plan



Foundation & Basement Plan

Portland Clubrooms—Floor Plans Showing Sizes of the Various Rooms

On the second floor of the building is a reading room, 39 ft. x 27 ft., and accommodations for an assembly hall and gymnasium 122 ft. long by 30 ft. wide. Efforts have been made to arrange the various rooms to suit the com-

be done for employees at a moderate expenditure, and judging by the good results such clubrooms have given elsewhere they are well worth the money which is spent upon fitting them up.















of its freight business with the steam railroads with which it makes connections.

There are other forms used in handling freight and express business, but the foregoing are the principal forms, and while, as stated at the outset, local conditions must influence the system adopted on different lines, it is hoped that a full discussion of this matter will result in the adoption of uniform blanks, especially by lines interchanging freight, as is now the case with many lines in the Central West.

The Central Electric Accounting Conference has endeavored to bring about the use of uniform blanks by its members and, while some good has been accomplished, there is room for much improvement in this matter and I hope that it will be fully discussed and steps taken to adopt uniform blanks whenever possible.

### TAKING ADVANTAGE OF TRANSFER OF WEIGHT IN BRAKING ON ONE-WAY CARS

BY W. H. MACALONEY, SUPERINTENDENT ROLLING STOCK, DENVER CITY TRAMWAY COMPANY

As platform expenses plus that of the executive and detail force of the transportation department are approximately 40 per cent of the total operating expense of a street railway system, the question of maintaining schedule time is very important. Both of the limiting factors, the increased cost of maintenance and the liability of accidents, depend upon the physical condition of the property. It is the intention of this article to show the advantages that can be secured in a one-way car by a transfer of weight during a brake application, and while these advantages can be obtained on a hand-brake car as well as with power brakes, it is not the intention to consider hand brakes except to show a comparative test made with a light car weighing 13 tons. The figures follow:

- Total weight of car empty, 26,000 lb.
- Level grade, good dry rail.
- Speed, 14 m.p.h.

- Average distance to stop (from four tests), hand brake, 79 ft.
- Average distance to stop (from four tests), air brake, 61 ft.

With a hand-brake car of moderate weight it takes from three seconds to four seconds to secure the maximum pressure on the wheels, depending on the strength and willingness of operator; with a high-leverage brake it takes longer to reach that maximum. The same car running under same conditions at a speed of 20 m.p.h. would require the following distances to stop:

- Distance to stop, hand brake..... 161 ft.
- Distance to stop, air brake..... 124 ft.

Starting and stopping of cars are complementary factors in the problem of making schedule and it is evident that the best results are obtained from the equipment only when provided with the most efficient braking system. Of the two the question of stopping is the more important, as the safety of the service to a greater degree depends upon it. The measure of value of a car brake is the ability to stop a car within the shortest possible distance when necessary. Loss of brake efficiency has a direct bearing on the accident account.

With high-pressure braking the possibility of skidding wheels depends entirely on the speed. It is not intended by the use of high braking efficiency to overlook the impor-

tance of automatic means for reducing the tension on the braking apparatus in proportion to the reduction of speed. Up to the present, however, such an improvement has not been brought out and applied successfully, and until it is, we must concede that the higher the braking power, the greater must be the dependence on the judgment of the operator. Motormen should be frequently reminded that with the same pressure the retarding effect is greater at slow speeds than at high speeds. The friction of the brake shoes upon the wheels varies inversely with the speed and shows the importance of employing greater brake-shoe pressure upon the wheels at high speed. A straight line stop is the ideal one not only from the points of time, distance and efficiency, but is an important consideration to the passengers.

The accompanying Westinghouse-Galton friction curves, Fig. 1, are reproduced to show the importance of securing the highest braking effect at the highest speed, and of decreasing this pressure in direct proportion to the reduction of speed. If the operator will keep this point closely in mind for a short time, the making of economical and ideal stops will soon become second nature to him.

The stopping power of a car is limited by the amount of power required to skid the wheels however applied. It is realized that the brake-shoe friction against the wheel should be just insufficient to overcome the constant static rail friction. After a powerful application of the brake

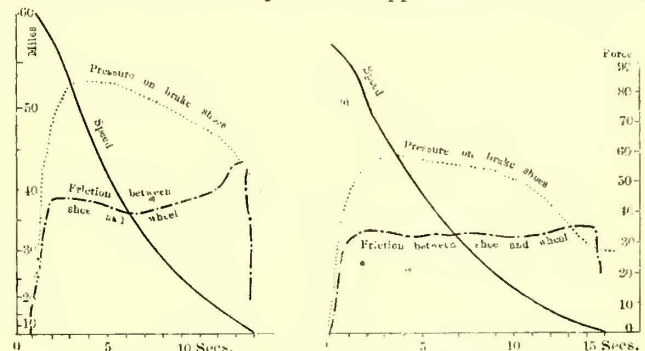


Fig. 1.—Westinghouse-Galton Friction Curves

a retardation is felt, then, if the wheels skid the car will shoot ahead as if the braking power had suddenly been diminished. If the wheels are allowed to continue skidding the distance covered before stopping will be considerably greater than if the brakes had less power and the wheels had not locked. This point should also be kept prominently before motormen. In the investigations leading to this article, the dangers from high power and skidding have been seriously considered. While the total braking power may at first thought seem too high, it will be noticed by reference to the proportions shown in the accompanying Figs. 2 to 4 that the increase in pressure is on the forward part of car and is accompanied by a proportionate increase of transferred weight due to the high center of gravity.

It is obvious that the existence of a greater rail pressure for the forward than for the rear pair of wheels of the truck implies the virtual transfer of a proportion of the normal pressure from one pair of wheels to the other. The brake-shoe pressure upon the rear pair of wheels must be insufficient to skid wheels and must therefore be cut down in proportion to the transfer of weight from the rear to the forward pair of wheels and the pressure on the forward pair must be increased in the same proportion.

The leverage and braking power of three different types of cars presented in Figs. 2 to 4, one a two-motor equip-



ment and the others four-motor equipments of different weights, were determined after numerous tests covering about a year. These figures show clearly the increased braking power which can be obtained without additional expense by taking advantage of the transfer of weight of a one-way car. This increase in power varies, of course, with the height of center of gravity, truck centers and truck wheel base.

cannot be operated on a two-way or double-end car, as the limit of maximum power obtainable up to the skidding point on the rear pair of wheels is about 95 per cent, which is the general practice for passenger cars for a speed of 20 m.p.h.

To illustrate how little anticipation there was of attaining the power possible on the No. 1 axle, the dead lever was first shortened to give 107 per cent and the car allowed to run for a month. With many misgivings the lever was then shortened until 124 per cent was obtained and allowed to run a month, then 133 per cent, then 166 per cent and the car was allowed to run three months at the last figures, feeling this was surely the limit. Later the lever was shortened to such an extent that 193 per cent power is given in service braking and 280 per cent when the brake is thrown in an emergency with the 6-in. cylinder.

From trials made at a speed of 25 m.p.h. on any of the three classes of cars as shown, emergency stops were made with brakes full on without any indication of skidding, showing conclusively that the limit in proportion had not been reached. The strength of the truck and maximum limit of cylinder travel, however, dictated the discontinuance of experiments.

THE USE OF SAND

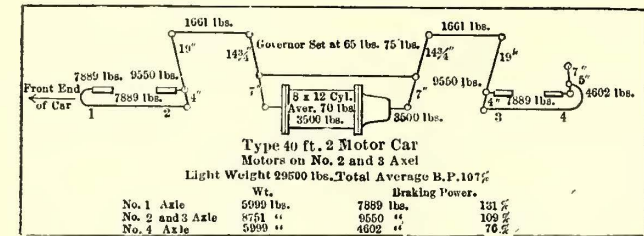


Fig. 2. Braking Data for 40-ft. Two-motor Car

Referring to the two-motor equipment with one motor on each truck (Fig. 2), it will be seen that the total average braking power reaches the good figure of 107 per cent and the efficiency of the brake on the drivers is not reduced because of the idlers, as from the tests made the proportion seems to be approximately correct. The 41-ft., four-motor car (Fig. 3) shows that in every maximum service application of the brake a total average of 131 per cent is obtained, on the No. 1 axle a pressure of 193 per cent, and

No doubt the rail friction of a wet rail with sand is at least equal to that of a dry rail without sand, and sand for increasing friction as in the case of the wheel and rail is probably most vital and necessary. It is difficult to attain satisfactory results from pneumatic sanders, yet they are known to be fairly successful if given as much care as other apparatus on the car. A great deal of attention is given to details of sanding by steam railroads, yet stops are made only on an average of 50 miles or upward, while street railways must stop on an average of every 400 ft. and possibly as often as 30-second intervals.

Without taking up space to show comparative tests, I wish to state that all pneumatic sanders taking their supply direct from the main reservoir deplete the system and thus reduce braking power to a very great extent. Hence, no company operating under city conditions can afford to use pneumatic sanders without an auxiliary reservoir.

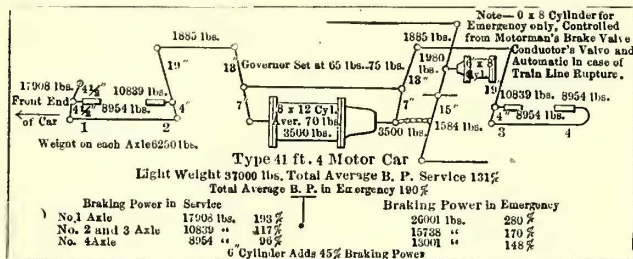


Fig. 3. Braking Data for 41-ft. Four-motor Car

when the 6-in. emergency cylinder acts a total of 190 per cent average is obtained and the No. 1 axle rises to 280 per cent. The 43-ft., four-motor car (Fig. 4) has a total average braking power of 128 per cent and has the highest proportion on the No. 1 axle, namely, 207 per cent, in maximum service application, as it does not possess the 6-in. emergency cylinder feature. The truck wheel bases are as follows: Fig. 2, 4 ft. 10 in.; Fig. 3, 4 ft., and Fig. 4, 4 ft. 9 in.

VIENNA TRAMWAY REPORT

The year 1907 has been a very active one for the Vienna Municipal Tramways, for beside receiving a concession from the central government for the construction of two interurban railways, the tramways also purchased for electrification the 42 km (26 miles) of steam tramway lines hitherto operated by Kraus & Company, and on March 23 and October 16, respectively, instituted an auto-omnibus service for two outlying districts with the results noted in a later chapter. The municipality now controls all the street railway systems within its boundaries.

During 1907 the municipal system operated on 400.7 km (248.4 miles) of track exclusive of 24 km (14.9 miles) of extensions and the steam lines. Only 29.8 km (18.5 miles) of track is operated with the conduit system. The track maintenance was considerable, requiring the installation of 5605 Melaun joints (applied by milling the rail head) on old rails. The Melaun joint also was used for 22.12 km (13.7 miles) of new rail and of the remainder of the new work, 0.38 km (0.23 mile) was equipped with the Scheinig & Hofmann joint and 11 km (6.8 miles) with angle joints.

The passenger rolling stock consisted of 1055 motor cars and 994 trailers with a total seating capacity of 77,835, or

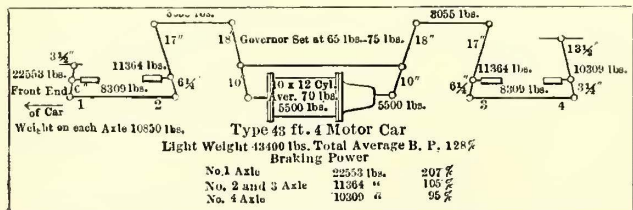


Fig. 4. Braking Data for 43-ft. Four-motor Car

proportion on the No. 1 axle has not been reached in any of these cases, but the strength of the truck frame permits carrying the pressure no higher at the top of dead lever. In all instances, due to the transfer of weight on the second truck, the No. 3 axle would stand probably 50 per cent greater pressure than the No. 2 axle, but we have not gone into any complex system of levers to obtain it.

It is readily understood that this high-braking power



slightly less than 39 per car. Although the route length increased from 186.6 km (115.7 miles) to 187.9 km (116.5 miles) only, the cars covered 62,430,926 car-km (38,706,174 car-miles), an increase of 6.6 per cent over the year 1906. The greatest mileage was 236,506 car-km (146,633 car-miles), operated on Nov. 1, with 935 motor cars, 936 trailers and 4500 trainmen. Trail cars are being used more than ever, the mileage from them having increased 11.5 per cent against 3.3 per cent from the motor cars.

The total number of passengers carried was 216,901,916, an increase of 8.8 per cent, or 2.2 per cent more than the mileage growth. During the same period the Stadtbahn (a local belt line) carried 33,703,565 passengers, Vienna General Omnibus Company, 13,784,196, and Kraus & Company's steam tramways, 4,395,558. The average daily travel on the municipal system was 568,924 against 523,761 passengers in 1906. The annual average density of traffic was 3.5 passengers per car-km or 5.6 passengers per car-mile.

The gross earnings from transportation were 30,885,019 crowns (\$7,489,617), an increase of 8.5 per cent over the preceding year. Excluding the amounts given for employees' welfare funds, the operating expenses were 61.5 per cent (59.3 per cent in 1906), but with such disbursements included this factor rises to 66.6 per cent (63 per cent in 1906). The surplus for 1907 was 2,800,416 crowns (\$697,101), or 890,168 crowns (\$215,866) less than 1906, but this was due to setting aside larger amounts for renewals and welfare work. The average income rose from 48.6 heller to 49.5 heller per car-km (\$.019 to \$.0192 per car-mile), while the average income per passenger was 14.4 heller (\$.035) as in 1906.

ACCIDENTS

Although accidents increased in number, this increase was less than the proportionate growth of the mileage. The number and character of accidents compared with the 1906 figures given in brackets were as follows: 1258 (1178) slight injuries, 109 (83) severe injuries, 18 (20) mortal injuries. As usual, the greatest number of accidents was caused in boarding or leaving cars, which resulted in killing three and severely injuring 27 passengers. Accidents from crossing the tracks brought death to 12 pedestrians.

That "ambulance chasing" is in a sadly neglected state in Vienna appears from the fact that only 314 claims for personal injury were presented out of a total of 1385 accidents. Of these 314 cases, 154 were privately settled for 42,728 crowns (\$10,361), or an average of \$61 per case. In 84 instances the tramways management refused payment without suffering litigation and the cases tried resulted in aggregate damages of 63,672 crowns (\$15,440).

Quite a number of unsettled suits from 1906 and earlier were disposed of in 1907. Fifty-seven cases were settled for 33,779 crowns (\$8,191), 39 cases lost in court cost 132,769 crowns (\$32,196), and others settled before the suits had come up for trial cost 82,890 crowns (\$20,100).

Property damage claims numbered 174, of which 81 were settled for 13,212 crowns (\$3,205) and 77 were refused payment without litigation in court. The total expense for property losses was 16,977 crowns (\$4,117), in addition to 3863 crowns (\$936) for old claims.

EMPLOYEES AND WELFARE WORK

The tramways had 7582 employees, of whom 5944 were in the transportation department. The office force is now graded in three divisions according to education, as follows: High school graduates, grammar school graduates and non-

graduates. Thus the clerical organization is on a civil service basis, and, in fact, increases in salary are now based according to this grading. A general increase was granted in 1907 to all employees. Aside from the larger regular contributions mentioned in the next paragraph, the management distributed 5576 crowns (\$1352) for efficient traffic handling on All Saints' Day, 116,177 crowns (\$28,173) for Christmas, 28,799 crowns (\$6984) for wages of employees attending military encampments and 32,705 crowns (\$7931) for carmen's premiums. During the small-pox epidemic in the autumn of 1907 all employees affected were home on full pay until the end of the quarantine.

During 1907 the Municipal Tramways contributed 1,595,959 crowns (\$387,020) for welfare purposes, embracing pensions, school fees for employees' orphans, sick benefits, etc. The different welfare organizations adopted a regulation that any member convicted of a crime shall cease to be a beneficiary.

The pension society of the clerical force now has a fund of 1,183,136 crowns (\$287,910) and a membership of 111 men and 131 women. The organization of the operating departments has a fund of 8,338,960 crowns (\$2,022,198) and a membership of 6818. The city guarantees to pay the pensions should the funds of the latter organization be exhausted at any time.

The sick benefit society of the operating men, which numbers 7306 members, expended an average of 40.3 crowns (\$9.77) for each member, while the individual average payment was 37.14 crowns (\$9). The money was spent as follows: Sick benefits, 64.56 per cent; medical attendance, 15.15 per cent; hospital cots, 3.52 per cent; medicines, baths, etc., 10.49 per cent; burials, 2.41 per cent; management, 1.54 per cent; depreciation of securities allowance, 2.33 per cent. The average length of sickness per member was 13.41 days. Accidents to employees are covered by special insurance which cost the tramway 89,608 crowns (\$21,730).

AUTO BUSES

For the convenience of residents in outlying, thinly settled communities, the Municipal Tramways started the two auto bus lines mentioned earlier in this report. Neither line has proved profitable as yet owing to the light travel and low fares. Line No. 1, operating to Kaiser-Ebersdorf, has a half-hourly service from 5:30 a. m. to midnight, with one Büssing and three Nesselhofan gasoline buses; fare of 12 heller (\$.03) for adults and 10 heller (\$.025) for children. Line No. 2, operating to Floridsdorf, has a schedule varying from half an hour to two and a quarter hours between 6 a. m. and 10:12 p. m., with two Büssing auto buses; adult fare of 12 heller (\$.03) for each of the first two sections and 20 heller (\$.05) for the third section, while the uniform fare for children is only 10 heller (\$.025) for the entire distance. The lengths of these lines are not given in the report, but the following table will be found to include income and operating cost per bus-mile, together with other detail data.

AUTOMOBILE OMNIBUS TRAFFIC TO VIENNA SUBURBS.

	Total traffic		
	Working days	Holidays	Total
Operating days .....	232	52	284
Omnibus days .....	555	161	716
Omnibus-km .....	71,823	17,550	89,373
Omnibus-miles .....	44,530	10,881	55,411
Passengers .....	172,423	65,103	237,526
Gross income, crowns .....	18,942	7,110	26,051
Gross income, dollars .....	4,593	1,724	6,317
Gross income per km operated, in hellers .....	26.4	40.5	29.1
Gross income per mile operated, in cents .....	10.4	16.2	12.0



## COMMUNICATIONS

### A "REASONABLE RETURN" ON RAILWAY CAPITAL

BOSTON, MASS., Aug. 25, 1908.

To the Editors:

A correspondent in your issue of Aug. 22 raises the very pertinent question as to what constitutes that return which is to be regarded as reasonable by the regulating authorities. This is a very vital matter, since on the interpretation depends the prosperity or failure of many an enterprise. The very phrase is provocative of quibbles, and the whole question is one which deserves open discussion, which I trust it will receive. No one is disposed to deny that such enterprises as railroad construction in a region of uncertain traffic deserve well of the community and are in all justice entitled to a proper recompense for the risks taken. As a matter of fact, American railroad building has always been along lines of uncertain traffic. As a rule, the builders have gone ahead with faith in the growth of the country and have taken chances that often seemed and frequently proved too long for prudence. The few prosperous lines make more impression on the popular mind than the many which are struggling along without paying dividends because the traffic is not sufficient to support them, or than those which have become self-supporting only after periods of insolvency and successive reorganizations. When one realizes that this country of ours has about one mile of railroad for every 375 inhabitants the magnitude of the risks that have been cheerfully taken may perhaps be the better appreciated. The reason for this optimism, of course, has lain in the expectation that the successful road would always be allowed to earn enough to recoup the promoters for their initial risk. It goes without saying, therefore, that a railway investment deserves, on the commonest principles of equity and justice, much larger returns than would be proper for funds stacked away in banks or secluded in Government bonds. And to bring the justice of this home to the community the railway deserves this because it is a public servant and is taking its risks in the belief that it will be such a public benefit as to win adequate support.

On the other hand, it should be frankly admitted that a railway, being under the law a common carrier, and deriving its always large and sometimes exclusive charter rights from the public, is properly subject to regulation that would be altogether out of place in a purely private enterprise. When the community concedes the right of eminent domain and other valuable equities, and undertakes, as it often does, to afford partial or complete protection against unrighteous competition, it very properly retains the right of protecting itself against the misuse of its concessions. Railways have often complained, and sometimes justly, that the public has broken its faith in this matter. But whatever one may consider the ultimate ethics of governmental regulation to be, it stands as an accomplished fact, subject only to that amendment to the Constitution which has been already so far warped from its well-known original intent as to make it a precarious shelter. The practical question, therefore, is not whether there shall be public regulation, but what are the limits of equity in such regulation. To determine these requires the answer of several other questions none of them easy. Taking it for granted that railroads are entitled to a reasonable return upon the capital invested, one instinctively first asks what is really implied by the words "capital invested."

If a general acceptable definition could be found for this phrase, a "reasonable return" would not be very difficult to agree upon. In other words, the question which Mr. Smith asks can be paraphrased to read: "Upon what investment is a railroad company in all fairness entitled to a return in excess of conservative investment rates, taking into consideration all the conditions of its public service?"

If the main question pertained merely to new roads it would be comparatively simple, but in most cases it involves a long history of financing, of failures and successes, of leases and reorganizations, from which has emerged a certain volume of securities bearing no easily ascertainable relation either to the original investment or to the cash expended in legitimate improvements for the public service. So far as public welfare is concerned, the value of a railroad is not directly affected by the fluctuations of its stock. On no reasonable theory can the market value of the securities be taken as the "capital invested" on which the road is entitled to claim special consideration. Nor is the present face value of the securities any better guide, if as good, since some roads are known to be conservatively capitalized and others to be overloaded. Even railway specialists are hardly agreed upon what constitutes water in securities, but most certainly "water" does not share the risks of, nor does it deserve the consideration due to, issues for legitimate improvements.

On the other hand, the replacement values of physical properties, often suggested by publicists as the basis for valuation of quasi-public corporations, do not seem fair to those who have put in good money under less favorable conditions than may now exist. If railway rates are to be regulated so as to limit the returns, surely those who put in hard-earned dollars to buy costly material ought not to suffer for the larger responsibilities they assumed. It seems rather that the investment on which the "reasonable return" is to be reckoned ought to be what the face value of the words would suggest—that is, the cash really put into original construction and successive additions and betterments, eliminating from these last all items of maintenance and depreciation. This sum certainly ought to include all legitimately incidental expenses of organization, plus the price paid for other roads reduced to this same investment basis. The sum thus obtained represents fairly enough the total of the primary monetary venture made in the public behalf by the successive owners of the railway property. Now on such an estimate a very liberal return is due the investors, a figure certainly much in excess of the suggested 8 per cent to which your correspondent refers.

And under such circumstances it seems that the public is not immediately concerned as to the form in which the railway company chooses to distribute these earnings if it is fortunate enough to get them. So long as the returns are figured on real money expended for the public benefit and not on the face or market value of securities why should the public care whether the road gets its funds by the sale of stock or bonds, or whether it distributes its earnings by paying 10 per cent dividends upon one sum or 5 per cent dividends upon twice that sum? Nor would such a valuation as that suggested check improvements to secure better service and economy of operation. For genuine costs, given a conservative administration, 8 per cent is surely too small an allowance, and if such an illiberal view as that suggested were to prevail railroading would soon be in a very bad way. The suggested basis is not a simple one to determine save in the case of new roads, but it certainly does represent a quantity on which something like a fair estimate of suit-



able returns can be made. Any other basis than cash investment introduces implicitly the very elements of risk which should be determined independently as the basis of the "reasonable return."

