Electric Railway Journal

A CONSOLIDATION OF

Street Railway Journal and Electric Railway Review

VOL. XXXVI. NEW YORK, SATURDAY, JULY 2, 1910 No. 1

PUBLISHED WEEKLY BY THE

McGraw Publishing Company

239 WEST THIRTY-NINTH STREET, NEW YORK

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TERMS OF SUBSCRIPTION:

For 52 weekly issues, and daily convention issues published from time to time in New York City or elsewhere: United States, Cuba and Mexico, $3.00 per year; Canada, $4.50 per year; all other countries, $6.00 per year. Single copies, 10 cents. Foreign subscriptions may be sent to our European office.

Requests for changes of address should be made one week in advance, giving *old* as well as new address. Date on wrapper indicates the month at the end of which subscription expires.

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to Tuesday noon of the week of issue.

Entered as second-class matter at the post office at New York, N. Y.

Of this issue of the ELECTRIC RAILWAY JOURNAL, 8500 *copies are printed.*

NEW YORK, SATURDAY, JULY 2, 1910.

CONTENTS.

The Increase in Commutation Fares Near New York

The increase in commutation fares, announced by practically all of the steam railroads entering New York, has aroused comparatively little opposition from patrons. Several "indignation" meetings have been held in Connecticut and a few in New Jersey, but they seem to have been engineered more for political effect than for any other purpose. The opportunity of championing the cause of the public was too good to be allowed to lapse entirely. Complaints were far more generally expressed on one of the lines whose service broke down during a severe winter several years ago than on the same road now in anticipation of the increase in rates. People generally recognize the fact that all the expenses of the railroad companies have increased. Advances in the wages paid employees have received publicity in the daily papers and the fact that materials of every kind have increased in cost is part of the personal knowledge and experience of every patron of the railroads. In an editorial commenting on the situation recently, the *New York World* referred to the steam railroads as being the only public utility in the vicinity of New York which had found it necessary to increase rates. A more correct statement would have been that it was the only public utility which had done so. But the need is equally great, if not greater, with the electric roads and we believe that if any practicable method should be devised to increase moderately the present rates of fares on city roads, the action would be accepted with much less opposition than many anticipate.

Fixed Wages for Men on the Extra List.

Two methods for paying trainmen on the extra list are in vogue. One is to pay extra conductors and motormen only for the time they are actually in service; the other is to give them a fixed minimum daily or weekly wage in accordance with the principle that "He also serves who only stands and waits." On first thought, it might appear that while the latter practice is more just to the men, the former has the merit of being less costly. This is not necessarily true in all cases. Several large city companies which have tried both methods have found that the average wages of the extras are no greater in one case than in the other. One railway company in the East pays each of its intermittent platform employees $10.50 a week, without regard to the time they work. Another has fixed a minimum rate of $1.50 a day for any period up to six hours with pay at the regular hourly rates for all work exceeding six hours. The benefit of this policy has made itself felt, not so much in a reduction of the payroll, as in the greater reliability of the extra men. The best recruits are among the first to desert if they find that they have no assurance of a living wage while waiting for a regular position. It is only natural, therefore, that they should look for steady work somewhere else. Transportation superintendents

who know how much it costs to break in platform men will appreciate that the fixed payment policy is worth trying from this standpoint alone, even if it should result in a slightly bigger payroll.

Changing the Running Speeds for Different Periods of the Day

Judging from talks with traffic managers and schedule makers, it seems that many of them do not give enough thought to the economics which are possible by changing the running speeds at certain intervals throughout the day. It goes without saying that