I hope that the subject will be taken up in detail in your columns by those familiar with railway management and be given the thorough discussion which its importance demands. Some form of limitation of railway profits by law much more far reaching than anything yet tried is altogether likely to come to pass, and it is in the interest of every conservatively managed property, and of the public as well, that the limitations should be such as will put a premium on careful, honest, farsighted administration and shall bear hard upon incompetence, improvidence and every sort of crooked "high finance."

CONSULTING ENGINEER.

### RULES FOR INDIANA INTERURBAN ROADS

Aug. 27, 1908.

To the Editors:

Rules for the operation of Indiana interurban lines were published in the *ELECTRIC RAILWAY JOURNAL* of June 27, 1908. In my opinion the railroad companies should compile their own rules, making them adaptable to their local conditions.

I believe, however, that the rules should be submitted to the railroad commissions for approval; but the situation in Indiana savors, in my opinion, too much of State control, and while the commissions are made up of men more or less familiar with railroads, we find they are mostly, if not altogether, made up of steam railroad men who have no ideas whatever of the difficulties of operating interurban electric lines.

I think you will find that the steam roads file copies of their rules with the commissions; in some States, at least, the commissions do not undertake to dictate the details covering the movements of trains.

GENERAL MANAGER.

### COMMITTEE ON EDUCATION OF AMERICAN STREET & INTERURBAN RAILWAY ASSOCIATION

President Goodrich, of the American Street & Interurban Railway Association, on the suggestion of Secretary Swenson, has appointed a committee on education. The committee consists of Prof. H. H. Norris, chairman; R. E. Danforth, of Newark, N. J., and Prof. A. S. Richey. This committee has been appointed to study and report upon the efforts which are being made by railway companies to train their employees for efficient service. The committee will investigate the present practice of steam railway and lighting companies, as well as that of the members of the association. The scope of their work will include not only the training of young men for executive positions, but also the efforts which are made in behalf of other employees.

It is expected that the committee will present a preliminary report at the coming convention, and that this report will contain considerable information of a practical nature. No attempt will be made this year to lay down any new plans. It is, however, the intention of the committee to keep the members informed upon all subjects properly coming within the range of the committee's activities.

Owing to the great flood in Augusta, Ga., this week, the Augusta Railway & Electric Company's power equipment had to close down and no cars were operated for several days.

### ORGANIZATION OF NEW YORK PUBLIC SERVICE COMMISSION, FIRST DISTRICT

The Public Service Commissions of New York State were created as of July 1, 1907, under the authority of the law passed by the Legislature of 1906-07. The commissions have jurisdiction over all public utility properties except telephone and telegraph companies. The State is divided into two districts and one commission exists for each district. The commission for the First District has jurisdiction within the city limits of Greater New York, and the commission for the Second District exercises jurisdiction in the rest of the State.

Each commission consists of five members appointed by the Governor for a 5-year term, but the first appointments were made so that one commissioner's term will expire on Feb. 1, 1909, and the others on Feb. 1 of each year thereafter.

The commission for the First District consists of William R. Willcox, of Manhattan, chairman, appointed for five years; William McCarroll, of Brooklyn, appointed for four years; Edward M. Bassett, of Brooklyn, appointed for three years; Milo R. Maltbie, of Manhattan, appointed for two years, and John E. Eustis, of the Bronx, appointed for one year. Each commissioner receives a salary of \$15,000 a year paid by the State of New York. Each commission is authorized to appoint a counsel at a salary of \$10,000 a year and a secretary at a salary of \$6,000 a year. These salaries are also paid by the State of New York. The running expenses of the Commission for the First District are a charge upon the city of New York, and are paid out of the city treasury.

Under the law, the secretary is charged with responsibility for the office, the organization of its working force, the custody of papers and their filing, the keeping of the minutes of the commission's proceedings and proper records of all official actions. For this position the commission for the First District chose Travis H. Whitney, a New York lawyer, who had been actively interested in public affairs and had served for some years at Albany as the agent of the Citizens' Union in watching New York City legislation.

The commissioners took office July 1, 1907, and within a month, with the assistance of Secretary Whitney, had evolved a plan of organization which had proved effective. The diagram on the next page shows the plan of organization. Under this plan, while the commission itself is supreme, all business passes through the office of the secretary. Each commissioner has a private secretary and a stenographer to attend to his individual correspondence.

While the secretary's office exercises general supervision over the whole organization, there are two large sub-divisions, namely, the legal department under the chief counsel, and the engineering department under the chief engineer. Directly under the secretary is the executive department of the office, in charge of the first assistant secretary, W. J. Norton. Working between the secretary and the first assistant secretary is the second assistant secretary, J. B. Walker, who has charge of the public hearings given by the commission, and furnishes to newspapers and others who may be interested copies of the commission's decisions, orders and resolutions.

The first assistant secretary has particular charge of the stenographic bureau, the file room, the general office, the auditor's office, the librarian's office and the purchasing bureau. The general office under him is in charge of Arthur McKinney, third assistant secretary, who keeps the



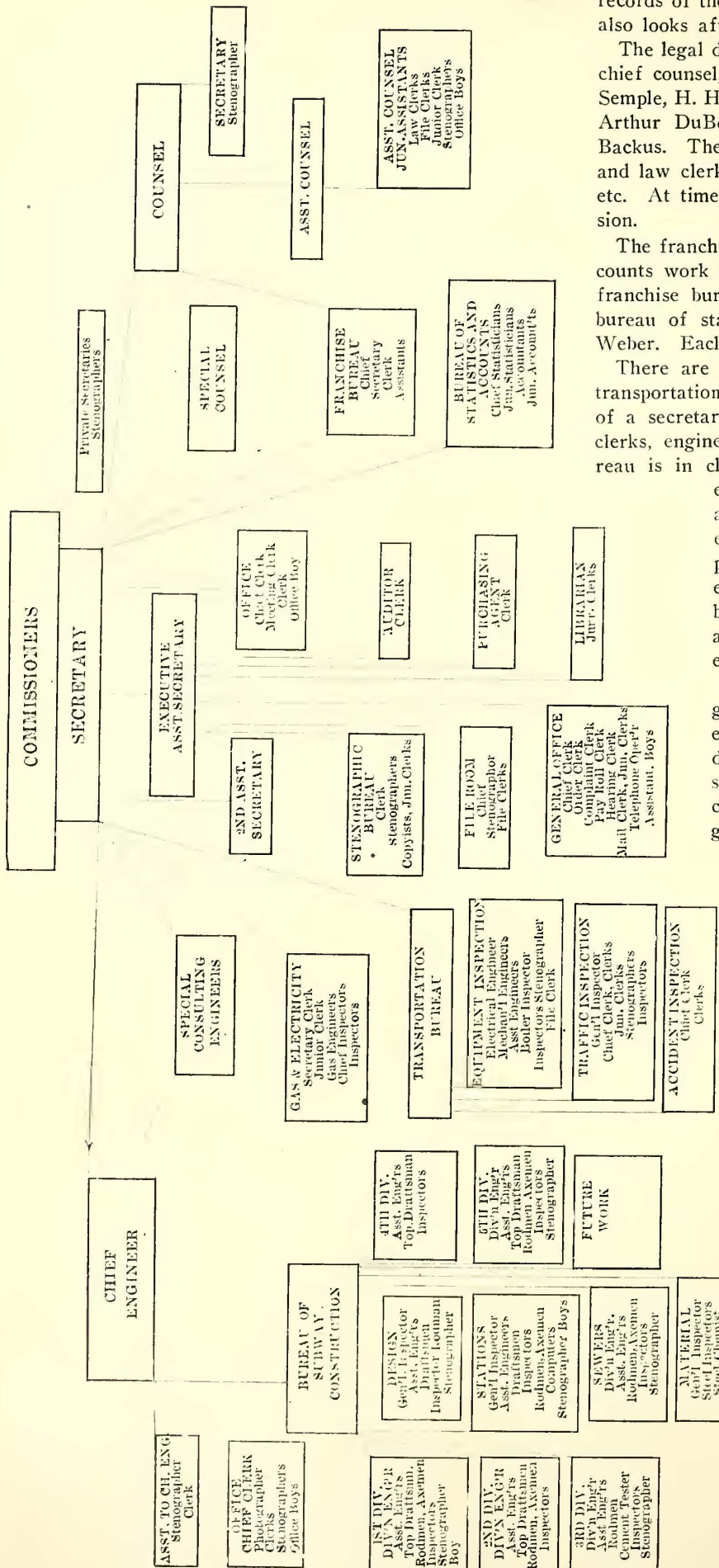


Chart of Organization of Public Service Commission of New York, First District

records of the commission and other documents on file and also looks after the indexing and mailing departments.

The legal department is in charge of George S. Coleman, chief counsel, who has the following assistants: Oliver C. Semple, H. H. Whitman, Leroy T. Harkness, A. H. Walker, Arthur DuBois, H. M. Chamberlain and Grosvenor H. Backus. There are also several junior assistant counsel and law clerks with the necessary force of stenographers, etc. At times special counsel is employed by the commission.

The franchise bureau and the bureau of statistics and accounts work between the secretary and the counsel. The franchise bureau is in charge of D. F. Wilcox and the bureau of statistics and accounts is in charge of A. F. Weber. Each has a number of assistants.

There are also bureaus of gas and electricity, and of transportation. The gas and electricity bureau is in charge of a secretary, Thomas D. Hoxsey, who has a force of clerks, engineers and inspectors. The transportation bureau is in charge of Daniel L. Turner, who is a civil engineer. Under him is a force of engineers and inspectors for equipment and traffic. The equipment inspection is under the direct supervision of A. W. McLimont, the electrical engineer of the commission. The accident bureau, in charge of George F. Daggett, is also a part of the transportation bureau and employs clerks and inspectors.

The engineering department is under the general charge of Henry B. Seaman, chief engineer of the commission. The chief subdivision of this department is the bureau of subway construction, which is under the charge of George S. Rice, formerly chief engineer for the Rapid Transit Commission. The

department has five divisions employing several engineers and draftsmen with special departments for design, stations, sewers, material and future work. Occasionally consulting engineers are retained outside of the engineering department, an instance being that of Bion J. Arnold, who has made a study of the New York subway and presented reports looking to the improvement of service therein. Lately Mr. Arnold has been placed in charge of the appraisal of the property of the surface railways in Manhattan and the Bronx.

As the duties of the former Board of Rapid Transit Railroad Commissioners, the Commission of Gas and Electricity, the State Board of Railroad Commissioners, and the State Inspector of Gas Meters were taken over by the commission and many additional duties assumed under the law, the work demanding attention has been enormous.

The correspondence alone sometimes reaches a total of 300 letters a day. It is the duty of the commission to consider and investigate

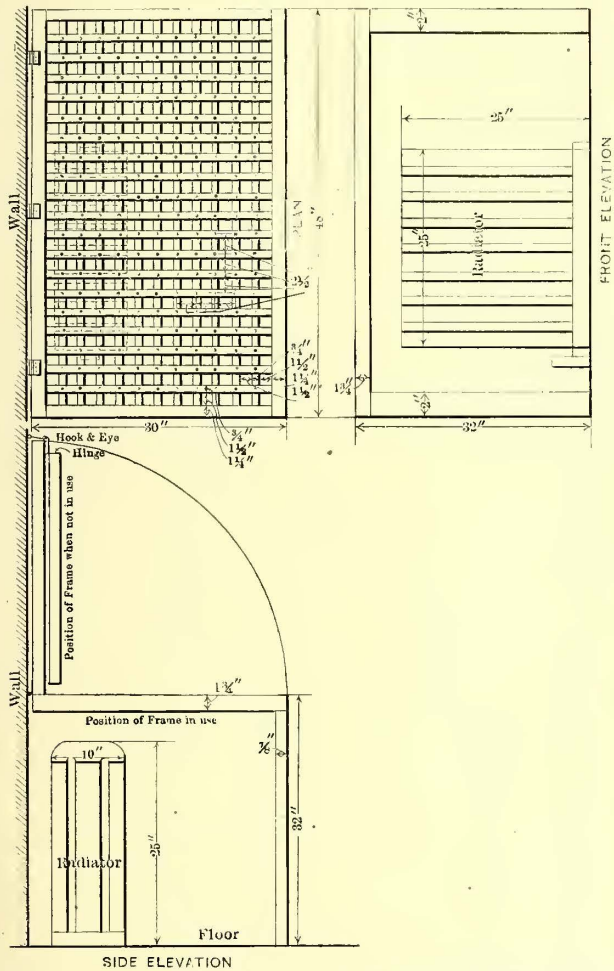


complaints, and scarcely a day passes when one or more hearings are not held; on some days the calendar has shown as many as 10 different hearings.

Figures on the cost of conducting the Public Service Commission, First District, for the first year of its existence have been made public by the commission. The total cost of this commission and its operations from July 1, 1907, to July 1, 1908, is \$863,372.98. From Jan. 1 to July 1, 1908, the expense was \$462,903.81.

**A HANDY BLUE PRINT FRAME**

The accompanying drawing illustrates a blue print drying frame used in the offices of the Boston Elevated Railway Company in a pent house on the roof of the Milk Street headquarters. It was designed by H. C. Hartwell, of the



**Blue Print Drying Frame Used by the Boston Elevated Railway**

elevated and subway engineering construction department, and was built to prevent warping when wet prints are laid upon it over a steam radiator on which the latter are dried when haste is required. The frame is of white pine, halved and screwed at intersections, and is designed to fold up against the wall when not in use. The openings in the lattice work enable the heat to be applied efficiently to the damp prints, and the cost of the frame was trifling.

As the result of a hearing on Sept. 2, regarding the Long Island Railroad's charge of 10 cents for a ride from the Flatbush Avenue terminal to the Brooklyn city line, the New York Public Service Commission has called for briefs from the company and complaining citizens for submission on Sept. 21, when a further hearing will be given.

**DECORATED CARS IN CROYDON**

A good example of the possibilities of the electric car for spectacular parades was shown during the festival at Croydon, England, on July 22, known as Lifeboat Day. One of the cars belonging to the corporation tramways was decorated with bunting, flowers and electric lights and formed a conspicuous part of the parade. A novel



**Decorated Car at the Croydon Lifeboat Carnival**

feature was its utilization also for collecting contributions for the life-saving fund. The windows on each side of the car were removed and a length of sail cloth was stretched across, running the whole length of the car. Coins were thrown through the windows as the car passed along. As a special attraction three targets were suspended on each side, inside the car, and people were invited to throw at them. Including four of the tramway staff who



**Night View of Illuminated Car During the Lifeboat Carnival**

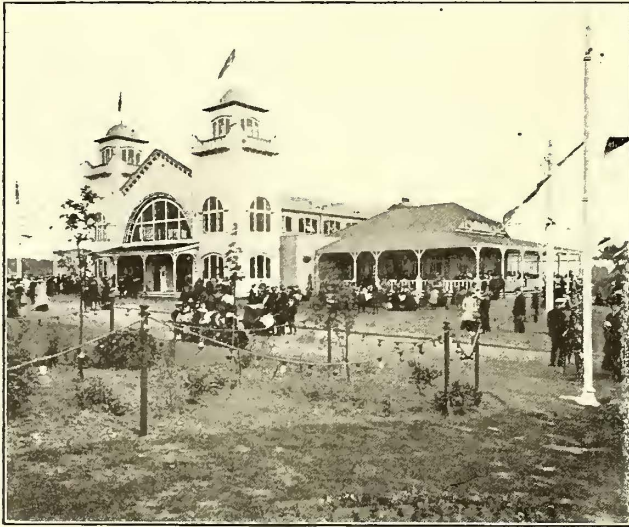
had "lifeboat" collecting boxes, the money taken by them and the "lifeboat car" amounted during the day to more than £27. During the week the car collected £45, and the profit for selling postcards of the car realized £19, giving a total of over £65, which was handed over to the fund.

The motorman and conductor in charge of the car, as well as the four men collecting, were suitably attired in lifeboat clothing.



## AN ENGLISH AMUSEMENT PARK

The first park to be run directly in connection with a tramway, light railway or municipal line in Great Britain was recently opened near Wakefield under the direction of the Wakefield & District Light Railways. It is known



Main Building in Lofthouse Park

as Lofthouse Park and is situated midway between Leeds and Wakefield and reached by the Leeds and Wakefield lines of the Wakefield & District Light Railways. The park proper is under the management of a separate company known as the Lofthouse Park Company, Ltd., and had its beginning in an attempt to furnish a place of recreation for the workers in the nearby collieries and villages and hamlets. It was at first laid out as a picnic ground, but later amusement attractions were added. Admission is free on presentation of a ticket from the tramway company showing its lines have been used to reach the park.

Lofthouse Park covers the whole of the southern slope of Lofthouse Hill and commands an extensive view of



Conservatory in Lofthouse Park

the Vale of the Calder. The 60 acres of ground have been fenced and laid out attractively and there are a pavilion, concert room, winter garden, restaurant and bandstand. The pavilion is of Oriental design and is in the center of the park, its gilded domes dominating the park and forming a central figure around which the smaller

buildings are clustered. It contains a concert hall, restaurant, grill room and cloak rooms. The concert room, which is in the pavilion, has a capacity of 1000 persons and is used for concerts, variety entertainments, balls, etc. Permanent stage fittings are provided and there are all the conveniences of the modern theater in the way of dressing rooms. The orchestra has been placed to the left of the pavilion, and by opening sliding windows the music can be heard equally well in the outer dancing platform and in the winter gardens. The winter gardens adjoin the pavilion and form a very popular resort for rest and refreshment. The catering is done by one of the best-known firms in Great Britain and the service, at popular prices, is first class in every respect. The bandstand, illuminated by an immense number of colored electric lights, occupies the center of a circular promenade 200 ft. in diameter, one-half of which is backed by an interesting rock garden containing hardy plants of all descriptions.

The amusement attractions include a native Bontoc Igorrote village, bowling green, a puzzle garden, numerous riding devices and small side shows. The Igorrote village is very popular, the natives being adepts at tree-climbing, spear-throwing and dancing. A lecturer is provided to tell about the habits and customs of the natives, and the work carried on by them in the village is the same as that which they do at home in the Philippine Islands. Music is furnished by a military band, which plays daily from 3 o'clock to 7 o'clock. As a special feature, there are firework displays by Messrs. Brock, of the Crystal Palace, on Wednesday and Saturday nights and on Monday afternoons there are daylight fireworks containing toys of all descriptions. Music for dancing is furnished by an orchestra, which plays every afternoon and evening, and those so inclined can enjoy this form of amusement either in the open air or the ballroom. Thousands of colored lamps are also used for outlining the flower beds and buildings at night. The success of the park has led the managers to decide to extend it and install a water chute, figure-eight roller-coaster and a miniature railway. While there are ample accommodations for cricket, football and other sports, it is the purpose of the management later to lay out an athletic field.

## MEETING OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION

The first fall bi-monthly meeting for 1908 of the Central Electric Railway Association of Indiana and Ohio will be held in the Claypool Hotel, Indianapolis, on Sept. 24.

The first paper will be read by David M. Rushmore, of the engineering, power and mining department of the General Electric Company, Schenectady, N. Y., on the subject, "Recent Developments of Lightning Arresters."

The second paper will be read by Ellis C. Carpenter, general claim adjuster of the Indiana Union Traction Company, Anderson, Ind., on "The Benefits of the Index Bureau."

The third paper will be by E. G. Hindert, of Elyria, Ohio, chief engineer of power, Cleveland, Southwestern & Columbus Railway, on "Electric Railway Return Current."

A fourth paper will be read by G. H. Kelsay, superintendent of power, Indiana Union Traction Company, Anderson, Ind., on a subject not yet announced.

An innovation will be introduced at this convention in the form of music or songs between the reading of the papers by a glee club connected with the Indiana Union Traction Company.



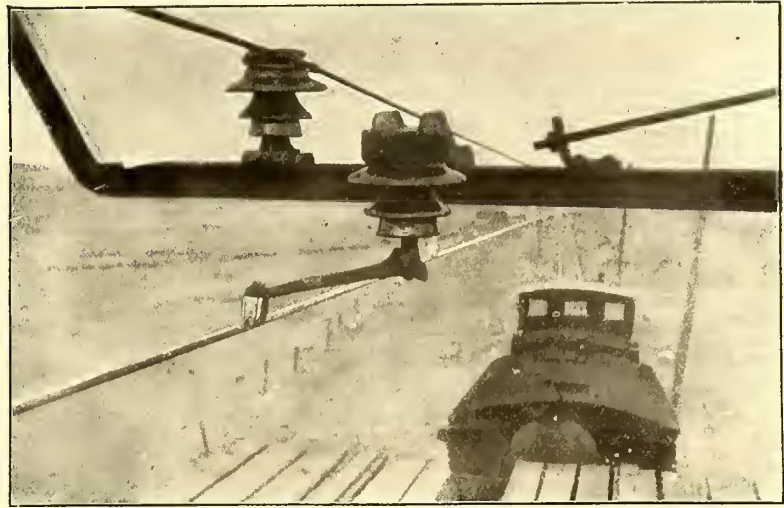
**CATENARY TROLLEY CONSTRUCTION**

The proceedings of the American Society of Civil Engineers for August, 1908, page 540, contain the text of a paper on the catenary construction of the Denver & Interurban Railroad which is to be presented by Oliver S. Lyford, Jr., at the meeting of the society on Oct. 7, 1908. The road is a part of the Colorado & Southern Railway system and connects Denver with Boulder. In the former city the cars operate over the 600-volt d.c. lines of the Denver City Tramway Company and at Boulder there is 1 1/3 miles of d.c. construction. The rest of the line, 44 miles in length, is equipped with the single-phase system in which 11,000 volts are used on the trolley wire.

The overhead line was put up rapidly with the assistance of a steam construction train and in one day's work 26 men installed 117 poles, including digging holes and tamping. A different construction train was used for erecting the brackets. For this service a number of box freight cars were equipped with a scaffold on the tops of the cars. With a train of five cars work could be done on four or five poles simultaneously, and 150 brackets were erected per day with 18 men. For stringing the catenary a derrick car was used, arranged to carry the reels and pay the wire out over elevated rollers. The best day's run on messenger wire was 7 miles strung and tied in. This took 17 workmen and two train crews. The best day's run on stringing and splicing trolley wire was also 7 miles, with 12

before the brackets were erected, and the wire was paid out over the end of the boom of the derrick.

In the Denver & Interurban work the sag table used was that published herewith. To verify this table a special dynamometer was provided consisting of a calibrated car spring. The use of this dynamometer disclosed a point of



Denver & Interurban Railway—Line Insulator and Steady Strain

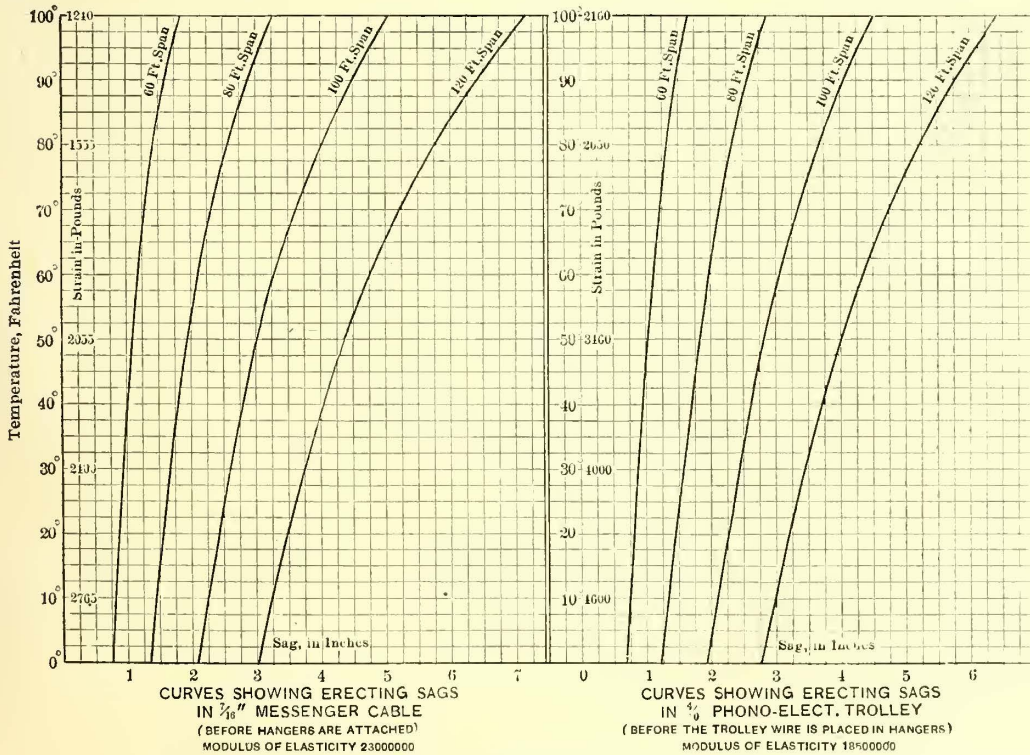
interest in connection with the erection of long lengths of wire and cable. For an average sag of the messenger cable, which according to the sag table should result in a tension of 2300 lb., the dynamometer showed an initial tension of 6000 lb. This initial strain decreased to 4000 lb.

before quitting, and after expansion and contraction over night came down to the figure in the sag table. This excessive initial strain occurred on a portion of the line which is full of curves and was due to the lack of equalization between spans of 1-mile section. On tangents the initial strain was between 3500 and 4000 lb. This is a point to be borne in mind in calculating the proper elastic limit for such wires and cables. All brackets are attached to the poles with pole collars, and to increase the life of the poles they were treated with carboli-neum.

In the Denver & Interurban work a ground

work consisting of 7/16 in. stranded galvanized steel cable was strung over the pole tops for the entire length of the line. Mr. Lyford enumerates the functions of this wire as follows:

It affords means for grounding the brackets and cross-spans so that working upon these parts is safe.



Denver & Interurban Railway—Sag Curves of Cable and Trolley

workmen and one train crew. The best day's record of clipping up messenger and trolley wire was 3 1/2 miles with 13 workmen and one train crew. A working day consisted of nine hours, with transportation from headquarters each day on the company's time, leaving about seven working hours. The ground wires and feeder wires were placed



The ground connection of the running rails can be made at every fifth pole instead of at every pole, as would be necessary without this cable.

It affords a third circuit in parallel with the two running rails for the return circuit.

Being at ground potential and at an elevation above the trolley wire, it affords effective lightning protection.

It is a cheaper construction than the grounding of each bracket to the running rail and the addition of lightning arresters.



Denver & Interurban Railway—Apparatus for Stringing Wires

The two running rails were also cross-bonded at frequent intervals, and are also provided with ground plates.

In Mr. Lyford's opinion, galvanizing affords the best protection for the iron and steel parts used in the overhead work. The combined action of the elements and locomotive gases on galvanized work has been watched carefully. The locomotive exhaust forms a hard deposit on wires placed directly above the center of the track, and this de-

breakage the insulators and the parts attached thereto are automatically released from the member attached to the trolley wire and fall to the ground, thus preventing interference with the pantograph.

OFFSET OF TROLLEY WIRE

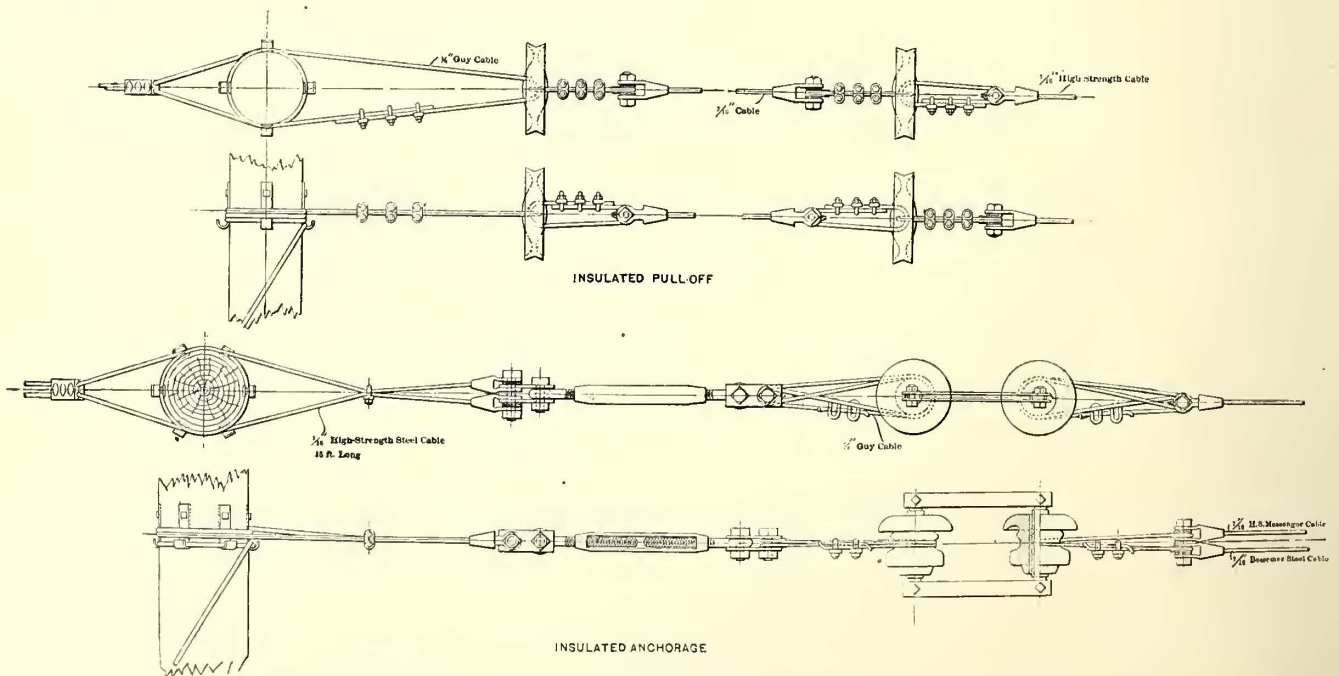
In the Denver & Interurban work the pole setting on curves has been such as will permit of keeping the trolley wire within 3 1/2 in. of a line directly above the center of the track. The poles were spaced according to the figures in Table I.

TABLE I—POLE SPACING

Degree of curvature of track, Tangent.	Pole spacing, in feet.	Divergence of trolley wire from track, in inches.
	120	0.
1	120	1.87
2	110	3.37
3	90	3.06
4	80	3.37
5	70	3.06
6	60	2.87
7	50	2.34
8	50	2.64
9	50	2.94
10	50	3.24

In discussing this question of offset and type of poles to be used, Mr. Lyford says:

"Many roads have used greater offsets than shown in Table I, in order to save poles, but it should be borne in mind that the use of an overhead conductor in a permanent position above the tracks has a material effect upon existing practice in maintaining roadbeds. Hitherto the tracks have been constantly shifted by the section men in the correction of the alignment and in ballasting, and there have been no close limitations. With catenary work above the track, the section man is forced to work within close limits. For instance, 1 in. super-elevation of one rail means 4 1/2 in. deflection of the pantograph. If this is a bump in the track and causes the car to sway, the divergence may be



Denver & Interurban Railway—Details of Pull-offs and Anchorages

posit seems to act as a preservative coating over the galvanized surface.

For the working conductor, phono-electric wire was used to secure greater tensile strength. The engravings on page 597 show the splicing sleeve used with this wire. Porcelain insulators were employed and the trolley hangers were spaced 10 ft. apart. The steady strain used on curves is of novel construction and is so arranged that in case of

considerably more. If this happens on a curve, the deflection of the pantograph and the offset of the wire act together. Obviously, it will be some time before section men are trained to the necessity of close work, and they should be given as much latitude as possible. This means that there should be as little offset as practicable in the original design. Furthermore, the use of small deflections means a minimum of side strain on the structure, and,



therefore, a minimum likelihood of displacement of insulators, steady strains, etc. With wood poles at present prices, adherence to this practice of using small offsets does not materially affect the cost."

The use of wooden poles for catenary construction is in many respects preferable to the use of heavy steel bridges. The principal advantage is in the case of repair. It is unfortunate for catenary work that the supply of wooden poles is rapidly diminishing. An equally light, but strong, substitute is desirable. The question naturally arises as to what will happen to the catenary structure if the poles are struck by a derailed train. One answer to this question was given in the case of similar catenary work for the Erie Railroad. A derailment of the work train occurred during the construction period, and the caboose was driven into one of the electric poles. The pole was cut off at the ground line, the insulator torn loose and the pole thrown to one side entirely free from the catenary work. The tie-wire, by which the messenger cable is attached to the insulator, acted as a safety connection in such a case, as, by breaking, it released the catenary structure from the

COMPARISON OF D.C. AND A.C.

Mr. Lyford includes in his paper a list of the number of electrified steam railroad installations and says:

"There are five roads using the direct-current third-rail system, two using the 600-volt direct-current trolley system, five using the single-phase system, one using the 1200-volt, direct-current trolley system and one using the three-phase alternating-current system. The last two systems have not met with general favor in America, and the single-phase system has been selected by most of the railroad companies whose decision to electrify has been made since the commercial success of this system has been demonstrated. The principal merit in a single-phase system lies in the ability to operate at high voltage with a single overhead conductor, and, therefore, to transmit power long distances with a minimum quantity of copper. These arguments apply particularly to the managers and engineers of large railroads."

In conclusion, the author states that under favorable conditions 11,000-volt catenary construction similar to that described with conductors sufficient for a half-hourly operation of two-car trains, and including track bonding, costs from \$3,500 to \$5,000 per mile of single track electrification.

HOBART ON SINGLE PHASE VS. DIRECT CURRENT

H. M. Hobart, the well-known electrical engineer, of London, contributed a letter to the *London Times Engineering Supplement* of Aug. 12, 1908, discussing the results secured with the single-phase electrical equipments installed on several British railways compared with what might have been secured with direct-current apparatus. The description of the Heysham line in the *ELECTRIC RAILWAY JOURNAL* for July 4 makes the comments of especial interest. Mr. Hobart says:

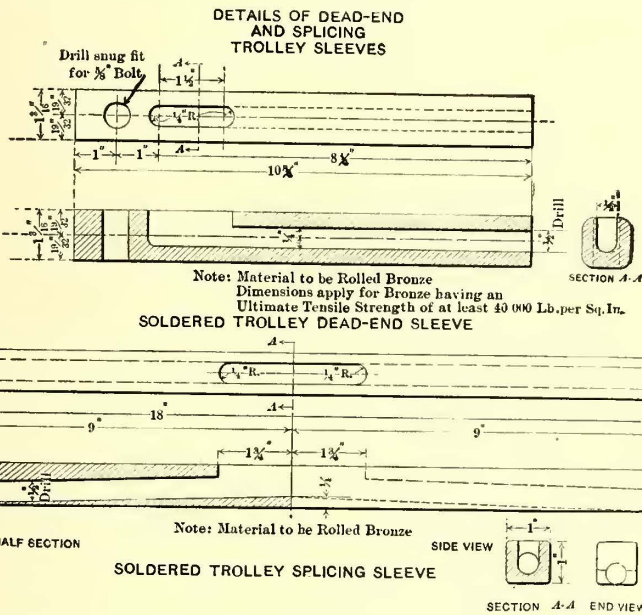
Considerably over a year ago in the *Times Engineering Supplement* for April 10, 1907, I pointed out certain grave faults in the single-phase system of electric traction. Messrs. A. C. Kelly, chief engineer of the British Westinghouse Company; Philip Dawson, consulting engineer for the electrical work being carried out on the London, Brighton & South Coast

Railway, challenged various of my statements, and also complained of my precipitancy in not awaiting the results of the electrification work in progress on the Midland Railway and on the London, Brighton & South Coast Railway. Meager results on the first of these two undertakings have finally been published, and I trust that I shall be pardoned for now returning to the subject without longer waiting for results on the London, Brighton & South Coast Railway.

The data on the Heysham line, as so far made public, do not include any figures for the energy consumption. The absence of a knowledge of the energy consumption data prevents me from comparing my estimates at all points, but the data published as regards equipment weights more than substantiate my standpoint.

Mr. Kelly, in the *Times Engineering Supplement* of April 17, 1907, expressed the opinion that my condemnation of the single-phase system was unjustified, since, he alleged, my comparison was confined to the motors. On this occasion he gave the following figures (see Table I) as representative of the weights of 150-hp motors for continuous current and alternating current respectively.

The equipments which Mr. Kelly's company has supplied to the Midland Railway each comprises two 150 (rated) hp single-phase motors and the necessary appliances for collecting the current, reducing the voltage, controlling the connections and cooling the motors. The Sie-



Denver & Interurban Railroad—Details of Trolley Sleeve

bracket and pole. With the tensions used in the ordinary structure of the Denver & Interurban, two adjoining poles may be destroyed and the trolley wire will only sag to 17 1/2 ft. above the track in the maximum case.

The conductor is divided into sections 4 or 5 miles in length, and is carried at a height of 22 ft. above the running rail. This means a standard height of 24 ft. for the clearances of through and under bridges and still greater clearance for other overhead obstructions wherever physical conditions permit.

POWER DISTRIBUTION

The power for operating the cars of the Denver & Interurban Railroad is furnished by the Northern Colorado Power Company from its power station near Louisville. For this purpose two 1000-kw single-phase turbo-generators are provided. Two feeders connect this power station with the center of distribution at Louisville Junction. The switch connections at Louisville Junction are such that both feeders may serve all three legs of the trolley simultaneously, or one feeder may serve the main line and the other feeders serve the two branches.



mens-Schuckert Company has also supplied equipments to the Midland Railway. Its motors are rated at 180 hp each. The published weights of the equipments may be summarized as follows: Weight, Westinghouse motors per rated horse-power, 18.5 kg; weight, Siemens-Schuckert motors per rated horse-power, 17.3 kg; weight balance of

TABLE I.—WEIGHTS GIVEN BY MR. KELLY

	Single-phase	Continuous current
Total weight of electrical equipment (two 150-hp motors).....	7.7 tons	6.4 tons
Total weight of electrical equipment per rated horse-power.....	25.6 kg	21.3 kg
Weight motors per rated horse-power.	18.3 kg	14.2 kg
Weight balance of electrical equipment per rated horse-power.....	7.3 kg	7.1 kg

Westinghouse equipment per rated horse-power, 22.0 kg; weight balance of Siemens-Schuckert equipment per rated horse-power, 24.2 kg.

It is thus reasonable to take the weight of forced ventilated single-phase motors at 18 kg per rated horse-power and the total weight of equipment at 40 kg per rated horse-power, or 2.2 times the weight of the motors alone instead of the figure given by Mr. Kelly of only 1.4 times the weight of the motors alone. The weight of the balance of the equipment is some 23 kg per rated horse-power or over three times Mr. Kelly's figure of 7.3 kg per rated horse-power.

Mr. Dalziel, in his letter published in your issue of April 17, 1907, gave as 11 tons the weight of the electrical equipment for one of these Midland motor cars as equipped by the Siemens-Schuckert Company. The true weight as now published is 14.9 tons, or 35 per cent greater than the figure published by Dalziel.

Eichberg stated in the *Times Engineering Supplement* for Nov. 22, 1905, that, "excepting the power transformer, the weight of the alternating-current equipment is practically the same as that of the continuous current for the same working conditions." The misleading nature of the statements of those who have backed this single-phase delusion will now be apparent to your readers.

Some hundreds of GE-69-B continuous-current motors have now been in service for several years on the underground railways of London. It has been pointed out by Sprague and others that, on the 1-hour 75-deg. C. basis, this motor rates at 240 hp and weighs, with gear and gear-case, 2.8 tons, or 11.7 kg per rated horse-power. The total electrical equipment of the motor coaches of the underground railways of London is 7.3 tons per motor coach, or 15.2 kg per rated horse-power. Thus we shall be correctly representing the present state of development of continuous-current railway equipments in assigning to the motor a weight of 12 kg per horse-power and to the total electrical equipment a weight of 16 kg per horse-power. Forced draught is just as legitimate a proposition for continuous current as for single-phase equipments, and, were it to be employed, the weights of continuous-current motors of from 150 to 250 hp could readily be reduced to 9 kg per rated horse-power, and the weights of the complete electrical equipments to 14 kg per rated horse-power; i. e., to practically one-third of the weight of the equivalent single-phase equipment. If the same low ratio of gearing were imposed on the single-phase motor as is considered good practice with the continuous-current motor, its weight would undergo a further material increase.

The main point to which I wish to direct attention is that it is now established that complete single-phase equipments work out in practice at about 40 kg per rated horse-power as against only some 16 kg per rated horse-power for complete continuous-current equipments. This enormous disparity in weights was disputed when I called attention to it last year. Now, however, it is an established fact in the case of the Heysham section of the Midland Railway and in other modern instances where single-phase equipments are employed, and it will be more than borne out by the weight of the equipments for the London, Brighton & South Coast project when these figures become public. Naturally we cannot hope for their publication until the completion of the work of electrification.

Now were the weight of electrical equipment an inconsiderable percentage of the total weight moved, it would not necessarily be of grave consequence that single-phase equipments should be two and one-half times as heavy as continuous-current equipments. The greater the distance between stops and the lower the speed, the less is the percentage which the weight of the electrical equipment constitutes of the total weight moved, and hence, for long non-stop runs, there is but little reason to object to the single-phase system on the score of greater weight of equipment. But it is not for long non-stop runs that electricity, at the present stage of development, presents for railway working, economic advantages over steam. On the contrary, the field where railways can electrify their systems with great advantage is for routes with frequent stops. For such routes the attainable schedule speeds are much greater with electricity than with steam, largely owing to the capacity possessed by suitable electric motors, of being worked up to a far higher accelerating rate than would be attainable in practice with present steam methods.

Most of the other advantages of electricity are more or less direct consequences of this high attainable acceleration. Thus, any very considerable increase above the low weight known to be attainable with continuous current equipments would only be justified by some corresponding advantage in some other direction. The advantage to which the single-phase advocates point is that of the greater economies attending transmission to considerable distances, which are inherent to the single-phase system. But electrical engineers are not as yet justified in advocating the supercession of the steam locomotive for long-distance runs with infrequent stops. On this point I am in complete agreement with Mr. Philip Dawson, who states that, for Great Britain at any rate, electricity does yet not present any serious advantages over steam so far as relates to long-distance lines.

But let us turn our attention to a case where steam methods are inadequate, such, for instance, as the case of a suburban service where it is desired to maintain a schedule speed of 25 m.p.h. with a stop every mile. Were single-phase apparatus to be employed in such a case it would be necessary to install electrical equipment amounting to some 70 per cent or more of the aggregate weight of the coaches, trucks and load, i. e., some 70 per cent or more of the total train weight exclusive of electrical equipment. Using the continuous-current system, however, the same service could be secured by providing electrical equipment not amounting to over 20 per cent of the aggregate weight of coaches, trucks and load, i. e., not over 20 per cent of the total train weight exclusive of electrical equipment.

Electrical equipments for trains cost the purchasers, roughly, some £125 per ton of total weight of electrical equipment. Thus complete single-phase equipments work out, roughly, at £5 per rated horse-power, as against only about £2 per rated horse-power of complete electrical equipment when the much more satisfactory continuous current system is employed.

It was, until recently, the belief of the single-phase advocates that the overhead construction would be comparatively inexpensive. Here, also, they have been shown to be completely in error. The cost of the overhead work in the case of the New York, New Haven & Hartford Railway's single-phase section was more than twice the originally published estimate. Thus Mr. Wilgus, vice-president of the New York Central Railway, writes as follows in the *STREET RAILWAY JOURNAL* of May 25, 1907: "Much has been said also about the cost of overhead single-phase construction. In 1906 one authority estimated it at £3,200 per mile, but the actual cost has been £10,000 per mile." This and the enormous cost per horse-power of train equipment amply account for the fact that so large a sum as £250,000 should have been found necessary for the London, Brighton & South Coast Company's 8-mile equipment. It must be kept in mind that no outlay for generating plant is included in this sum. One hundred and sixty thousand pounds is an outside estimate for the equivalent in the continuous current system, and one year (as against four) would have seen the road in successful commercial operation.

The single-phase system is a splendid system—for a few Continental manufacturers and their representatives in this country.



**THERMIT WELD OF AN UNUSUAL COMPROMISE JOINT**

The accompanying illustration shows a rather uncommon thermit-weld of a compromise joint made in the Goldschmidt Thermit Company's works for the Union Railway Company of New York City. The joint was difficult to weld owing to the fact that one of the rail sections was of the exceedingly shallow section used only on the Central bridge, as described in the *ELECTRIC RAILWAY JOURNAL* of June 27. The Union Railway Company decided to install welded compromise joints between this rail section and its regular street section and the lengths of rail were shipped to the factory in Jersey City.

In doing the work it was necessary to make a pattern of yellow wax about the ends of the rail of the exact form which it was desired to have the thermit steel reinforcement assume. A mold box was then placed around the wax and filled with molding material consisting of one-third fire clay, one-third fire sand and one-third ground fire brick, provision being made for leaving a small hole at the bottom and space for a narrow gate and large riser. The flame of a powerful gasoline-compressed-air blow torch was then directed into the hole at the bottom of the mold and the heating continued until all the wax had run out and the sections to be welded had been brought to a bright red heat. In the meantime a crucible containing the proper quantity of thermit was suspended over the pouring gate and as soon as the torch had been removed and the lower hole plugged up, the thermit in the crucible was ignited and the liquid thermit steel tapped into the mold, where it occupied the space formerly filled by the wax. The only remaining operation was to grind off the collar from the top part of the rail, as shown in the illustration.

It is probable that this is the first time two rail sections of



**Compromise Weld of Deep and Shallow Rail Made for Central Bridge of the Union Railway Company**

such totally different design have ever been welded and the success of this weld is another proof of the great flexibility of this system.

The United States Department of Agriculture has printed a circular No. 151 on "The Preservative Treatment of Loblolly Pine Cross-arms." This bulletin contains a great deal of useful information on this important subject and is accompanied by numerous tables and curves giving the results attained. Particular attention is given to the spacing of the timber to secure the best seasoning at the least cost and within the shortest time.

Consul William W. Canada, at Vera Cruz, Mexico, writes that an American company has a project to purchase the mule tramways and other properties at Orizaba for \$625,000 gold, with the intention to change them to electric traction. Water power is abundant in that vicinity.

**CROWDED CAR AT EAST CLEVELAND**

During the acute period of the controversy between the Municipal Traction Company, of Cleveland, Ohio, and the officials of East Cleveland, a residence suburb, the company reduced its service temporarily to the point permitted by its franchise and operated cars every 10 minutes. The officials of East Cleveland took photographs of the cars, which were submitted in court as evidence that the service



**Result of Ten-minute Service on a Cleveland Line**

was inadequate. The accompanying illustration was made from a photograph taken by the photographer who made the exhibits used in court. When this photograph was taken it was intended for use as an exhibit, but was rejected in favor of other photographs which showed a more serious condition of crowding.

**A GRAPHITE OIL LUBRICANT**

The lubricating qualities of graphite are well known and both the crystalline and amorphous varieties are widely used. The crystalline product is claimed to be superior to amorphous graphite in having better lubricating qualities because of its density, fewer impurities and greater tenacity and hardness. It is asserted that after extended use the clay in amorphous graphite, from which it is impossible to free it, tends to increase instead of diminish friction. However, the very hardness of crystalline graphite heretofore made it impossible to reduce it to a degree which would make it an impalpable powder and keep it free from grit, and then treat it so that it remains in suspension in oils. This two-fold object appears to be attained in a product called Graphlio, which has been placed on the market by the Walter D. Carpenter Company, of New York, after many severe service tests. The raw material is a flaked graphite reduced extremely fine (about 225 mesh) free from grit, and made up of 95 per cent carbon and 5 per cent silica. This finely divided graphite then is treated with a secret preparation which reduces it to a semi-liquid state ready for mixture in the approximate proportion of 1 lb. Graphlio to 20 gal. of oil.

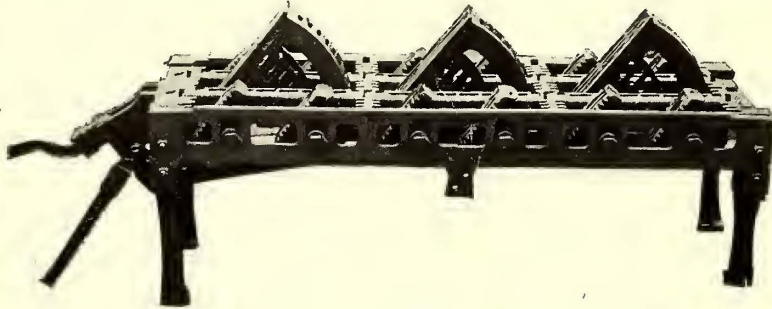
It is stated that the introduction of this material in combination with any oil the buyer may be using will effect 40 to 60 per cent saving in the cost of lubrication without any



change whatever in the oil cups or other lubricating devices. The tests of the lightest oils did not show a greater precipitation than 10 per cent, but even this settling does not occur under regular running conditions.

### STOKING WITHOUT OPENING THE FURNACE DOORS

The Reagan Grate Bar Company, of Philadelphia, Pa., has brought out an improved device for mechanically stoking bituminous fires. The new stoker eliminates the stoker bar and permits uniform stoking without opening the fire doors, thereby securing better economy in the boiler room and greatly lightening the work of the fireman, who no longer has to contend with the slicing of fires with the

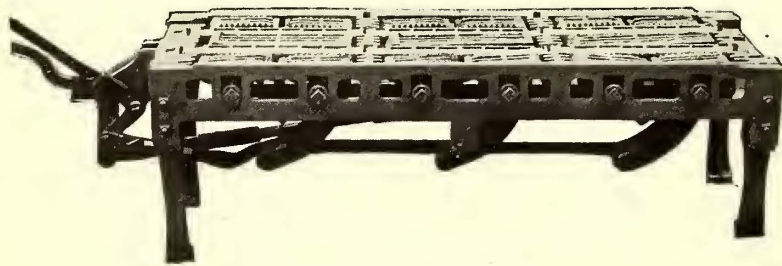


Grate with Stokers and Choppers in Action

stoker bar. The tendency of the new device is to keep the fire in a porous state at all times by breaking up clinkers before they have had a chance to cake so that a continuous supply of air is obtained for perfect combustion.

Under the old conditions, when the fire doors are opened for the stoker bar, the cold air rushing in and over the fire retards combustion and produces smoke by lowering the temperature of the boiler furnace. With this stoker, the fire can be run continually without opening the doors for stoking.

This stoking contrivance is very simple, consisting of a series of lifting fire bars extending the entire length of the



View of Grate at Rest

grate, and each series spaced 18 in. apart in the width of the grate. When not in action, the stoker is a part of the grate and like the latter is air cooled and durable. The attachment for working the fire bars is connected to the shaker which operates the choppers, but this movement is absolutely independent of the choppers, although if desired it can be operated in connection with them.

The most sensational move on the part of the authorities since the strike of the employees of the Chester (Pa.) Traction Company occurred Sept. 1 when warrants charging 22 of the striking trolley men with dynamiting cars, destroying property and other offenses were sworn out by County Detective Berry at the instance of District Attorney MacDade. The accused strikers were held in \$2,000 bail.

### MEETING OF THE EXECUTIVE COMMITTEE OF THE TRANSPORTATION & TRAFFIC ASSOCIATION

A meeting of the executive committee of the American Street & Interurban Railway Transportation & Traffic Association was held at the headquarters of the American Street & Interurban Railway Association in New York on Aug. 31. Those present were:

President, C. Loomis Allen, Utica, N. Y.; first vice-president, R. I. Todd, Indianapolis, Ind.; second vice-president, G. L. Radcliffe, Cleveland, Ohio; third vice-president, A. W. Warnock, Minneapolis, Minn.; secretary and treasurer, B. V. Swenson, and G. W. Parker, Detroit, Mich., and N. W. Bolen, Newark, N. J., members of the executive committee of the association.

The meeting was called particularly to discuss the program of the coming convention. The complete schedule of papers and reports will probably be ready for announcement next week, but at present it is expected that there will be reports from the committees on the training of employees, freight and express, rules for trainmen and establishment of passenger traffic schedules, and papers on the transportation of mail, the promotion of traffic, publicity work and multiple unit car trains.

The meetings of the Transportation & Traffic Association will be held on Monday afternoon, Tuesday morning, Wednesday morning and Thursday morning of convention week at the Assembly Hall at the far end of the steel pier. The times of these meetings will not conflict with those of the American Street & Interurban Railway Association which come on the afternoons of Tuesday, Wednesday and Thursday. The headquarters of the American Street & Interurban Railway Transportation & Traffic Association will be at the Traymore Hotel, and all members are requested to be present at Atlantic City by Monday morning to register.

Indications point to a very successful convention. A detailed program will be issued from the office of the secretary soon.

### KARBOLITH CAR FLOOR IN ST. LOUIS

The United Railways Company of St. Louis has placed in one of its cars for trial purposes, a solid floor made of Karbolith supplied by the American Safety Tread Company, of Boston. The car floor is made up as follows:

On top of the usual  $\frac{7}{8}$ -in. yellow pine floor poultry netting is spread to serve as reinforcement for the composition flooring. The mixture of Karbolith, which is placed like cement, is then laid on to about 1 in. in thickness. At the sides of the car the Karbolith is brought up about 3 in. with round fillets at the corners about 3 in. high. These fillets assist materially in preventing the collection of dust in corners where it cannot conveniently be reached by the cleaners. The solid floor covering is sloped from both sides and ends toward the center of the car where a drain opening is provided. The seat pedestals are placed in the ordinary way, the screws being driven through the solid floor to the yellow pine below.

It is stated that the cost for such a floor in a car body 34 ft. long and 9 ft. wide is about \$50. The United Railways Company has used this kind of a floor for about six months in a car on one of the busiest lines.



## LONDON LETTER

(FROM OUR REGULAR CORRESPONDENT)

Mr. Nance, the general manager of the Belfast City Tramways, seems to have at last achieved a victory over the tramway committee of the Belfast Corporation, which has never, since the inception of the electric tramways, allowed him absolute control. For some time it has been apparent that the system has not been paying, and a month or so ago another experiment was made, against Mr. Nance's judgment, involving a somewhat complicated system of fares and a very large adoption of halfpenny fares. As was to be expected, the receipts fell off more than ever and the committee has at last decided to adopt Mr. Nance's method and all of his suggestions in future. No better example, perhaps, of the utter absurdity of the management of tramways by certain municipalities could be advanced, many of them appointing general managers at very comfortable salaries and then depriving them of all responsibility or control, the result being that the tramways instead of being managed by an expert who knows his business are managed in a haphazard way by a body of amateurs. It is too early to speak of the success of the new fares adopted by Mr. Nance, but judging by the few days' results now available the corner has been turned and increased receipts are in evidence. Roughly, the scheme of charges which has been put in force by Mr. Nance is the abolition of halfpenny fares, except for children, the adoption of penny stages up to about  $2\frac{1}{4}$  miles and the making of a through fare on any car uniformly twopence. This is actually the scheme of fares which was originally promulgated by Mr. Nance some years ago, but which was overridden by the committee.

Last month we referred to the deplorable state of affairs on the Mile End section of the London County Council Tramways which has recently been equipped on the G. B. surface contact system, and we hinted at that time that the system had not been an entire success. The whole question has been one of bitter discussion and has been unfortunately made the subject of acrid political comment between the Moderates and the Progressives. At one of the meetings of the highway committees it was officially decided to abandon the system as it seemed to be impossible to get it to work satisfactorily. The owners of the G. B. system naturally were greatly incensed at this decision of the Council and have publicly stated that the reason of the non-success of the Mile End route could not be directly attributable to them, as various alterations had been made on their methods of construction by the London County Council officials and they claim strongly that if they were given a free hand they could put the whole thing right at an expenditure of about £4,000. A more moderate decision has been, therefore, arrived at at a more recent meeting of the London County Council, and another opportunity is to be given the G. B. Company to get the system into proper working order. Whether it will be able to do so remains to be seen, though the fact still remains that the system is working most admirably at Lincoln. This recent decision was reached after an all-night sitting and may have been influenced by the fact that the Stepney Borough Council still absolutely refuses to allow the London County Council to install the overhead system of electric traction through that portion of the route controlled by them.

The annual accounts of the London County Council up to the end of March have now been published and show a profit over working expenses of over £550,000, the total amounting to £1,663,031 and the working expenses to £1,170,115. Interest, repayment of debt, etc., have absorbed over £447,510, so that with the balance brought forward from last year the total surplus available is reduced to the comparatively small sum of a little over £51,000, which has been placed to the credit of the renewals accounts. There is, of course, a large portion of the system still operated by horse cars which shows a deficiency in the year's working of over £57,000. With the new construction work going on this sum will be reduced year by year and when the whole system is completed the total result will undoubtedly be much better. In the meantime, the tramway men in the employment of the Council are again threatening to go on strike, demanding, first, an eight-hour day; second, some superannuation benefit; third, fewer hours of work on Sundays, and, fourth, a week's holiday annually. With regard to the experiment which the Council has been making on the Tooting line with cars for women only, it is interesting to note that this experiment has now been abandoned, as the cars were invaded by men and, after investigation, it was discovered that the Council had no right under the law to exclude men from any cars operated by it. It seems a pity that such cars cannot be

operated as there is a fierce scramble every morning and every evening in which girls and women are at a disadvantage, but so long as it is against the law it would appear that special cars designed for the use of women only cannot be maintained.

There has been a somewhat determined effort to persuade the Liverpool Corporation to carry the blind people of that city free, but at a recent meeting, when a special report made by the general manager was presented, it was decided that such action could not be adopted, and though as a body they could sympathize very strongly with the blind people, they could not see their way to recommend the adoption of charity on this basis. It would appear that a much better way would be to help institutions for the blind by granting a lump sum than to introduce a system for granting special facilities to the blind preferentially. If they were to adopt such a system cripples might also apply for the same rights, and if they were to give the blind free transportation why not also free water and other privileges? The manager's report was eventually adopted and so an end has been put to the discussion.

We have referred from time to time to the special cars which have been built for through connection between Leeds and Bradford, because the tramway gages of the two cities are different. These special cars for through traffic have proved a success and the tramways committee of the Bradford City Council has now recommended the adoption of an agreement between the corporations of Leeds and Bradford for an experimental service of tramcars between the two cities, the agreement to exist for a year. Each corporation is to equip and operate an equal number of cars and an equitable arrangement has been made as to the takings from the cars, based upon the mileage. Each undertaking is to be entitled to the whole of the local receipts taken in its own area, but the through fares are to be equally divided up to a certain number and after that number on the ratio of the route mileage traveled on each system, approximately,  $5\frac{1}{2}$  miles for Leeds and 4 miles for Bradford. At the end of the year matters in dispute may be considered and adjusted, failing which the disputes are to be put in the hands of an arbitrator mutually chosen or decided by the board of trade.

The London & District Electric Supply Bill, mentioned last month, has now been up in the House of Commons and passed its second reading. There were many amendments and considerable opposition, but after a lengthy discussion the bill was passed. It will now have to come up for third reading, after which it will have to receive the approval of the House of Lords.

Work has been commenced by Dick, Kerr & Company, who have received a contract for another section of the Middlesex County Council's electric tramways which will link up the Southgate and Barnet lines. Contracts have also been entered into, amounting to £157,198, for lines through Hendon and Finchley (linking the Edgware and Barnet systems) and from Southgate to Enfield. These lines will be an immense boon to Middlesex residents, who are fairly well provided with means of transit to and from London, but are without means of cross-country communication. The Middlesex County Council works its tramways under a profit-sharing agreement with the Metropolitan Electric Tramways Company.

The report of the Manchester Corporation tramways for the year ended March 31, 1908, shows a gross profit of £271,153, against £266,891 for the preceding year—an advance of £4,262. This has been accomplished while there has been an increase in working expenses and a reduction in the receipts for each car-mile. The amount the department has contributed to the city fund in relief of rates since 1901 is £307,000. In the same period £191,543 has been set aside as a sinking fund for reduction of debt, and £382,327 has been marked for renewals and depreciation.

At a special meeting of the Morecambe Town Council it was decided to approve the recommendation of the tramways committee to purchase the trams within the borough from a private company. The corporation valuers put the value at £7,661, and the company's valuers put £15,952 down as the amount the company should receive. It was resolved to ask the board of trade to appoint a referee to fix the purchase money, and for sanction to borrow the necessary money.

The board of trade has notified tramway and motoring organizations that it is at present considering the question of requiring the adoption of speed indicators on tramcars, and would be glad if the organizations would assist it by communicating any information they may possess with regard to the reliability and also the cost of any speed indicators now on the market. The board adds that for purposes of tramcars it would be very desirable that the speed indicator should be reliable for speeds of as slow as 4 miles an hour, as well as for high speeds. A. C. S.



# News of Electric Railways

## Traction Affairs in Cleveland

The Municipal Traction Company of Cleveland is now charging a cash fare of 5 cents, and conductors are not allowed to sell the disks at 3 cents each except in quantities of five or more. Passengers who are not acquainted with the system will be compelled to pay 5 cents for each ride if they board the car without securing disks. The company has established an office in one of the public comfort stations on the public square, where single disks may be purchased for 3 cents each, but those who cannot conveniently reach that point are unable to take advantage of the reduced rate. The company has been compelled to adopt so many novel methods to make the nominal 3-cent fare yield increasing revenues that people in Cleveland have grown accustomed to expect something new at frequent intervals.

The reduction in the service shown by the car miles operated is still causing inconvenience to the public, as cars cannot be had as frequently as they are desired. The rush is also heavy morning and evening. Certain members of the city council are again agitating the passage of an ordinance that will forbid the loading of cars in such a manner as to render the trip uncomfortable or expose the passengers to danger from disease. One councilman wishes to limit the number to as many as a car will seat and one-third more. This would be an improvement on the service that is now given during the rush hours.

The company continues to count the fares at the boundary line between Cleveland and East Cleveland, but nothing further has been done regarding the suits. While the company may secure a little information as to the number of passengers taken across the line in both directions, it has been hinted that it will also have to produce some very accurate information as to what the cars actually earn on their entire trips before the number of passengers carried to and from East Cleveland will be admitted as of much value in the legal controversy.

## Overhead Transmission Wires Approved

While disclaiming any preference for aerial construction over underground construction, the Public Service Commission in a decision just rendered affirms the right of the New York Central & Hudson River Railroad to maintain its overhead high-tension system of electrical transmission and dismisses the complaint of John H. O'Brien, commissioner of water supply, gas and electricity, who asked that the company be directed to place its wires underground. The decision of the commission, however, which was written by Commissioner John E. Eustis, who conducted the hearings, directs that certain changes shall be made in the present construction of the overhead system, with the idea of making it absolutely safe at street crossings and other points of danger.

In his opinion Commissioner Eustis cites the testimony of Prof. George F. Sever, one of the city's electrical experts, that the overhead construction of the road is the best of its kind and with such changes as he recommended would be very safe overhead construction. Charles F. Lacombe, chief engineer of the department of water supply, gas and electricity, also admitted that the line is as good as exists anywhere, and that he would not criticize it if it was in a farming country up the State.

The complainant's counsel and experts took the position that, while the system was safe as overhead construction, it was not as safe as underground construction would be, although they admitted that many more difficulties arose from underground than from overhead construction. The railroad company's experts did not agree with the city, that underground construction is safer, and the evidence showed that the company had experienced more serious trouble from their underground than from their overhead lines.

It was shown by testimony that in addition to the system of the Long Island Railroad there are at present in the City of New York, maintained presumably under permits from the city, 513 miles of high-tension overhead lines, carrying from 1000 to 3000 volts, divided among the boroughs as follows: Manhattan, 1 mile; Brooklyn, 130 miles; The Bronx, 80 miles; Queens, 152 miles; Richmond, 150 miles. In addition to these there are 47 miles of overhead high-tension wires carrying from 3000 to 11,000 volts, as follows: Brooklyn, 15 miles; The Bronx, 12 miles; Queens, 20 miles. All of these wires are used for electric light or

trolley service and are strung along the streets of the city.

Commissioner Eustis is of the opinion that the complainant failed to prove that the overhead system for the lines in question is unsafe. No evidence regarding injury to persons or property, due to the aerial lines, was presented. If the overhead system is safe, he argues, it would seem to be a great injustice to the company for the Public Service Commission to compel it to destroy its present lines and place the high-tension wires underground at a cost estimated at from \$1,500,000 to \$2,000,000. The best evidence of what will be is what has been, and the experience of the road since the inauguration of electrical operation has been that most of its troubles have occurred with the underground conduit system.

In his decision Mr. Eustis says that the commission does not thereby express its preference for an aerial system, but is simply passing on the evidence submitted in this case, which has failed to prove that the railway's overhead system is unsafe.

## Operating Agreement between Chicago City Railway and Calumet & South Chicago Railway Approved

On June 29 the Chicago Council approved an ordinance which, described briefly, is a contract between the Chicago City Railway Company and the Calumet & South Chicago Railway Company, the former agreeing to operate the property of the latter until Feb. 1, 1927, and return to the owners of the Calumet & South Chicago property 75 per cent of the money saved by reason of the more economical operation which can be obtained with the combined property. Under this ordinance the Chicago City Railway is empowered to perform the work of rehabilitation, subject to the approval of the Calumet company. Preparations have been made for the immediate reconstruction of about 3½ miles of single track, mostly located in South Chicago. Extensions comprising about a mile of track also will be built. The new track will comprise 7-in. 91-lb. T-rails laid on wooden ties with concrete placed between the ties. Brick will be used for pavement over the larger part of this work. Instead of using special nose brick the paving brick will be butted under the heads of the rails. The joints in this track will be cast-welded and new hard-center special work will be placed at all intersections. It is not expected that the overhead construction or power distribution feeders will be rebuilt this year.

## Transit Affairs in New York

The Public Service Commission, First District, has taken steps to intervene in the proceedings brought by A. C. Gutner against the New York City officials for an injunction to restrain them from paying out money at the request of the commission. The petition to the commission states that the members of the commission were duly appointed and qualified in accordance with the Public Service Commission laws. Other arguments contained in the petition are as follows: The commission succeeded the Board of Rapid Transit Railroad Commissioners, the Board of Railroad Commissioners of the State of New York, the Commission of Gas and Electricity and the inspector of gas meters and also assumed new duties of a far-reaching character affecting common carriers and gas and electric corporations. The commission, in exercising the power and duties of the former rapid transit commission, is seeking to execute contracts for the construction and operation of new subways. In addition to other powers and duties, the commission has undertaken new and additional powers prescribed by the Public Service Commission's law.

The Public Service Commission of the First District has approved changes in the plans for the city hall station of the Brooklyn loop line of the Interborough Rapid Transit Company.

President Joseph W. Moore of the Bayonne Civic Club is authority for the statement that President William McAdoo of the Hudson Tunnels Company has indorsed the project to construct a subway from the Kill von Kulls through Bayonne and Jersey City, to connect with the tunnel to Manhattan.

The Public Service Commission, First District, has recommended the issuance of an order against the Hudson & Manhattan Railroad, directing the chief engineer of the commission to take steps to remedy the condition of Sixth Avenue, from Fourteenth Street to Twenty-third Street, regarding which complaint has been made by the Retail Dry Goods Association.



**United Railways of St. Louis to Introduce Pay-as-You-Enter Cars.**—The United Railways of St. Louis, having secured rights from the Pay-as-You-Enter Car Company, will operate 50 pay-as-you-enter cars on the Olive Street line early in September. As soon as the operation of these cars has been begun, additional cars will be equipped for pay-as-you-enter service.

**Pay-as-You-Enter-Cars in Kansas City.**—Twelve pay-as-you-enter cars have been equipped by the Metropolitan Street Railway of Kansas City, Mo., for introduction on the Rock Hill and Northeast divisions. The introduction of these cars follows other cars of the same type which the company is operating, rights having been secured from the Pay-as-You-Enter Car Company.

**Outing of Employees of United Railways.**—The annual outing of the employees of the United Railways of St. Louis was held Aug. 26 and 27. The United Railways band, composed of 48 of the employees, furnished the music during the outing. Athletic events were one of the chief sources of amusement. They were under the direction of a committee, of which F. L. Betts was chairman.

**Marion-Bucyrus Line Opened.**—The Marion-Bucyrus extension of the Columbus, Delaware & Marion Railway in Ohio was opened for traffic last week. In connection with the extension of the Cleveland, Southwestern & Columbus Railway, now nearing completion, the line completes a through route from Columbus to Cleveland. The company will operate through cars from Bucyrus to Columbus in the near future.

**Service Started Between South Bend and LaPorte, Ind.**—Regular service between South Bend and LaPorte, Ind., and intervening points was inaugurated on the western extension of the Chicago, South Bend & Northern Indiana Railway, on Aug. 26. The cars make the trip every two hours. The opening of this extension gives the Murdock interests a continuous line from Goshen to Michigan City.

**New Line Opened Between Syracuse and Oneida Lake, N. Y.**—The Syracuse & South Bay Traction Company, controlled by the Beebe syndicate, opened its line to the public with a one-hour schedule, operating two cars, on Aug. 27. Within a week two more cars will be added, and a half-hour schedule given. The line is double-track, rock-ballasted, and was started about five years ago by W. R. Kimball, but has been in the hands of the present company for the past two years. It is 10 miles long and runs from the city limits of Syracuse to Oneida Lake, via North Syracuse and Cicero.

**T-Rails to Be Used in Portland, Ore.**—Grooved rails on the narrow-gage lines of the Portland Railway, Light & Power Company will be abandoned gradually. When new rails are laid the T-rail will be put down. B. S. Josselyn, president of the company, is quoted as saying: "Over 200 derailments a month are caused on our narrow-gage lines through the use of grooved rails. We are required by ordinance to put in only a 50-lb. rail on our city lines, and it is impossible to get a satisfactory grooved rail of that weight."

**New England Street Railway Club Outing.**—The August outing of the New England Street Railway Club was held on the afternoon and evening of Aug. 25 at Norumbega Park, Auburndale, about 150 members and guests being present. The occasion was celebrated as a ladies' day. Special cars were run through the courtesy of the Boston Elevated Railway, the Newton Street Railway and the Boston & Worcester Street Railway to the park, arriving between 5 and 6 p.m. Dinner was served at the park soon after the arrival of the different parties and launches were provided on the Charles River for the use of the members and their friends. At 8 p.m. the party attended the open-air theater, leaving the park about 9:45 p.m. The Boston & Northern Railway and the Old Colony Street Railway furnished free transportation for members and ladies residing in their districts.

**Philadelphia Committee Will Prepare Report.**—The special committee of Councils of the City of Philadelphia, which has been investigating traction conditions in nine cities, has returned to Philadelphia. After inspecting operating methods of the Philadelphia Rapid Transit Company, the committee will prepare a report for submission to Councils, embodying the results of its investigation. John B. Parsons, president of the Philadelphia Rapid Transit Company, is quoted as saying that whatever information the company has in its possession in relation to the cost of operation, fares and free transfers will be given to the committee if its members desire. Edwin O. Lewis, a member of the committee, said: "In one city we visited where 'pay-as-you-enter' cars were used, the increase in collected fares amounted to 6 per cent, while we learned from other cities that as much as 12 and 16 per cent had been gained."

# Financial and Corporate

## New York Stock and Money Markets

SEPT. 2, 1908.

The tendency of the New York stock market is persistently upward. This is true in spite of the spasmodic reactions and the intermittent bear raids. A difference between the present character of market support and the ordinary manipulation of speculators must be recognized. While it is true that recent reactions have been brought about largely by profit taking, it is also true that on every occasion when those seeking lower prices have attacked the market they have met with little success. There have always been enough buying orders to run the shorts to cover and there never has been the slightest indication of panic or nervousness. This condition is due to the fact that strong interests are sustaining the market and that the available supply of stocks for transfer or for loan is remarkably limited. The bears dare not go very far through fear of meeting the fate of H. O. Brown & Company, who failed to find stock enough, by thousands of shares, to deliver on their contracts. In the present condition of the market it is decidedly unsafe for any broker to sell large amounts of what he does not possess or has not arranged to secure.

The practical influences which generally control the course of the stock market are satisfactory, even if not stirringly bullish. The crop reports continue to be encouraging—the August condition report of cotton indicating a bumper yield—money continues to be plentiful and cheap, and there is an optimistic tone if not very much absolute betterment in commercial trade. The net changes for the week ended Sept. 1 were almost all advances, although on the last day there were fractional reactions. Rates for money are practically unchanged at 1@1¼ per cent for call loans and 2@2¼ per cent for 90 days.

## Other Markets

There has been little trading in traction securities on the Boston market during the past week. A few shares of Massachusetts Electric were sold at from 47 to 48, the latter being the final quotation on Sept. 1. Boston Elevated was nominal at 132 to 133. But few transactions in bonds were recorded.

In the Philadelphia market Philadelphia Rapid Transit continues to be the most active of the traction shares. The general selling pressure in the stock which has been in evidence for several weeks has disappeared and some advance in price is the result. The closing figure on Sept. 1 was 14½. In other traction securities the trading was light and quotations are practically unchanged.

In Chicago South Side Elevated stock has exhibited some strength and has made fractional gains. The last quotation on Sept. 1 was 46. Chicago Railways was practically unchanged in price, Series 1 of the participation certificates being quoted at 100 and Series 2 at 39%. Other issues were dormant.

As has been the case for months, the only traction securities attracting interest in the Baltimore market were the bonds, United Railway 4s being the most active. These have ranged in price from 85½ to 85¾. The income 5s are quoted at 53¼. A few, Baltimore Traction 5s have changed hands at 110.

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

	Aug. 25.	Sept. 1.
American Railways Company, Philadelphia.....	45½	45½
Boston Elevated Railway.....	133	133½
Brooklyn Rapid Transit Company.....	51¾	54½
Chicago City Railway.....	a180	a180
Cleveland Railway.....	—	—
Consolidated Traction Company of New Jersey.....	a70	a60
Consolidated Traction Company of New Jersey, 5 per cent bonds.....	a104	a104
Detroit United Railway.....	a40	a40¾
Interborough-Metropolitan Company.....	11½	12
Interborough-Metropolitan Company (preferred).....	32½	34¾
Manhattan Railway.....	137	139
Massachusetts Electric Companies (common).....	9½	9
Massachusetts Electric Companies (preferred).....	47	48
Metropolitan West Side Elevated Railway, Chicago (common).....	a15	a17
Metropolitan West Side Elevated Railway, Chicago (preferred).....	a43½	a43½
Metropolitan Street Railway.....	28	29½
North American Company.....	62	64
Philadelphia Company, Pittsburg (common).....	39	38¾
Philadelphia Company, Pittsburg (preferred).....	40	40
Philadelphia Rapid Transit Company.....	13½	14
Philadelphia Traction Company.....	88¾	89
Public Service Corporation, 5 per cent collateral notes.....	a97	a97
Public Service Corporation, certificates.....	a70¾	a71
Twin City Rapid Transit Company, Minneapolis (common).....	a90	a90
Union Traction Company, Philadelphia.....	48½	48¾
a Asked.		



## Annual Report of Brooklyn Rapid Transit Company

Gross earnings from operation of the Brooklyn Rapid Transit Company for the year ended June 30, 1908, were \$19,870,567, an increase of \$488,979 over the preceding fiscal year. As operating expenses increased \$473,874, the gain in net earnings from operation was \$15,105. The figures for the year, with a comparison, were as follows:

	1908.	1907.	Increase.
Gross earnings.			
Passenger .....	\$18,930,164.18	\$18,443,983.27	\$486,180.91
Freight, mail and express.....	315,719.08	349,538.93	33,819.85
Advertising .....	155,204.65	148,424.16	6,780.49
American R'y Traffic Co.....	469,478.64	439,640.79	29,837.85
Total earnings from operation	\$19,870,566.55	\$19,381,587.15	\$488,979.40
Operating expenses.			
Maintenance of way and structure	\$1,020,103.81	\$860,075.38	\$160,028.43
Maintenance of equipment.....	1,837,550.29	1,786,731.06	50,819.23
Operation of power plant.....	1,653,727.74	1,655,400.38	1,672.64
Operation of cars—trainmen's wages	3,369,858.95	3,238,970.65	130,888.30
Operation of cars—other expenses	1,609,897.62	1,554,849.58	55,048.04
Damages and legal expenses.....	1,242,301.24	1,126,248.34	116,112.90
General expenses.....	651,669.03	643,898.78	7,770.25
Freight, mail and express—expenses	190,885.29	233,667.33	*42,782.04
American R'y Traffic Co.—expenses	363,524.62	365,863.26	*2,338.64
Total operating expenses.....	\$11,939,578.59	\$11,465,704.76	\$473,873.83
Net earnings from operation....	\$7,930,987.96	\$7,915,882.39	\$15,105.57
Income from other sources.			
Rent of land and buildings.....	\$63,836.85	\$68,490.32	*\$4,653.47
Rent of tracks and structure.....	101,419.29	125,865.31	*24,446.02
Miscellaneous .....	512,567.80	360,810.30	*151,757.50
Total income.....	\$8,608,811.90	\$8,471,048.32	\$137,763.58
Deductions.			
Taxes .....	\$930,007.47	\$893,782.44	\$36,225.03
Interest and rentals—net.....	5,604,931.15	5,132,604.28	472,326.87
Total deductions .....	\$6,534,938.62	\$6,026,386.72	\$508,551.90
Net income.....	\$2,073,873.28	\$2,444,661.60	*\$370,788.32
Special appropriations.....	229,781.18	442,063.37	*212,282.19
Surplus .....	\$1,844,092.10	\$2,002,598.23	*\$158,506.13

\*Decrease.

Construction expenditures on the system aggregated \$6,476,959 in the last year as compared with \$5,703,186 in the preceding year. In his statement to shareholders Edwin W. Winter, the president, discusses the important events of the year affecting the property. He said in part:

"Total earnings from operation of the entire system for the 12 months ending June 30, 1908, were \$19,870,567, an increase of 2.52 per cent over the previous fiscal year. The percentage of operating cost to earnings, including special appropriations for additions and betterments to the property, was 61.25 per cent as compared with 61.42 per cent for the previous year.

"There were carried 515,184,067 passengers for the fiscal year ending June 30, 1908, an increase of 3,345,530. The average gross earnings per passenger were 3.67 cents. The average cost per passenger carried was 2.25 cents, leaving an average net per passenger of 1.42 cents, from which must be taken all charges other than for operation.

"The average number of cars operated daily for the 12 months was 2,203, an increase of 5.2 per cent. The average gross passenger earnings per car-mile were 25.7 cents, as compared with 27 cents for the fiscal year ending June 30, 1907, a decrease of 4.8 per cent. The total trips run for the fiscal year ending June 30, 1908, was 6,148,774, an increase of 4.3 per cent over the corresponding period of the previous year.

"The daily average passengers per car for the fiscal year ending June 30, 1908, were 639, a decrease of 4.6 per cent over the corresponding period ending June 30, 1907. The increase in damages and legal expenses is attributable to the disposal of a much larger number of impending cases and claims than in the preceding year. Accidents of car collisions decreased 37.2 per cent; car and vehicles, 23.1 per cent; boarding and lighting, 9.3 per cent and from negligence in handling cars 8.3 per cent.

"Additional elevated motor and surface closed passenger cars, 100 of each type, have been received and placed in service. One steel motor car for elevated service has been received and will be placed in service early next fall. No additional cars were ordered during the year. All surface passenger cars are vestibuled as required by law, 206 cars having been thus equipped during the past year.

"The Public Service Commission for the First District began investigation of the companies comprised in the Brooklyn Rapid Transit System shortly after taking office at the opening of the fiscal year.

"A corps of accountants in the employ of the commission was assigned to the work, and for a period of three months occupied quarters and had free access to the records in the general offices of the company. During the same period public inquiries were conducted by special counsel of the commission at sittings presided over by one or more members of that board, at which questions bearing on the finan-

cial history of the companies in the system from their beginning down to date of inquiry, their relations to the holding company and each other, capitalization, character of leases, extent of ownership by the Brooklyn Rapid Transit Company and how acquired, methods of accounting and operation, physical conditions, etc., were thoroughly gone into. The commission had the fullest co-operation of the company throughout the investigation, which fell short of being completed, if at all, in that no public announcement of the commission's findings was made at the conclusion of the proceedings. It is gratifying, however, to be assured that the result was altogether favorable to the system, by, among other things, imparting to the public a fuller knowledge of its operations, financial affairs and policy, than would have been otherwise possible; and so clearing away many false impressions which had become more or less fixed in the public mind.

"It will be noted that the general business depression is reflected in the earnings of the company. From an almost unbroken daily record of increase, running through more than five consecutive years and keeping pace with large expenditures for improvements, there has come a falling off of gross earnings beginning with the last quarter of 1907 and increasing with the downward trend of conditions generally through the balance of the fiscal year. While the loss is distributed over the entire system, it is more acutely felt during the summer months on lines serving seaside resorts.

"The opening of the subway for regular operation between Battery Park and the terminus at Flatbush and Atlantic Avenues has somewhat affected the revenue of certain lines, but no materially harmful results to the business of the company were manifested and none is expected from this addition to the lines of communication between Manhattan and Brooklyn.

"However seriously the prevailing depression may for the time being affect the business of the system, full restoration and the continued growth of traffic demands in Brooklyn are as certain as the operation of any natural law, but whether the whole local transit situation of Greater New York is not seriously imperiled by the trend toward zero of net per passenger carried is a question of vital importance to the companies concerned, and to the public dependent upon them for continued development of transit facilities.

"For some years past, through mergers, leases and other forms of combination, segregated lines have been coming together into large systems, unquestionably to the very great advantage of public travel, whatever may be said concerning the movement in other respects. Encouraged by the rapidly increasing demand for more and better local transportation, and the assumption that the gross rate of five cents for the carrier could be substantially preserved, enormous expenditures have been made in the improvement of existing facilities and creation of still more costly means of transit, and these vastly enhanced conveniences turned to public use without increase in the rate of fare. On the contrary, through the growth of transfers, the average gross return per passenger has been decreasing until the cost of transportation supplied per capita and the amount received for it have come unpleasantly close to each other. It is obvious that these conditions cannot continue without serious results alike to the public and the transportation companies.

"If private capital is to be the means of further transit development in this city, the investor must first be assured of the safety of his money and a reasonable return thereon. The case is exceptional where this can be given on the present margin between cost and, after transfer dilution, amount realized per passenger carried.

"The welfare of the public to the extent that it is dependent upon local transportation, as well as that of the corporations which are expected to supply it, would be promoted by the mutual recognition of a situation, the undeniably discouraging aspect of which in its bearings on the question of future development must become evident to those who will give it patient and intelligent examination.

"The trackage over the two East River bridges now in service, while constituting a part of the operating routes of the many lines converging at the Brooklyn terminus, is distinguished from the rest of the system by inherent conditions both troublesome and costly to deal with, but from the operation of which no adequate revenue return is derived. The relative importance of this distinctly peculiar feature of your company's situation increases with the opening of new bridges and growth of traffic between Brooklyn and Manhattan. Over 12 per cent of the 72,674,770 total car miles during the last fiscal year, or about 9,000,000 car miles, were made on the two bridges. This very considerable part of the total car movement was through a traffic desert, save the comparatively small receipts in half fares from passen-



gers riding between bridge ends. In other words, the Brooklyn system, after running its cars to the boundary of its traffic territory, adds an average of about 12 per cent actual service at greatly increased relative cost without extra charge to the passenger.

"During the fiscal years 1900 to 1907, inclusive, after crediting the account with all revenue from local bridge traffic, the Brooklyn system has paid out nearly \$5,000,000 for charges attaching exclusively to bridge maintenance and operation. No charge applying generally to the system as a whole nor of more than \$700,000 paid for various fixtures supplied to the bridges to aid in the handling of that business is taken into this account.

"The physical conditions of your properties is reflected by the downward trend in the insurance rate, which from 1.35 in 1902 and 76-100 in 1905 is now slightly above 1/2 of 1 per cent. During the year \$32,906.50 was added to the insurance reserve fund, which now amounts to \$84,334.77. It is proposed to rapidly build up this fund until, under a plan for co-insurance, each company comprised in the system shall be able to carry a large part or all of its own risks."

**Aurora, DeKalb & Rockford Electric Traction Company, Aurora, Ill.**—Upon application made by the American Trust & Savings Bank of Chicago as trustee, in a suit to foreclose the \$750,000 mortgage, Judge Slussen, of the Circuit Court at Elgin, Ill., on Aug. 24 appointed Gilbert B. Shaw and Daniel Peterkin, of Chicago, receivers for the company.

**Baltimore, Halethorpe & Elkridge Railway, Baltimore, Md.**—This company has filed a mortgage to the Fidelity Trust Company, of Baltimore, as trustee, to secure an issue of \$300,000 of 20-year 5 per cent bonds, principal and interest payable at the office of Alexander Brown & Sons. The majority of the stock of the company is owned by the United Railways & Electric Company, of Baltimore, which, however, does not guarantee the principal and interest of the bonds. The length of the proposed line is 2.8 miles and construction work is now in progress.

**Boston (Mass.) Suburban Electric Companies.**—President James L. Richards, of the Boston Suburban Electric Companies, has filed a petition with the Massachusetts Railroad Commission asking the board's consent to the merger of the Natick & Cochituate and the Westboro & Hopkinton street railways with the Middlesex & Boston Street Railway. The terms of the consolidation provide for the exchange by the Middlesex & Boston road of share for share with the Westboro & Hopkinton road to the extent of 400 shares at a par value of \$100 and 1000 shares at \$100 par value with the Natick & Cochituate Street Railway.

**Camden & Trenton Railway, Camden, N. J.**—An opinion has been filed in the Court of Chancery by Vice Chancellor Leaming denying the petition of William F. Sadler, Jr., receiver of the Camden & Trenton Railway, for leave to issue receiver's certificates for \$41,000 to repair and improve bridges and the road.

**Carolina Power & Lighting Company, Raleigh, N. C.**—This company has been formed by the merger of the Raleigh Electric Company with the Central Carolina Power Company, of Buckhorn Falls, N. C., and the Consumers' Light & Power Company, of Sanford, N. C.

**Denver City Tramway Company, Denver, Col.**—At a meeting of stockholders on Aug. 27 the issue of \$25,000,000 of bonds was authorized. The bonds will run for 30 years and bear interest at the rate of 5 per cent per annum.

**Missouri Electric Railroad.**—This company, organized recently to take over the property of the St. Louis, St. Charles & Western Railroad, has filed a mortgage to the Mercantile Trust Company, of St. Louis, Mo., as trustee, to secure an issue of \$1,000,000 bonds, of which \$700,000 are reserved to refund present indebtedness and for extending and repairing the system.

**Monmouth County Electric Company, Red Bank, N. J.**—At the sale of unpaid taxes for 1907 recently, the city of Long Branch bought the property of the Monmouth County Electric Company, including its roadbed, for \$422.48.

**Northern Ohio Traction & Light Company, Akron, Ohio.**—The directors on Aug. 21 declared two quarterly dividends of one-quarter of 1 per cent each, payable on the \$8,938,900 capital stock, with money already provided, on Sept. 15 and Dec. 15, 1908, to holders as of Sept. 1 and Dec. 1, respectively. This reduces the annual rate to 1 per cent, contrasting with 2 per cent (one-half of 1 per cent quarterly), the basis maintained from June 15, 1906, when distributions were begun, to June 15, 1908, inclusive.

**Philadelphia Company, Pittsburg, Pa.**—Charles D. Barney & Company, of Philadelphia, who purchased \$1,000,000 of the issue of \$2,600,000 6 per cent collateral trust notes, are offering the unsold portion for sale at a price to net 6 1/2 per cent.

**Roanoke (Va.) Traction & Light Company.**—It is announced that interests connected with this company, which was incorporated recently with \$500,000 minimum and \$2,000,000 maximum capital stock and an authorized issue of \$3,000,000 bonds, have purchased the stock and bonds of the Roanoke Water Power Company and the James River Water Power Company. It is stated that these properties, with those of the Roanoke Railway & Electric Company and the Roanoke Heat, Light & Power Company, will be merged into the holding company chartered as the Roanoke Traction & Light Company.

**Rochester, Charlotte & Manitou Railroad, Rochester, N. Y.**—The New York Public Service Commission, Second District, has issued the following statement: "The commission has approved of the transfer by Kendall B. Castle, of Rochester, to the Rochester & Manitou Railroad of all the property and franchises formerly owned by the Rochester, Charlotte & Manitou Railroad Company and authorized the Rochester & Manitou Railroad Company to issue \$60,000 of its capital stock; the sum of \$10,000 for cash; the sum of \$50,000 for the purpose of purchasing from Kendall B. Castle all the rights, franchises, property and assets formerly belonging to the Rochester, Charlotte & Manitou Railroad Company, purchased by him at the foreclosure sale of the Rochester, Charlotte & Manitou Railroad Company's property.

**Toledo, Ann Arbor & Detroit Railroad, Toledo, Ohio.**—The property of this company will be offered for sale under foreclosure on Oct. 12 at Monroe, Mich.

**Toledo (Ohio) Railways & Light Company.**—It is reported that the Toledo, Ottawa Beach & Northern, the Toledo & Western and Maumee Valley Railways & Light, subsidiary companies of the Toledo Railway & Light Company, are to be incorporated with the parent company into one organization.

**Washington, Baltimore & Annapolis Electric Railway, Baltimore, Md.**—George T. Bishop, the president, has issued a statement saying:

"We enclose a condensed statement which shows the result of nearly four months' operation of this company's railway, indicating a deficit of \$43,312. The officers and directors of your company believe that the conditions which have made such an unfavorable showing possible are only temporary and that beginning with the present month of August a steady improvement will take place. Not only are the earnings increasing, but operating expenses are being reduced because of the completion of certain construction work which has heretofore been charged to operating instead of construction, to which it properly could have been charged.

"The gross earnings shown in our statement do not include about \$2,250 a month freight earnings on the A., W. & B. division, the accounts of which will be kept separate from those of the remainder of the system until Sept. 1.

"Earnings from all sources for the month of July average \$1,438 a day, and for the first 14 days of August \$1,626, an increase of \$188 a day. Statements will hereafter be sent to stockholders monthly.

Period covered	Gross	Net	Interest	Deficit
Three months, ending June 30, 1908..	\$123,416	\$39,917	\$70,575	\$30,658
Month of July, 1908.	44,230	12,283	*24,937	12,654
Total, four months.	\$167,646	\$52,200	\$95,512	\$43,312

\*Includes taxes and interest.

**Bulletin on Fares Charged on City Railways**

The American Street & Interurban Railway Association has just published a bulletin giving information concerning the fares charged on city railways, based upon information secured from a data sheet to which 117 companies replied. The bulletin gives the number of companies which sell tickets, the prices at which the tickets are sold, and by whom they can be used. Data are also published on the issue and registration of transfers, the population served, etc. The bulletin is being sent only to member-companies of the association.

A request has been filed by John M. Roach, president of the Chicago Railways Company, and the Chicago Consolidated Traction Company, with the Board of Review to reduce the valuation of these properties to the figures reported by the board of supervising engineers, Chicago Traction, as of April 1, 1908. Mr. Roach asked that the valuation of \$20,000,000 on the personal property of the Chicago Railways Company be reduced to \$8,322,283, and that the valuation for the Chicago Consolidated Company, be reduced from \$3,596,806 to \$1,811,133. The lower figures, are those reported by the board of engineers.



# Traffic and Transportation

## Hearing on Joint Rate for New York Surface Lines

An investigation was begun on Aug. 27 by the New York Public Service Commission, First District, to determine what joint rate would be fair and reasonable for through routes between the Metropolitan Street Railway and the Central Park, North & East River Railroad. Albert G. Millbank, of counsel for the receivers, presented the following statement on their behalf:

"Counsel for the receivers of the Metropolitan Street Railway Company appear and object to any and all proceedings by the commission under Orders Nos. 615 and 673, or the resolution of Aug. 25, 1908, for a hearing, on the ground that the commission has no power, authority or jurisdiction to make any order to require street surface railroad corporations in the City of New York to establish through routes or joint rates, fares or charges for the transportation of passengers, freight or property; or to establish rates, fares or charges for such through transportation, or to declare the portion thereof to which the respective street railroad corporations shall be entitled or the manner in which the same shall be entitled or the manner in which the same shall be paid or secured, and no power, authority or jurisdiction to make the orders known as Nos. 615 and 673, or the said resolution, or to do any act or acts in pursuance of such orders or resolution. And counsel further states that the receivers are ready and willing to furnish such information as the commission may request and which it is in their power to furnish in relation to the property in their charge and to produce their subordinates and operating officers for examination, subject, however, to the objection to jurisdiction above stated."

Oren Root, Jr., general manager for the receivers of the Metropolitan system, was then called as a witness.

Mr. Root said that he had made a comparison of the gross receipts of the lines which would naturally be affected by the withdrawal of the transfers, notably the Crosstown line, from which the business would be deflected, and from that superficial examination it was very evident to him that the Metropolitan Street Railway receivers were gaining very materially since the abrogation of the lease. He had also found from his own observation and from the informal reports and other reports of officials that a large number of fares were received by the Metropolitan receivers at Fifty-ninth Street, representing passengers who had formerly used transfers. He had also been informed unofficially that a material reduction had taken place in the receipts of the Central Park, North & East River Railroad, notably on the Fifty-ninth Street line. His own observation confirmed this formal report. Taking all factors into consideration, Mr. Root reached the conclusion that there is no question of a material gain to the Metropolitan receivers. As to what that gain is and what rate the receivers should receive to compensate them if a joint rate should be established and the question as to how the joint rate would become effective and whether it would be effective, required a much longer and more detailed study than they had been able to give to this subject.

Oliver C. Semple, of counsel for the commission, said he observed that in the statement which had been filed by the receivers with the commission it appeared that about 13,000,000 passengers were carried by transfer on the Fifty-ninth Street line as compared with 7,000,000 revenue passengers. He asked Mr. Root by what method it was ascertained that as many as 13,000,000 transfer passengers rode on the Belt line and the Fifty-ninth Street line. Mr. Root said that a passenger, for instance, riding on a Madison Avenue car, south bound, might have held a transfer to cross the Fifty-ninth Street line; after crossing on this line the passenger would travel south on Eighth Avenue. The conductors on the Eighth Avenue line had been given special envelopes previously with instructions to place all the transfers they received from each one of the longitudinal lines in a separate envelope. That plan was followed out with each of the transfers and gave the actual count for the day of the transfers held over. That method was followed because the system of issuing transfers is changed. There have been times when instead of having the tickets held over, each transfer was taken up and another issued by the conductor. In order that the basis of comparison might be true from year to year, that method of ascertaining the number held over was adopted.

Mr. Root added that the receivers believe that they are entitled to get what revenue they can from the abrogation of the lease and that whatever division is made of any rate that might be established should compensate them in a like amount and that anything else would be confiscatory.

Answering other questions, Mr. Root said that a passenger was carried on the Eighth Avenue line for 5 cents from South Ferry to 155th Street, a distance of about 11 miles or 12 miles. He was asked whether it would cost any more for the company to carry a passenger from Thirty-fourth Street to Fifty-ninth Street and then from Fifty-ninth Street to 116th Street on Second Avenue than for the straight haul on Eighth Avenue. Mr. Root said he did not think that the receivers would want to extend the unprofitable business which they are now doing if they could help it.

Mr. Root said his personal opinion is that the receivers and any person managing the property have a very good opportunity to prove the question of confiscation on the transfer system.

George W. Lynch, general manager of the Central Park road, said that the gross earnings amount now to about 75 per cent to 80 per cent of the operating expenses and said that the gross revenues of the Fifty-ninth Street line alone amount to about 60 per cent of the operating expenses.

Henry W. Brown, auditor of the Metropolitan Street Railway, said that it was ascertained by an estimate that the Fifty-ninth Street Crosstown line and the Central Park company were not paying expenses. In referring to the item of deferred damages in the statement for the period beginning Sept. 25, 1907, and ending June 30, 1908, Mr. Brown said the figure was an estimate based on the ratio of the cost of injuries and damages to the gross earnings during the three years ending June 30, 1907. These years were considered as being representative, indicating the proportion of earnings that would probably be devoted to the settlement of claims for injuries and damages. The figure was 10.186 per cent of the gross earnings.

At the hearing on Aug. 28, Adrian H. Joline, one of the receivers of the Metropolitan Street Railway, took the stand. He said that at the meeting with the representatives of the Central Park, North & East River Railroad it was thought that any division of a 5-cent fare between the two companies was impracticable. He said he thought the general consensus of opinion is that any rate which, in connection with the other income of the property, would afford a fair return on the investment might be a proper rate to agree upon, but the question as to what such a rate would be is, of course, very complicated. He said that counsel for the receivers had said to them that in his opinion the statute does not authorize the commission to establish joint rates or through routes on the city surface railroads of New York City. When pressed for his own opinion on this point, he said that if the commission insisted upon having it he would say that in his personal judgment the statute does not give the authority. He said that the objection of the receivers was not made in a factious spirit, but in carrying out their duty toward the people who control the properties. He said, speaking for himself only, that it would be very much to his satisfaction to be able to find what was a proper rate and agree upon it irrespective of any question as to the power of the commission to order it or not.

George S. Coleman, who examined Mr. Joline for the commission, asked the following question: "If it is found to be practicable to fix a joint rate in these proceedings or in any other that would be fair to your company and to the other company, is there any reason that you can now disclose why such an arrangement would be objectionable?" Mr. Joline answered: "None to me personally, except that we should not be understood as waiving any condition as to jurisdiction in case any other matter should be taken up." He said he knew of no reason why an arrangement should not be made, assuming that the State or the city or the commission had power to make it, provided it is a rate which affords a fair return.

Mr. Coleman said that at the previous hearing it was brought out, as the result of an investigation into the traffic for several days after the abrogation of the lease of the Third Avenue Railroad, that considerable improvement had taken place and that the average revenue per passenger is now about 3.2 cents. He was asked if there was any reason why, if the estimate of a joint rate should leave that situation as it is, the arrangement would be confiscatory if the system received 3.2 cents per passenger carried. Mr. Joline said that the company was losing now on that figure and presumed it would continue to lose more if the condition should be extended.

Commissioner Eustis asked Mr. Joline what he would want to know in order to change the rate in addition to the total cost of operation per car-mile and the revenue per car-mile. Mr. Joline said he would want to know the value of the investment. He said he knew that the abandonment of transfers on Fifty-ninth Street would result in inconvenience to the public, and he regretted it very deeply.



Mr. Joline said that the court did not act hastily in instructing the receivers to abrogate the lease of the Belt line. The opinion of the court, which Mr. Joline quoted, said: "Inasmuch as it is not the first object of the receivers to pay excessive rentals to these lines, the manifest thing to do is promptly to terminate the existing situation and relieve the property which they are operating from the burden of its unprofitable contract. If the lessors should thereafter offer the property as to more favorable terms as to rental and also as to provision for such construction expenses as might be required to render the property more efficient for service, such proposition may then be considered."

Mr. Joline said that if the stockholders had come to the receivers with any proposition of this character they would certainly have considered it and would have presented it to the court to see if it was approved or not.

Responding to further questions, Mr. Joline said that a certain portion of the expenses would be reduced as the property is made more efficient. He added: "You know, of course, that what we call the underground conduit system is the most expensive in the world to maintain and operate as well as to construct. I do not think, although I am perhaps not qualified to express an opinion about it, that the scientific people have as yet thoroughly mastered the whole business. It wears out very quickly and is extremely expensive to repair and very expensive to rebuild, and how much will have to be expended for some years to come I am unable to say, but I doubt whether the amount of the expense could be very materially reduced for some two or three years to come."

**Coney Island Fare Established at 10 Cents.**—The Coney Island & Brooklyn Railroad has established, effective on Aug. 28, a 10-cent fare to and from Coney Island.

**Central Electric Mileage Book.**—The Central Electric Traffic Association's interchangeable mileage ticket is in the hands of the printer and will be placed on sale Sept. 10.

**Through Cars to Be Discontinued.**—The United Traction Company, of Albany, N. Y., has discontinued the operation of through cars between Albany and Watervliet Arsenal.

**Railroad Commissioners Approve Freight Franchise.**—The Railroad Commissioners have approved the freight and express franchise awarded to the Fitchburg & Leominster Street Railway by the Leominster Selectmen.

**Transfers Desired on Staten Island.**—The New York Public Service Commission, First District, has passed orders directing the Staten Island-Midland Railroad and the Richmond Light & Railroad Company to answer within 10 days complaints that the companies refuse to issue transfers over each other's lines. One of the complaints which is responsible for bringing the matter before the commission states that the two companies are managed by the same officers and are believed to be owned and controlled by the same interests.

**Transfers with Interurban Line Requested in Evansville, Ind.**—The Board of Public Works of Evansville, Ind., has asked General Manager F. M. Durbin, of the Evansville & Southern Indiana Traction Company, to establish a system of transfers between the Princeton traction cars and the Evansville city line. Mr. Durbin replied that in the event such transfers were put into effect the interurban company would be obliged to increase the fare into the city, since it had not been charging an extra amount from the city limits to the downtown section heretofore. He said that where the transfer privilege between interurban and city lines is effective the interurban line always allows a separate 5-cent fare for the distance within the city limits.

Active preparations are now under way to celebrate fittingly the jubilee of the Atlantic submarine cable and 25 years' continuous electric service in New York by an electrical show in Madison Square Garden, New York. The work has been taken in hand by a committee of distinguished men in the electrical field who will endeavor to bring together the greatest possible number of useful working exhibits of electricity to show to the public in a practical manner the many ways in which electricity may be used in daily life. Thomas A. Edison is president. The chairman of the committee on exhibits is George F. Parker, 116 Nassau Street, New York. The show is planned to run from Oct. 3 to Oct. 14, inclusive.

An innovation in connection with this exhibition will be the giving of season passes to every central station manager in the country so that those in closest touch with electricity consumers will have every opportunity of meeting the principal manufacturers and dealers in electrical material.

## Personal Mention

**Mr. A. E. Roome** has been appointed superintendent of telegraph, telephones and signals of the Pacific Electric Railway, Los Angeles, Cal.

**Mr. Harry Ethredge** has been appointed general manager of the Pittsburg, Harmony, Butler & New Castle Railway, Harmony, Pa., to succeed Mr. M. M. Reid.

**Mr. W. A. Kappler**, secretary and assistant treasurer of the Washington, Baltimore & Annapolis Electric Railway, Baltimore, Md., has tendered his resignation, effective Aug. 22, 1908.

**Mr. C. A. Coons** has been appointed superintendent of the Buffalo division of the International Railway, Buffalo, N. Y., the office of superintendent of transportation being abolished.

**Mr. Joseph McBride** has been appointed auditor and secretary of the Pacific Electric Railway and the Los Angeles Inter-Urban Railway, Los Angeles, Cal., vice Mr. G. W. Mulks, resigned.

**Mr. J. W. Crawford**, assistant claim agent, International Railway Company, Buffalo, has been appointed comptroller of that company. Mr. Crawford has been with the International Railway since 1901.

**Mr. L. L. Lewis, Jr.**, has been elected president of the Buffalo & Williamsville Electric Railway, Buffalo, N. Y., to succeed Mr. George L. Lewis. Mr. Godfrey Morgan has been elected secretary of the company.

**Mr. Edward M. Bassett** member of the New York Public Service Commission for the First District, returned to New York from Europe on Sept. 1. During his trip abroad Mr. Bassett studied street railway operation in London, Paris, Berlin, Vienna, Munich and Budapest.

**Mr. Joseph O'Hara** has resigned as superintendent of transportation of the Washington, Baltimore & Annapolis Electric Railway, Washington, D. C., and has been succeeded by Mr. J. J. Doyle, formerly superintendent of traction and overhead construction.

**Mr. W. Caryl Ely**, ex-president of the American Street & Interurban Railway Association, is being prominently mentioned as candidate for Governor of New York this year on the Democratic State ticket. Mr. Ely has not yet announced that he would accept the nomination if tendered.

**Mr. Thomas Pumfrey** has been appointed acting engineer of way of the International Railway, Buffalo, N. Y., vice Mr. C. H. Clark, resigned. Mr. Pumfrey will be in charge of and responsible for the track and roadway on the Buffalo division only, and will act in an advisory capacity in track and roadway matters on the Niagara Falls and Lockport divisions.

**Mr. Thomas Kinsella**, of North Tonawanda, has been appointed superintendent of the Buffalo, Lockport-Olcott divisions of the International Railway, which will be connected with the Buffalo, Lockport & Rochester Railway line between Rochester and Lockport. He succeeds Mr. Martin Sheehan, who has been made superintendent of the Buffalo-Niagara Falls division.

**Mr. C. F. Gailor**, assistant engineer of the Goldschmidt Thermit Company, has resigned that position to take up the duties of roadmaster for the Connecticut Company at Hartford, Conn. He succeeds Mr. R. B. Davis, who has resigned to take up contract work. Mr. Gailor has been with the Goldschmidt Thermit Company in the capacity of engineer and salesman for the past year and a half, during which he traveled extensively in the interests of the company and has made many friends and acquaintances among street railway officials. Previous to his connection with the Goldschmidt Thermit Company he was chief engineer of the Binghamton (N. Y.) Railway, and before that was chief engineer of the Rutland (Vt.) Railway, Light & Power Company. He was also connected with the Hudson Valley Railway Company for four years, during which he acted in nearly all capacities, from rodman to engineer in charge of construction.

**Mr. F. H. Knox**, who was recently appointed vice-president and general manager of the Spartanburg (S. C.) Railway, Gas & Electric Company, was connected with the Westinghouse Electric & Manufacturing Company from 1888 to 1901. From 1892 until 1895, Mr. Knox was on the engineering staff of J. G. White & Company, when he severed his connection with that company to become constructing engineer of the Charleston (S. C.) City Railway, a position which he held from 1896 to 1898. The following year Mr. Knox held the position of chief engineer of the Charleston & Seashore Railway and for the next three years served as chief engineer of the Spartanburg Railway, Gas & Electric Company. In 1903 Mr. Knox resigned from this company and for three years acted in the capacity of



consulting engineer with headquarters in Pittsburg, Pa. In 1906 he was appointed chief engineer of Boise & Interurban Railway, Boise, Idaho, resigning a few weeks ago to return to the Spartanburg Railway, Gas & Electric Company.

**Mr. F. D. Hunt**, whose appointment as traffic manager of the Portland (Ore.) Railway, Light & Power Company was noted in the issue of the *ELECTRIC RAILWAY JOURNAL* for Aug. 29, entered the railway field in August, 1894, as local freight and passenger agent, as well as commercial agent of the Blair line at Clinton, Mo., and from Sept. 1, 1898, until March, 1902, filled the same position with the Frisco System at Clinton, Mo., and Pittsburg, Kan. Mr. Hunt then resigned to become superintendent, general freight and passenger agent of the Arkansas Western Railway, which position he held until August, 1905. He was then appointed general superintendent of the Denver, Enid & Gulf Railway, Enid, Okla., and remained with that company until December, 1905. Mr. Hunt then entered the service of the Kansas City Southern Railway, Kansas City, Mo., as industrial agent and on July 15, 1908, was appointed local freight agent of this company, resigning on Aug. 5 to become connected with the Portland Railway, Light & Power Company.

**Mr. Charles H. Clark**, whose resignation as engineer of maintenance of way of the International Railway Company, of Buffalo, was announced last week, has accepted the position of chief engineer of the New York & North Shore Traction Company, of Mineola, L. I. This line connects Mineola, Roslyn and Port Washington, and Mr. John J. Stanley, of Cleveland, is president. Mr. Clark is chairman of the way committee of the American Street & Interurban Railway Engineering Association and has been prominent in the work of that body. He was engineer of maintenance of way of the Cleveland Electric Railway Company before his removal to Buffalo, and during the appraisal proceedings before the Cleveland system was taken over by the Municipal Traction Company, Mr. Clark acted for the company as appraiser of its track and pavement. He was born in Rochester, N. Y., in 1869, and was educated at the Canastota high school and at Cornell University, being graduated from the latter institution in 1892 with the degree of civil engineer. He then became associated with T. William Harris, of New York, who was a prominent street railway contractor, and supervised for Mr. Harris the construction of electric railways in Syracuse, Oswego, Scranton, Troy, New York City, Norristown, Pa., and elsewhere. He also had charge of the construction as engineer for Mr. Harris of the Trenton Falls dam. After leaving Mr. Harris he became associated as draughtsman and outside construction superintendent with Wm. Wharton, Jr., & Company, Inc. In 1901 he was appointed chief engineer of the Utica & Mohawk Valley Railway and had charge of the construction of that line for the Andrews-Stanley syndicate. In the latter year he went to Cleveland for the same interests to take charge of the track work of the Cleveland Electric Railway Company. On the New York & North Shore Traction Company's line Mr. Clark's headquarters will be at Port Washington, N. Y.

#### OBITUARY

**George N. Burpee**, superintendent of construction of the Manchester Traction, Light, Heat & Power Company, Manchester, N. H., is dead. Mr. Burpee died suddenly on a train while on his way to Boston.

#### Address of T. P. Shonts on Transportation

T. P. Shonts, president of the Interborough-Metropolitan Company of New York, made an address at Centerville, Iowa, on Aug. 28 on the subject of "Transportation." He divided the history of American transportation into three periods. First was the period of pioneer construction, when roads were built in advance of a demand not yet developed. In the second period these conditions were reversed by the rapid development of the country and the roads were compelled to incur great expense for improvements in the face of ruinous competition. The third period, Mr. Shonts said, "is the period of governmental control and interference. If the legislatures of the country, after passing laws to stamp out rebates and protect the public from fictitious issues of securities and making the affairs of every railroad public property through standardizing accounts, had stopped there, no evil would have been done; but the pendulum of public opinion continued to swing until many harmful and hurtful laws had been passed in various parts of the country."

Mr. Shonts said that the railroads are entitled to a fair price for what they have to sell, and that in the face of increased cost of operation and maintenance and with widespread demands for extensions and betterments their rates had been decreased greatly.

## Construction News

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

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

#### FRANCHISES

**Santa Monica, Cal.**—The Los Angeles-Pacific Company has been awarded a new franchise covering all the existing lines, main and local, and adding the right to operate cars along Third Street and from Montana Avenue and Seventh Street to San Vicente Boulevard. The extension is for 21 years. In consequence of the grant the company has promised to resume operations on the Third Street line at once.

**Ansonia, Conn.**—The Board of Aldermen has granted the Connecticut Company an extension of time for double tracking in Ansonia to Nov. 1, 1909. All the conditions of the amended agreement entered into with the company last winter are retained, including the immediate payment of \$4,000, the relaying of the Main Street pavement, and in addition the company is to repair the covered bridge at its own expense within two weeks and resume the running of cars over the structure. [E. R. J., Aug. 29, '08.]

**\*Sanford, Fla.**—S. O. Chase, A. T. Rossiter, A. P. Connolly, F. P. Forster and J. N. Whitner have made an application to the City Council for a franchise to operate a street railway in Sanford. This company is to be known as the Sanford Traction Company.

**\*Iowa City, Ia.**—Henry Negus and I. J. Hamiel, representing the Rundell Land & Improvement Company, have applied to the City Council for a franchise to build a street railway 5 miles long in Iowa City.

**Rochester, N. H.**—The City Council has granted the petition of the Dover, Somersworth & Rochester Street Railway for the layout of the electric road between Rochester and East Rochester. The company expects to begin the construction of the line immediately.

**Long Island City, N. Y.**—A franchise was granted to the New York & Queens County Railway this week for the construction of the double-track extension from Flushing to Bayside and Whitestone. The improvement has been under consideration for some time. It was said that work on the construction of the road will be begun at once. The road will be 5 miles long.

**Toronto, Ont.**—Application will be made by the Toronto Suburban Railway for a 25-year extension of its franchise and for the right to extend its line through Swansea to the Lake Shore Railroad.

**Chattanooga, Tenn.**—S. W. Divine, promoter of the Tennessee-Georgia Interurban Railroad, has applied to the City Council for a new franchise. The new franchise provides for a loop, the route of the same being from Cowart and Union Streets, eastward on Union to King, on King to Eleventh, west on Eleventh to Market, south on Market to Cowart, thence on Cowart to Union. The franchise is also for a continuous single-track line from this point on Cowart to Chattanooga Avenue, east on Chattanooga Avenue to Long Street, thence on Long to the corporation line. Mr. Divine wants a franchise good for 40 years and proposes to pay \$500 a year as compensation or, in lieu of that, 2 per cent of the gross fares collected within the city limits.

**Salem, Va.**—The town of Salem has granted a franchise to the Roanoke Railway & Electric Company to extend its line 1 mile out Main Street to Lake Spring. J. W. Hancock, Roanoke, Va., general manager.

**\*Olympia, Wash.**—The City Council has passed an ordinance granting the Olympia Light & Power Company a franchise to operate a street railway from the intersection of Main and Third Streets west to the Government water-way.

#### NEW INCORPORATIONS

**Napa & Lakeport Railroad, San Francisco, Cal.**—This company has been incorporated to build an electric railway from Napa northerly to Lakeport, in Lake County. The estimated length of the line is 90 miles. Headquarters, San Francisco. Capital stock, \$2,000,000, of which \$110,000 has been fully subscribed. Directors: C. W. Conlisk, San Francisco, treasurer; W. M. Rank, Alameda, Cal., R. A. Morton, San Francisco. [S. R. J., Nov. 9, '07.]

**\*Valparaiso & Northern Railway, Valparaiso, Ind.**—This company has been incorporated to construct and operate street and interurban railroads in Porter County. Capital stock, \$10,000. The first line will be constructed from Valparaiso to Chesterton. A system will also be built in Chesterton. Headquarters, Valparaiso. Directors: George



G. Pfeleger, L. E. Woodard, D. R. Chase, M. J. Cook and W. R. Watson, all of Chicago.

**\*Saginaw & Flint Railway, Saginaw, Mich.**—This company has just been incorporated and has purchased the street railway formerly owned by the Detroit, Flint & Saginaw Railway. The new company will immediately begin work building the line to Flint. Incorporators: A. J. Groesbeck, Mark Mitshkun and N. A. Tabor. Officers: A. J. Groesbeck, president; N. A. Tabor, treasurer, and Mark Mitshkun, secretary. Principal office, Detroit, Mich. Purchasing agent, M. Mitshkun, 33 E Street, Detroit, Mich.

**\*Western Central Railroad, Holdrege, Neb.**—This company has been incorporated to construct an electric railway from Holdrege to a point a few miles west of Kearney. The company is now engaged in making the survey and securing the right-of-way. Capital stock, \$250,000. Directors: T. E. Brady, Charles Stanton, J. G. Burlingham, E. O. Carlson and S. C. Nelson, all of Omaha.

#### TRACK AND ROADWAY

**Pacific Electric Railway, Los Angeles, Cal.**—A contract has been let by the Los Angeles Interurban Railway Company to W. N. Crandall, of Los Angeles, for grading on the La Habra line of the Pacific Electric.

**Southern Pacific Company, Palo Alto, Cal.**—The Southern Pacific Company has begun making its survey of the rights of way purchased last week from the Santa Clara County & Interurban Railroad. As soon as the preliminary surveys are made active operations will be begun on the construction of the road and will be rushed to completion. When this road is complete there will be a continuous line from San Francisco to San José.

**Kansas-Colorado Railroad, Pueblo, Colo.**—This company, organized recently at Pueblo, Colo., to build an electric railway system in the Arkansas Valley from Pueblo as far east as Dodge City, Kan., has applied to the State charter board at Topeka for authority to engage in business in Kansas. The original company was chartered under the laws of Colorado and its headquarters are at Pueblo. Directors: W. P. Humphrey, Syracuse, Kan.; A. C. Campbell, Lakin, Kan.; Andrew Russell, Dodge City, Kan., and A. H. Warner, Garden City, Kan. [E. R. J., Aug. 15, '08.]

**Capital Traction Company, Washington, D. C.**—The commissioners have approved the request of this company for a permit to make specified extensions of its lines as authorized by Congress.

**Washington, D. C.**—Bids will be received at the office of Capt. F. C. Boggs, U. S. A., general purchasing officer, Isthmian Canal Commission, Washington, D. C., until Sept. 28 for an electrical industrial railway consisting of 16,600 ft. of trackage, with 12 electric locomotives and 24 flat cars.

**\*Fairburn, Ga.**—It is reported that a local company is being organized to build an electric street railway from Fairburn to College Park. A mass meeting was held last week, when the project was discussed and the following committee appointed to secure a right-of-way and solicit subscriptions. This committee is composed of Dr. L. M. Hobgood, W. A. McCurry, C. B. Dorris, B. F. Jones, Fairburn; J. F. Hemperley, Union City; F. M. Scarbrough, W. B. Trentham, Stonewall; H. C. Williams, Red Oak; H. H. Camp, College Park. It is proposed to capitalize the company at \$90,000.

**Milner & North Side Railroad, Milner, Idaho.**—D. C. McWatters, president, states that this line will be completed to Wendell by Oct. 15. The grading has been finished up to a point south of Gooding. Another grading outfit is working for the road out of Milner toward Jerome. The length of the system when completed will be 65 miles. The power for the road will be furnished by two plants, one at Shoshone and the other at the lower Salmon Falls. The material for the completion of the road has been ordered and is being distributed along the right of way in readiness for being set in place.

**Chicago & Southern Traction Company, Chicago, Ill.**—President Matthew Slush, of this company, announces that he will be in Fowler within the next two or three weeks to consult with the people in regard to the construction of the interurban line from Kankakee to Lafayette. The company is anxious to get this extension built, as it will give it a through line from Chicago to Indianapolis. It is said that the bonds for the construction of the road have already been issued. The exact route has not been decided upon.

**Chicago, Ill.**—A new street railway across the southern and western edges of the Chicago business district is being planned so as to connect all of the six large railroad depots of the city. This line will enable passengers to travel directly from any depot to any other without being carried through the most congested district. Being less than 2

miles in extreme length and carrying the bulk of its passengers for much shorter distance, this line promises to be an exceedingly profitable one.

**Alton, Jacksonville & Peoria Railway, Jerseyville, Ill.**—W. R. Heagler, of Chicago, chief engineer for this company, is reported to have announced that the engineers are now running the lines and that contracts for the entire line would be let. The bonds of the road have all been sold and the company now has the funds to proceed with the construction.

**Sterling, Dixon & Eastern Electric Railway, Sterling, Ill.**—This company has just made an extension to the Chicago & Northwestern Railway depot and completed a spur to Mineral Springs. Various other improvements are being made by E. E. Downs, whose appointment as manager of this line was noted in the March 21 issue of the STREET RAILWAY JOURNAL. Mr. Downs is receiving many congratulations from the local papers upon the successful way in which his road handled the crowds during the recent Rock River Assembly.

**Ferdinand Railway, Indianapolis, Ind.**—D. H. Morgan writes that this company proposes to begin construction work next month on the electric railway projected between Huntingburg and Ferdinand, Ind. The length of the system will be 7 miles. Capital stock, \$50,000. Headquarters, 617 Terminal Building, Indianapolis, Ind. Officers: O. W. Blickenstaff, C. M. C. Shanks, vice-president; D. H. Morgan, secretary; N. P. Carter, treasurer; H. E. Huntington, general manager; C. A. Morgan, electrical engineer; Will Duncan, chief engineer. [E. R. J., Aug. 22, '08.]

**Sioux City (Ia.) Traction Company.**—General Manager E. L. Kirk states that construction work on the Coles' addition line will be started within a few days. A year ago the company ordered 150 tons of steel rails from the Illinois Steel Company and notice has been received from that corporation that the rails will be delivered in Sioux City at once. The company is also making a number of improvements on its Crescent Park line.

**Boston (Mass.) Elevated Railway.**—This company will immediately begin the construction of a double-track line for surface cars between Broadway Square, Malden, and the Melrose City line. Rockport granite paving will be used between tracks and the line is expected to be ready for service by Sept. 10.

**Norfolk & Bristol Street Railway, South Walpole, Mass.**—This company has asked the Town Board of Foxboro for a relocation of its tracks on Main Street to facilitate the widening of the highway where the State is to build a section of road.

**\*Hagerstown, Md.**—It is reported that a movement is on foot to construct an electric railway from Mercersburg to Williamsport via Fairview. W. D. Byran & Sons, who operate extensive tanneries at Williamsport and Mercersburg, are said to be interested in the proposed railway, which would pass through a fertile and populous section of country now without railroad facilities. The rumor says that a company will be organized to finance the enterprise.

**Detroit (Mich.) United Railway.**—This company expects to reconstruct a mile of double track on Jefferson Avenue this year. The line on Grand River Avenue from Trumbull east to Woodward Avenue will also be rebuilt.

**Michigan United Railways, Kalamazoo, Mich.**—This company has recently applied to the City Council for permission to double-track its line on North Burdick Street from Main Street to the Michigan Central Railway.

**\*Duluth, Minn.**—It is reported that John E. Roemer is interested in a project to construct an aerial railway between Duluth and Fond du Lac.

**St. Joseph (Mo.) Railway, Light, Heat & Power Company.**—This company has begun work on the extension of its Union line, from Krug Park northward to the new town of North St. Joseph. The extension will be 1¼ miles in length, and the cost will be about \$18,000.

**United Railways, St. Louis, Mo.**—This company has begun reconstructing the track and road on Broadway between Franklin and Clark Avenues, and while the work is in progress the routes of several lines will be changed. Northbound Broadway cars are routed over Fourth Street between Chouteau and Franklin Avenues, while the southbound cars are to be operated as usual, on Broadway. Laclede cars are running over the loop on Broadway, Walnut, Fourth and Market Streets. The Lee and Spring Avenue cars are running north on Fourth Street.

**Lincoln (Neb.) Traction Company.**—This company has been given permission to construct a single track turnout on Fourteenth Street to connect with its present track on that street, between X and Y Streets; also permission to



build a 45-ft. radius curve at the northwest corner of Tenth and O Streets, joining the present track on Tenth Street with the north track on O Street.

**North Jersey Rapid Transit Company, Paterson, N. J.**—Bids will be received until Sept. 15 at the office of this company, Colt Building, Paterson, N. J., for the grading, masonry and bridging on Section 1 of the proposed electric railway between Paterson, N. J., and Suffern, N. Y. [E. R. J., Aug. 22, '08.]

**\*Raton, N. M.**—H. N. Siegfried, of Denver, general manager of the Southern Colorado Power Company, is said to be considering a proposition to install an electric light plant and street-car system in Raton.

**Binghamton (N. Y.) Railway.**—As a result of a meeting of the trustees of the village of Union and Vestal and J. P. E. Clark and G. Tracy Rogers, of the Binghamton Railway, it is expected the company will soon begin the work of extending the railway line to Owego. It is the plan to extend the present Binghamton-Union line to Choconut Bridge this fall.

**Buffalo & Lake Erie Traction Company, Buffalo, N. Y.**—This company will build a double-track steel viaduct 1400 ft. long, with concrete piers and approaches, near Westfield, N. Y. Bids were recently received for an all-concrete structure, but were rejected. The Western New York Construction Company, 535 Brisbane Building, Buffalo, N. Y., is receiving the bids.

**Ocean Electric Railway, Far Rockaway, N. Y.**—This company is getting ready to lay its tracks along Fifth and Newport Avenues, at Rockaway Park. The company's cars now run on Washington Avenue, and it is planned to change the route between Fifth Avenue and Belle Harbor so that the cars will go down Newport Avenue, leaving Washington Avenue as a wide parkway. Permission has been granted the company to make this change by the Public Service Commission.

**New York, N. Y.**—An order for 300 tons of heavy rails for the Blackwell's Island Bridge, and a contract for frogs and switches at the Brooklyn terminus, involving about \$30,000 in all, have been placed with the Pennsylvania Steel Company.

**Rochester (N. Y.) Railway.**—This company expects to apply shortly for permission to put in the second track on the curve from Court Street into Clinton Avenue south. The company plans to have the work completed and the new second track in use before Sept. 15.

**Rochester & Sodus Bay Railway, Rochester, N. Y.**—A new bridge of reinforced concrete, to cost \$6,000, will be constructed at the Clifford Street crossing of the Glen Haven line by the Rochester & Sodus Bay Railway Company. Work on the structure will be commenced in a few days and the work must be completed by Oct. 15. Bids will be received by the company next week. The building will enable the company to lay a double track at that point.

**Syracuse (N. Y.) Rapid Transit Company.**—Reconstruction of the overhead work on the Solvay line of this company is rapidly nearing completion. In Wilbur and Milton Avenues steel poles are being erected to carry the new feed and trolley wires. The work of relaying tracks in South Salina Street between Jefferson and Onondaga Streets will be completed in a few days.

**Rochester, Syracuse & Eastern Railroad, Syracuse, N. Y.**—This company is now making preliminary surveys from Port Byron to Syracuse, a distance of 25 miles. This line was opened for service three weeks ago by the way of the Auburn & Syracuse Traction Company's lines, also controlled by the same company, but the proposed route will lessen the time between Rochester and Syracuse by one hour. The matter of extension at the present time is now under consideration and decision will be made by Oct. 1 as to whether construction will be continued at the present time or taken up at a later date. T. H. Mather, chief engineer.

**Syracuse, Lake Shore & Northern Railroad, Syracuse, N. Y.**—This company, which is now operating as far as Baldwinsville, N. Y., with a 12-mile double-track extension under way between Baldwinsville and Fulton, is considering preliminary plans and surveys for a 11-mile double-track extension to Oswego, N. Y.

**Auburn & Syracuse Electric Railroad, Syracuse, N. Y.**—It is reported that this company has under consideration the construction of a line from Auburn to Seneca Falls, a distance of 15 miles. At present only a few preliminary surveys are being made and the matter will be definitely decided on later. C. D. Beebe, president.

**Cincinnati (Ohio) Traction Company.**—This company is

reported to be spending \$700,000 in track renewal work which will be done within the next three months. About 600 men will be employed in relaying track on a number of the leading city lines. The new track is being laid with 108-lb. rails, with concrete foundation. The work of renewals will be carried on gradually until the entire system is in first class shape and in condition to carry the heaviest cars.

**Findlay-Marion Railway & Light Company, Findlay, Ohio.**—Citizens of Findlay on Aug. 22 met with the projectors of this company which proposes to construct an electric railway connecting Findlay and Marion, and agreed to undertake the work of raising \$125,000 necessary for the road's financing. A like amount has been allotted to Marion citizens to raise, and it is thought that the \$250,000 will be guaranteed within a few weeks. Already \$800,000 worth of bonds have been sold to Eastern parties. It is stated that work on the construction of the road will begin at once. It will be 48 miles long. [S. R. J., April 11, '08.]

**Ohio Electric Railway, Lima, Ohio.**—This company has secured the contract for building the switches into the grounds of the new State Hospital for the Criminal Insane in Lima.

**\*Zanesville & Meigs Valley Traction Company, Zanesville, Ohio.**—The ELECTRIC RAILWAY JOURNAL is informed that this company has been organized to construct an electric railway from Zanesville to Beverly, Ohio, via McConeville. The company has practically 50 per cent of the right of way under option and the balance will be closed shortly. Capital stock, \$10,000. Officers: E. R. Meyer, Zanesville, president; C. T. Gale, Blue Rock, Ohio, vice-president; F. M. Cruise, Zanesville, secretary; A. J. Longstreth, Zanesville, treasurer; H. D. Blodgett, Zanesville, general manager. Headquarters, Zanesville.

**El Reno (Okla.) Interurban Railway.**—It is announced that this company, which contemplates the construction of an electric railway between El Reno to Shawnee, Okla., will begin surveying the line shortly. The first section to be surveyed will be from Britton to El Reno. It is planned to use the Oklahoma Railway Company's line in from Belle Isle. Construction work is expected to begin within 90 days. The company has just taken out an amended charter at Guthrie, raising its capital stock from \$25,000 to \$1,000,000. Henry K. Schafer and James W. Maney are connected with this project. [E. R. J., July 18, '08.]

**Muskogee (Okla.) Electric Traction Company.**—This company has recently completed and placed in operation its new Fond du Lac line in the northwest part of the city. The company now operates 20 miles of track in Muskogee.

**Coos Bay Railway & Terminal Company, Marshfield, Ore.**—Seymour H. Bell writes that this company has already begun construction work on its standard-gage railway which is to link Empire City, North Bend, Marshfield and Eastside. The system will comprise about 10 miles of track. The company plans to operate nine cars. The overhead trolley system will be adopted, current being obtained from the Coos Bay Gas & Electric Company, which is owned by the railway company. North Bend, Ore., has been selected as the location for the repair shops. Headquarters, Marshfield, Ore. Capital stock, \$250,000. Officers: Henry Hewitt, Jr., 517 Provident Block, Tacoma, Wash., president; L. J. Simpson, North Bend, Ore., vice-president; J. J. Hewitt, Tacoma, Wash., secretary; Seymour H. Bell, Marshfield, Ore., treasurer and general manager. Incorporated Aug. 13, 1908. [E. R. J., Aug. 8, '08.]

**Wasco County Electric & Power Company, Portland, Ore.**—Contracts for the structural steel work of the proposed electric railway were let some days ago by the Portland Construction Company to J. R. Bowles of the Northwest Bridge Works. This contract gives the Northwest Bridge Works all the bridge construction for the new line on its 200 miles of roadbed. The sub-contract for the grading and construction work on the first 20 miles of the road between Condon and Fossil was also let, and the grading was begun Sept. 1. Engineers are now at work on a survey of the first 40 miles of the road, and an additional crew of surveyors under R. A. Hollenbeck have started out to begin work on the survey for the dam, which will be located on the John Day river.

**Northern Cambria Street Railway, Patton, Pa.**—The Barnesboro Construction Company has been awarded a contract by the Northern Cambria Street Railway for the construction of an extension of its system from Barnesboro to Hastings. W. H. Denlinger, Patton, president.

**Cleburne, Tex.**—J. H. Ransom, who recently secured a street railway franchise from the City Council, has leased 290 acres of land 3½ miles north of Cleburne. It is the intention of the lessee to extend the proposed city street



railway to the park, which he will open either the latter part of this or the first of next year. [E. R. J., Aug. 15, '08.]

**Tacoma (Wash.) Railway & Power Company.**—It is the intention of this company to extend its McKinley Park line to Forty-first Street by the first of next year.

**Washington Water Power Company, Cheney, Wash.**—This company has completed a survey for the spur which is to be built to Normal Hill. From there the spur will be extended to Railroad Avenue and east along this thoroughfare for a considerable distance. H. L. Bleeker, Spokane, Wash., secretary.

**Cincinnati Construction Company, Janesville, Wis.**—The ELECTRIC RAILWAY JOURNAL is advised that this company is rapidly completing the final surveys for its proposed electric railway which is to connect Janesville, Edgerton, Stoughton, Lake Kegonsa, Lake Waubesa and Madison. H. H. Zigler, Columbus, Ohio, president, and Joseph Ellis, Janesville, Wis., manager and chief engineer. [E. R. J., Aug. 1, '08.]

**POWER HOUSES AND SUBSTATIONS**

**Little Rock, Ark.**—The Little Rock Railway & Electric Company is installing a new Blake duplex boiler feed, 14 in. x 9 in. x 12 in., in addition to the 1500-kw turbine which is being supplied by the General Electric Company and not by the Western Electric Company, as stated in a recent issue. These additions to the company's power equipment had to be made on account of a large increase in business.

**Saginaw & Flint Railway, Saginaw, Mich.**—This company has decided to abandon and dismantle its power station erected in Bridgeport. The company has practically concluded negotiations with the Bartlett Illuminating Company, of Saginaw, for power with which to operate its line and projected extensions to Flint and Vassar.

**Albion, N. Y.**—The Buffalo, Lockport & Rochester Railway Company has presented a petition in writing to the Albion Village Board of Trustees requesting permission to construct, maintain and use and operate a transmission line over and across the streets along the route of its electric road in Albion.

**Tarrytown, White Plains & Mamaroneck Railway, White Plains, N. Y.**—Arrangements have been completed between this company and the Westchester Lighting Company, by which the latter is to furnish the power with which the line will be operated. Three additional lines will be strung between New Rochelle and White Plains.

**Vancouver (Wash.) Traction Company.**—A contract has been entered into between the Portland Railway, Light & Power Company and the Vancouver Traction Company, according to the terms of which the Portland company will furnish the power to operate the new Vancouver railway line for a period of one year. The contract calls for the delivery of current commencing Sept. 1.

**SHOPS AND BUILDINGS**

**British Columbia Electric Railway, Victoria, B. C.**—An announcement is reported to have been made at Vancouver by General Manager R. H. Sperling to the effect that the board of directors of this company has passed appropriations for this province for the year beginning in September amounting to \$4,280,000, and that the construction of a new office building and freight sheds in Vancouver would be immediately commenced. Freight sheds will be erected at the foot of Carroll Street, on False Creek, and the cost of the new office building will be \$200,000.

**Union Electric Company, Dubuque, Ia.**—The ELECTRIC RAILWAY JOURNAL is advised that this company proposes to increase its car storage capacity by the erection of a concrete or brick building about 50 ft. wide by 280 ft. long. The building will have a fireproof roof supported by steel trusses. Special trackwork has been received for five storage tracks. There will be no increase in the machine shops as reported. Definite construction plans will not be made until about Oct. 1.

**Grand Rapids, Grand Haven & Muskegon Railway, Grand Rapids, Mich.**—This company expects to build a new depot at the terminal at Seventh Street, in Muskegon, Mich. The structure is estimated to cost \$15,000.

**Interborough Rapid Transit Company, New York, N. Y.**—The Rapid Transit Construction Company has filed plans with the building superintendent for the working outfit to be used by the company for the enlargement of the subway from Ninety-sixth to 102d Street. The construction plant is to be erected at Broadway and Ninety-seventh Street and will comprise six buildings, consisting of a machine shop with a compressor room, a smithy, a carpenter shop, a supply house, an oil house and a cement shed and storage yard.

**Manufactures & Supplies**

**ROLLING STOCK**

**Washington Water Power Company, Spokane, Wash.**, is reported to be in the market for 30 cars.

**Yonkers (N. Y.) Railroad** has placed an order for 20 cars with the American Car Company, St. Louis.

**Columbus (Ohio) Railway & Light Company** has ordered 10 double-truck cars from the J. G. Brill Company.

**Houghton County Traction Company, Houghton, Mich.**, is reported to be in the market for a number of cars.

**Kansas City (Mo.) Railway, Light & Power Company** has placed an order with the St. Louis Car Company for six cars.

**Oregon Electric Railway, Portland, Ore.**, has placed an order for eight cars with the Niles Car & Manufacturing Company.

**Pacific Traction Company, Tacoma, Wash.**, is reported to have placed an order with the American Car Company, St. Louis, for an electric work locomotive.

**Milwaukee & Fox River Valley Railroad** is reported to be considering the purchase of two interurban cars. J. M. Saemann, Sheboygan, Wis., is president of this new road.

**Arkansas & Gulf Railway** is in the market for a second-hand gasoline motor with a seating capacity of from five to ten people. P. Kimball, Equitable Building, St. Louis, Mo., general manager.

**Jacksonville (Fla.) Electric Company** has ordered, through the Stone & Webster Engineering Corporation, five semi-convertible double truck cars, equipped each with four 30-horsepower motors. The length will be 44 ft. over the buffers. The cars will be built by the J. G. Brill Company and will have Standard Motor Truck Company trucks and General Electric motors and air brakes.

**Metropolitan Street Railway, New York City**, A. H. Joline and Douglas Robinson, receivers, placed an order last week for 125 cars of the pay-as-you-enter type, but with a number of changes from the cars of that type which have been in operation on the Madison Avenue line. Seventy-five of the car bodies have been ordered from the J. G. Brill Company, of Philadelphia, and 50 from the Jewett Car Company, of Newark, Ohio. The Metropolitan Street Railway made a contract with the Pay-as-You-Enter Car Company for the use of its principle of car design and these cars will be built under that contract. At the same time the receivers placed an order with the J. G. Brill Company for 75 trucks of the maximum traction type and 50 trucks of the same type with the Standard Motor Truck Company, of Pittsburg, Pa.

**Lewiston, Augusta & Waterville Street Railway, Lewiston, Maine**, has just received from the J. G. Brill Company eight single-end semi-convertible cars. Details of the cars follow:

Seating capacity.....	42	Height inside.....	8 ft. 5 in.
Weight .....	24,000 lb.	Sill to trolley base,	8 ft. 10 in.
Wheel base.....	6 ft. 6 in.	Height from track to sills,	3 ft. 2 in.
Length of body.....	29 ft.	Over vestibule..	33 ft. 3 in.
Over vestibule..	33 ft. 3 in.	Body .....	Wood
Length over all..	42 ft. 6 in.	Underframe .....	Wood
Width inside .....	8 ft.	Over all.....	8 ft. 5 in.

**Special Equipment**

Air brakes,	General Electric Company	Heating system...Hot water
Headlights.....	Combination arc	Interior finish,
Bolsters, body.....	Iron	Robin's-egg blue
Bolsters, truck.....	Iron	Journal boxes....Symington
Brakeshoes .....	Streeter	Motors, type and number,
Car trimmings .....	Brass	4, G.E., 202
Control system,	Series, multiple	Roofs .....
Couplers .....	Brill	Sanders..J. G. Brill Company
Destination signs....	Hunter	Seats....J. G. Brill Company
Gears and pinions,	General Electric	Side bearings.....Adjustable
Gongs...J. G. Brill Company		Trolley poles and attach-
Hand brakes,	J. G. Brill Company	ments,
		General Electric No. 6
		Trucks, type and make,
		Brill, 27 E

**TRADE NOTES**

**Perry, Coffin & Burr, Boston, Mass.**, announce that William L. Garrison, Jr., and Philip S. Dalton were admitted to partnership on Sept. 1, 1908.

**Doubleday-Hill Electric Company, Pittsburg**, announces that W. D. Shaler has been elected secretary of this company to fill the place made vacant by the decease of his brother, H. G. Shaler.



**Irving L. Reed**, formerly secretary and treasurer of the Charles E. Dustin Company, has formed a connection with Rossiter, MacGovern & Company. In his new connection Mr. Reed will become manager of sales.

**American Automatic Fender Company, Minneapolis, Minn.**, is being organized with a capital of \$500,000 to engage in the manufacture of street-car fenders and locomotive pilots. F. A. Nelson, of Minneapolis, is the patentee of the devices.

**Crocker-Wheeler Company, Ampere, N. J.**, has opened a new office in the Gumbel Building, Kansas City, Mo., for the sale of C-W motors, dynamos, transformers, switchboards, etc. The office is in charge of A. W. Paine, who will give personal attention to business in Kansas City and vicinity.

**\*Haytian Electric Company, Jersey City, N. J.**, has recently been incorporated to engage in the construction of electric railroads, submarine cable, telegraph and telephone lines in the West Indies. Capital stock, \$100,000. Incorporators: Lucien M. Archer, Plainfield, N. J.; Samuel H. Parsons and Joseph L. Egan, 5 Nassau Street, New York, N. Y.

**G. E. Austin**, general manager of the American Engineering Company, New York, has recently started on a trip to the West in the interests of the business of his company. Mr. Austin will visit Denver, Los Angeles, San Francisco, Portland, Seattle and Vancouver and will return by way of Canada. Agencies will be established where the outlook for business justifies them.

**D. C. & Wm. B. Jackson** announce that they have removed their Western office from Madison, Wis., to the Commercial National Bank Building, Chicago, and that William J. Crumpton will be in immediate charge of the same. The telephone number in Chicago is Randolph 1153, and that in Boston is Fort Hill 1875. The Boston office is located in the India Building, 84 State Street.

**Sargent-Hollingshead Company, Fisher Building, Chicago**, has just been organized to sell steam and electric railway specialties. This company has offices at 1616 Fisher Building and is making selling arrangements for a number of attractive specialties. The company is headed by G. H. Sargent and A. G. Hollingshead. Mr. Sargent formerly was a principal in the Sargent Company. In 1900 Mr. Sargent and Percival Manchester organized the Railway Appliances Company, now the Quincy, Manchester, Sargent Company. He is still a director of this company. Mr. Hollingshead has had experience in steam railroad work and has been connected with the Ralston Steel Car Company.

**Charles S. Powell**, 165 Broadway, New York, formerly of the Westinghouse interests, has just returned from a trip through the South in connection with some engineering work which his firm is carrying out. Mr. Powell reports that the business conditions in the South are cheerful and an optimistic tone is present everywhere. In Jacksonville, Fla., particularly, the citizens are proud of the fact that during the recent stringency the banks were able to meet the situation without recourse to clearing-house certificates. Jacksonville is one of the growing cities of the new South, and with the opening of the Panama canal will be one of the important ports on the Atlantic ocean.

**Chicago Pneumatic Tool Company, of Chicago**, has issued the semi-annual report for the period ending June 30, 1908. President Duntley states that the business during this period shows a falling off of 46 per cent, owing to the prevailing depression in the iron and steel industries, and the company's showing of earnings is therefore greatly reduced. Notwithstanding the prevailing depression and decreased business, the company has reduced its indebtedness, included in mortgage assumed, bills payable and accounts payable, \$123,000, and has in addition met all of its fixed charges, and a balance of \$18,085.53 has been added to surplus account. The profits for the half year were \$149,958, less \$44,122 for depreciation and renewals and \$3,000 for perfecting new tools, leaving a net profit of \$102,835. The sinking fund reserve was \$84,750, leaving \$18,085 available for dividend. For the six years ended Dec. 31, 1907, the company reports gross profits of \$4,771,273 and a balance to surplus amounting to \$1,380,502.

**Railway Audit & Inspection Company, of Philadelphia**, announces that it has secured as the head of its engineering department Wm. R. Allen, of Philadelphia. Mr. Allen is a University of Pennsylvania man, class of 1897, has been actively engaged in engineering work since that time on all classes of industrial development, having spent four years in Colorado and old Mexico on special water power undertakings, and has acted as chief engineer for the following companies: Vandergrift Construction Company, Indiana Union Traction Company, Lexington & Interurban

Railways Company, Norfolk & Atlantic Terminal Company and Norfolk & Portsmouth Traction Company. Mr. Allen heads a staff prepared to undertake surveys, estimates and reports on new development, estimates and reports on extensions of all classes, either power, lighting or railway, and special reports as to the physical condition of all classes of industrial properties for prospective purchasers or investors. The company is prepared to undertake and carry out this class of work, submitting a proposition based either upon percentage or fixed fee.

#### ADVERTISING LITERATURE

**J. G. Brill Company, Philadelphia, Pa.**—Among the interesting features of *Brill's Magazine* dated Aug. 15, is an article describing the semi-steel trail cars built for the Illinois Traction Company. Incidentally a number of interesting line views are appended together with a brief description of the traffic conditions on this railway.

**Harry De Steese, New York.**—This manufacturer of coils and commutators has issued an illustrated folder which describes in an interesting manner the methods used in his shops for making commutators and impregnating coils by the vacuum process. An illustration shows a part of the ample equipment which Mr. De Steese has installed for repair work.

**Chicago Pneumatic Tool Company, Chicago and New York**, has issued advance sheets of Catalog No. 6, devoted to Franklin air compressors. These compressors are of the duplex steam-driven and duplex belt-driven types and are thoroughly described by means of the illustrations and accompanying detail tables of capacity, diagrams, mode of drive, weight, etc.

**B. F. Sturtevant Company, Boston, Mass.**—This company, whose line of small engines and motors is in wide use, has just issued bulletin No. 159, which describes its Type H electric motors. They are specially designed for direct connection to Sturtevant blowers and exhausters and are made open, semi-enclosed or enclosed, according to the conditions of installation. The descriptions are accompanied by tables of horse-power, speed, and rates, as well as the principal dimensions.

**Wisconsin Engine Company, Corliss, Wis.**—This company is sending out a notice to the effect that it is now engaged in the manufacture of gas engines for all purposes in addition to its high-duty Corliss engines and pumping engines. The gas-engine department is in charge of Charles E. Sargent, the inventor of a horizontal tandem, double-acting engine, and the company has control of Mr. Sargent's patents on internal combustion engines. In appearance the new engines will bear some of the characteristics of this company's Corliss steam engines. Contracts have been secured for several gas engines of 500 hp to 5000 hp capacity and the company is prepared to bid on every contemplated installation using natural, producer, coke-oven or blast-furnace gases.

**Trussed Concrete Steel Company, Detroit, Mich.**—This company has published an eight-page bulletin in which are given the results of a series of tests made in the University of Wisconsin in the spring of 1907 to determine the relative efficiency of reinforced bars with inclined rigidly connected shear members (as in the Kahn bars) compared with bars with loose stirrups. The design of the bars, method of loading and reinforcement and the remarkable results of these tests in favor of the Kahn bars are shown in a table and illustrations. A more detailed report of these tests will be found in bullet No. 197 of the University of Wisconsin, Engineering series, Volume 4, No. 2. The company reports that similar tests are being made in other universities.

**Southworth Brothers, Portland, Me.**—The American transfer punch made by Southworth Brothers is described and illustrated in a booklet just issued by them. The punch is intended for punching out the day and month from pads of transfers before they are given to the conductor, and may be operated by foot or hand power. The gages are easily set and several hundred pads can be punched in an hour. The knife or die cuts on to a disk of hard fiber and by turning a knob at the back of the machine the disk or cutting block revolves so that a fresh cutting surface is presented as often as desired. V-shape and round dies are made. The V-shape provides a ready means of checking up transfers as they may be bunched and by looking along the edge any V notch that is out of line can be readily seen and the conductor who took up such a transfer called to account. Specimens of the transfers punched with the V-shaped die and the round die are included. The price of the machine includes one die of either shape. The punch is in use on a number of lines, which Southworth Brothers give as references.

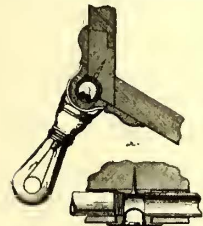


**ELECTRIC RAILWAY PATENTS**

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 41 Park Row, New York.]

UNITED STATES PATENTS ISSUED AUGUST 18, 1908

**Railway Brake Shoe**, 896,076; James S. Baker, Altoona, Pa. App. filed Jan. 11, 1908. Comprises a cast metal body having a steel strengthening plate secured to the back thereof, the ends of the steel plate terminating slightly short of the ends of the body and an intermediate portion thereof being slotted and struck up to form sockets on opposite sides of the slot and a U-shaped attachment loop having feet received in said sockets, portions of the metal of the body extending over the ends of the plate and through the slot to embrace the feet and sockets.



**Brake for Rolling Stock of Railways and Tramways**, 869,129; Alfred Walter Maley, Leeds, England. App. filed Dec. 10, 1907. The main brake block is applied to the car wheels and means for causing the drag thereon to press an auxiliary track block upon the rail.

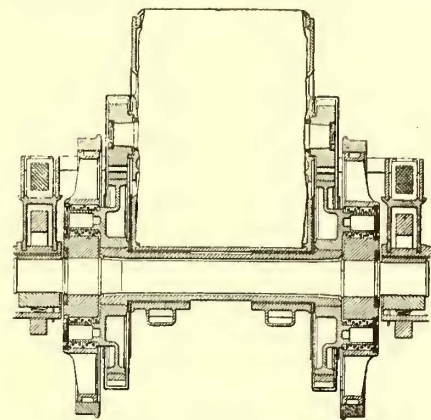
**Electric Trolley**, 869,189; John Young, Toledo, Ohio. App. filed April 29, 1908. Has an eccentrically mounted case suspended from the harp, rollers mounted in the case and an annular contact ring rotatable upon the rollers.

No. 896,463—Conduit

**Trolley Pole**, 896,198; Lawrence C. Collins and Arthur R. Eltom, Cranford, N. J. App. filed Feb. 28, 1908. Provides a supplemental trolley wheel mounted on a forked hinge on the usual harp and adapted to be elevated to guide the usual wheel onto the trolley conductor.

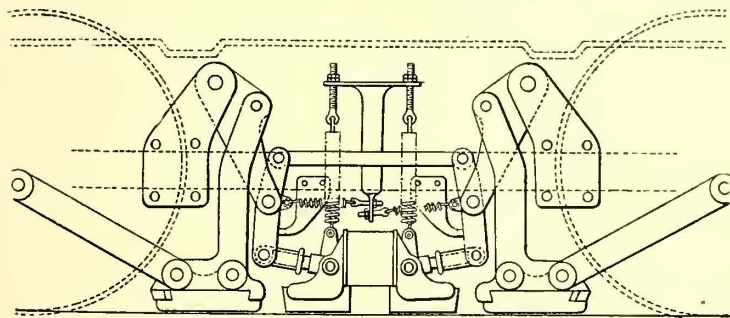
**Air-Actuated Railway Fender**, 896,212; Smith S. Johnson and Henry A. Thompson, Seattle, Wash. App. filed Feb. 6, 1907. Means are provided whereby an emergency application of the air brakes will lower the fender.

**Electric Locomotive**, 896,220; Benjamin G. Lammie and Norman W. Storer, Pittsburg, Pa. App. filed Jan. 5, 1907. The motor is mounted vertically over the axle to secure greater room on the truck and drives a quill with resilient connections to the wheels. Means for independently and resiliently supporting the truck frame and the motor upon the journal bearings.



No. 896,220—Electric Motor

**Means for Automatically Restoring a Trolley Wheel to**



No. 896,129—Track and Wheel Brake

**the Wire**, 896,225; Charles F. Mehl, Cleveland, Ohio. App. filed Sept. 18, 1907. A special wheel or roller adapted to guide the trolley wheel upon the wire, is slidably mounted upon the trolley pole and is impelled upward to operative position by a solenoid magnet.

**Car Fender**, 896,279; Joseph Dornberger, Toledo, Ohio. App. filed Sept. 20, 1907. Relates to means for vertically adjusting the fender to and from the rails.

**Setting and Operating Device for Fare Registers**, 896,315; John F. Ohmer, Dayton, Ohio. App. filed Jan. 14, 1907. On lines having fare rates are too varied to be registered by one indicator, two registers or indicators are used, an actuating device for each machine, and selective means common to both machines whereby the fare to be registered in one or the other of said machines is selected.

**Current Collector for Electric Railways**, 896,319; Philip Pferr, Lankwitz, near Berlin, and Paul E. Herkner, Berlin, Germany. App. filed Jan. 23, 1907. A pair of current collectors independently controlled by pneumatic systems. Has means for controlling a pneumatic system operating by the reversal switch of the train so that the direction of the current collectors is automatically changed with changes in the direction of the vehicle.

**Fender**, 896,351; William James Birchell, Los Angeles,

Cal. App. filed Dec. 28, 1907. The fender comprises a plurality of short cushioned rods vertically mounted.

**Brake for Railway Cars**, 896,377; John M. Goodnight, Kansas City, Kan. App. filed April 30, 1908. Relates to improvements in brakes for railway cars and pertains more particularly to bottom rods and springs for adjusting and releasing the brakeshoes.

**Combined Railway Tie Fish Plate and Car Replacer**, 896,378; William W. Gordon, Washington, D. C. App. filed June 6, 1907. Details of construction.

**Amusement Apparatus of the Gravity Railway Type**, 896,430; Robert Hodges Bishop and William Down, London, England. App. filed April 3, 1908. The car is provided with rollers mounted on vertical axes placed to underlie the flanges of a T-headed guide rail on either side

of the web thereof. No track rails are provided. Has other features.

**Car Replacer**, 896,457; Frank A. Mills, Los Angeles, Cal. App. filed March 10, 1908. Comprises a pair of platforms adapted for placement on the rails, one of said platforms provided with a flange groove on each side of the rail and converging toward the rail.

**Fireproof Support for Electrical Wires in Railway Cars**, 896,463; Edward T. Robinson, St. Louis, Mo. App. filed Feb. 11, 1908. The wires are laid in a metallic conduit having openings therein for the passage of electrical conductors for lighting purposes.

**Rail Joint and Fastener**, 896,549; Irvin Johnson, Perryopolis, Pa. App. filed Nov. 27, 1907. Details of construction.

**Rail Joint**, 896,553; Ber; Koontz, Stewardson, Ill. App. filed June 15, 1907. Comprises interlocking ball extensions secured on the meeting rail ends, a web extension projecting from the meeting end of each rail and designed to be disposed side by side, means for normally spacing said web extensions a slight distance apart when so disposed, and means for connecting said extensions.

**Rail Joint**, 896,615; Josef Bernhard and Frederick C. Schoepner, Allegheny, Pa. App. filed June 1, 1907. Comprises a chair supporting and embracing the base and webs of a pair of rails at their ends, wedge-shaped keys of greater length than the chair, the keys alternately disposed with respect to each other and interposed between the webs of the rails and the sides of the chair whereby pressure is exerted by the keys between the webs of the rails and the sides of the chair, one of said keys having its upper edge provided with a wing adapted to engage one end of one side of the chair.

**Brake**, 896,649; William C. Marsh, Dunkirk, N. Y. App. filed Jan. 16, 1908. Means are provided for transmitting power from the axle of the car to one member of a friction brake setting mechanism.

It is announced that the next meeting of the New York Railroad Club will be held at the building of the United Engineering Societies, No. 29 West Thirty-ninth Street, on Friday evening, Sept. 18, at 8 o'clock. The nominating committee will report nominations for officers for the next fiscal year. Raffe Emerson, of Topeka, Kan., assistant engineer of methods of the Atchison, Topeka & Santa Fe Railroad, will present a paper on "Better Service at Reduced Cost." It is also announced that members wishing bound volumes of the club proceedings can obtain same from the secretary at \$2 per volume. As this is the first fall meeting a large attendance is expected.



## TABLE OF MONTHLY EARNINGS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement, "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. \* Including taxes. † Deficit.

COMPANY	Period	Gross Income	Operating Expenses	Gross Income Less Operating Expenses	Deductions From Income	Net Income	COMPANY	Period	Gross Income	Operating Expenses	Gross Income Less Operating Expenses	Deductions From Income	Net Income
AKRON, O. Northern Ohio Tr. & Light Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	200,392 209,040 1,038,136 1,058,297	105,377 110,149 623,034 623,554	95,015 98,891 415,101 434,743	44,052 43,624 305,215 296,359	50,963 55,267 109,887 138,384	LITTLE ROCK, ARK. Little Rock Ry. & Elec. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	53,560 55,812 384,293 355,128	*30,095 *28,973 *198,717 *189,235	23,465 26,839 185,576 165,893	10,874 8,370 68,875 58,701	12,590 18,468 116,701 107,192
BELLINGHAM, WASH., Whatcom Co. Ry. & Lt. Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	27,129 27,362 363,288 318,131	16,862 15,941 204,893 181,316	9,267 11,421 158,395 133,816	7,970 7,490 93,030 74,198	1,297 3,932 65,366 59,618	MEMPHIS, TENN. Memphis St. Ry. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	140,461 148,613 913,529 913,257	*89,018 *89,240 *583,419 *569,199	51,442 59,373 332,109 344,058	35,463 34,447 243,903 232,611	15,978 24,926 88,205 111,447
CHAMPAIGN, ILL. Illinois Traction Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	342,273 329,601 2,255,790 2,035,918	*191,280 *183,318 *1,329,873 *1,158,200	150,993 146,283 925,917 877,718	..... ..... ..... .....	..... ..... ..... .....	MILWAUKEE, WIS. Milwaukee Elec. Ry. & Lt. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	336,889 337,649 2,227,308 2,199,576	160,883 166,125 1,165,648 1,102,428	176,005 171,524 1,061,660 1,097,148	99,989 103,158 691,706 671,851	76,016 68,366 369,954 425,297
CHARLESTON, S. C. Charleston Con. Ry. Gas & Elec. Co.	1m., July '08 1 " " '07 5 " " '08 5 " " '07	68,988 67,298 323,169 302,942	41,012 38,619 202,759 185,667	27,976 28,679 120,410 117,274	14,899 14,718 78,026 74,121	13,077 13,961 45,384 43,103	Milwaukee Lt., Ht. & Tr. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	145,759 142,179 778,989 531,715	34,237 35,488 210,606 194,199	111,521 106,692 568,383 337,516	64,888 60,020 410,842 269,942	47,133 46,672 157,901 67,575
CHICAGO, ILL. Aurora, Elgin & Chicago Ry. Co.	1m., July '08 1 " " '07	148,748 152,252	72,208 74,909	76,540 77,344	27,778 27,508	48,762 49,835	MINNEAPOLIS, MINN. Twin City R. T. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	606,374 571,986 3,589,223 3,420,600	278,139 271,236 1,813,729 1,668,378	328,234 300,749 1,775,494 1,752,221	128,361 115,142 877,789 806,458	199,874 185,607 897,705 945,763
Lake Shore Electric Railway Company	1m., June '08 1 " " '07 6 " " '08 6 " " '07	78,828 83,554 922,914 892,294	*43,644 *44,953 *514,670 *489,740	35,183 38,601 408,244 402,554	25,893 24,467 305,785 274,188	9,291 14,133 102,438 128,366	MONTREAL, CAN. Montreal St. Ry.	1m., July '08 1 " " '07 10 " " '08 10 " " '07	326,524 339,756 2,999,288 2,834,644	162,414 175,947 1,814,428 1,761,515	164,110 163,810 1,184,859 1,073,099	65,013 67,733 515,889 457,347	99,098 96,077 668,971 615,752
DALLAS, TEX. Dallas Elec. Corp'n.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	88,501 91,926 1,136,980 1,062,056	71,654 61,383 761,252 730,674	16,846 30,543 375,727 331,382	26,098 22,862 309,160 248,143	9,251 7,681 66,567 83,239	NASHVILLE, TENN. Nashville Ry. & Lt. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	127,937 129,577 887,987 870,078	*78,216 *78,362 *542,400 *524,281	49,721 51,215 345,587 345,797	33,101 30,468 221,162 201,716	16,620 20,746 124,426 144,081
DETROIT, MICH. Detroit United Ry. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	685,908 707,137 3,999,947 4,022,248	*417,869 *413,312 *2,528,176 *2,518,552	268,039 293,825 1,471,770 1,503,695	135,978 132,021 948,952 901,999	132,061 161,803 522,818 602,595	PENSACOLA, FLA. Pensacola Elec. Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	19,020 19,850 216,361 197,180	14,020 11,468 152,928 123,872	5,000 8,382 63,433 73,308	4,315 3,768 50,340 40,197	685 4,615 13,093 33,112
DULUTH, MINN. Duluth St. Ry. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	81,425 83,921 491,806 470,042	44,386 36,073 306,765 237,126	37,039 47,847 185,042 232,916	18,417 17,991 128,917 123,922	18,623 29,857 56,125 108,993	PLYMOUTH, MASS. Brockton & Plymouth St. Ry. Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	12,152 12,360 122,041 116,420	8,915 8,017 90,218 70,281	3,238 4,343 31,822 46,139	2,264 2,239 27,585 26,393	973 2,104 4,237 19,747
E. ST. LOUIS, ILL. East St. Louis & Suburban Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	165,451 186,171 1,143,447 1,189,576	87,622 97,936 602,974 645,060	78,828 88,235 540,474 544,516	..... ..... ..... .....	..... ..... ..... .....	ST. LOUIS, MO. United Railways Co of St. Louis	1m., July '08 1 " " '07 7 " " '08 7 " " '07	898,210 941,878 6,061,765 6,229,490	*578,528 *573,936 *3,946,025 *4,099,972	319,682 367,942 2,115,740 2,129,518	232,852 232,510 1,628,400 1,618,820	86,830 135,432 487,340 510,698
EL PASO, TEX. El Paso Cos.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	41,995 41,030 533,492 444,507	30,397 29,268 376,413 331,292	11,599 11,762 157,179 113,214	7,415 5,948 79,117 61,104	4,184 5,815 77,961 52,110	SAVANNAH, GA. Savannah Electric Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	50,006 51,836 601,157 590,843	30,498 31,399 406,137 461,130	19,508 20,437 194,840 229,713	15,656 13,948 183,895 162,890	3,852 6,489 10,945 66,823
FT. WAYNE, IND. Ft. Wayne & Wabash Valley Tr. Co.	1m., June '08 1 " " '07 6 " " '08 6 " " '07	110,035 107,307 615,201 569,278	65,442 64,238 360,594 348,995	44,592 43,070 254,607 220,283	..... ..... ..... .....	..... ..... ..... .....	SCHENECTADY, N. Y. Schenectady Ry. Co.	3m., June '08 3 " " '07 6 " " '08 6 " " '07	221,026 270,041 415,240 502,030	158,559 174,755 311,941 357,249	62,467 95,286 103,299 144,781	30,883 32,450 60,139 62,331	31,584 62,836 43,160 28,450
FORT WORTH, TEX. Northern Texas Elec. Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	90,550 92,588 1,061,577 967,105	66,051 51,183 611,496 582,560	24,499 41,405 450,082 384,545	19,191 13,124 174,986 146,986	5,308 28,281 275,095 237,559	SEATTLE, WASH. Seattle Elec. Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	358,207 339,510 4,384,439 3,667,111	202,875 202,511 2,594,122 2,084,892	155,332 137,000 1,790,316 1,582,220	86,351 70,214 929,287 702,905	68,981 66,785 861,029 879,315
GALVESTON, TEX. Galveston-Houston Elec. Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	92,442 95,597 1,069,016 980,501	53,235 55,366 625,598 584,215	39,207 40,231 443,418 396,286	18,400 15,886 206,672 180,975	20,807 24,345 236,746 215,311	SYRACUSE, N. Y. Syracuse R. T. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	110,727 112,563 759,702 706,683	63,120 63,300 437,888 400,776	47,607 49,263 301,814 305,907	29,410 26,483 202,106 177,522	18,197 22,780 99,708 128,385
HOUGHTON, MICH. Houghton County St. Ry. Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	23,343 22,438 257,067 243,320	12,781 11,313 147,937 142,666	10,561 11,125 109,130 100,654	4,624 4,695 57,288 55,622	5,938 6,430 51,842 45,031	TACOMA, WASH. Puget Sound Elec. Ry. Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	141,645 147,200 1,687,657 1,520,908	87,141 83,232 1,060,995 935,962	54,505 63,968 626,662 584,947	38,526 33,818 450,590 360,039	15,978 30,150 176,072 224,907
JACKSONVILLE, FLA. Jacksonville Elec. Co.	1m., June '08 1 " " '07 12 " " '08 12 " " '07	35,882 34,162 410,628 366,765	23,876 18,855 250,784 210,629	12,005 15,307 159,844 156,137	8,295 6,094 92,554 63,515	3,710 9,213 67,290 92,622	TAMPA, FLA. Tampa Elec. Co.	1m., June '08 1 " " '07 6 " " '08 6 " " '07	45,070 41,152 271,957 253,362	31,839 34,810 188,184 188,826	13,231 6,342 83,773 64,536	2,571 1,285 10,246 7,865	10,660 5,057 73,527 56,671
LEXINGTON, KY. Lexington & Interurban Rys. Co.	1m., June '08 1 " " '07 6 " " '08 6 " " '07	54,983 45,475 280,324 249,696	33,375 30,964 187,833 169,529	21,609 14,511 92,491 80,167	..... ..... ..... .....	..... ..... ..... .....	TOLEDO, O. Toledo Rys. & Lt. Co.	1m., July '08 1 " " '07 7 " " '08 7 " " '07	213,989 199,328 1,465,068 1,432,487	120,122 111,665 854,174 794,054	93,868 87,663 610,894 638,433	67,433 71,751 447,575 491,888	26,435 15,912 163,319 146,545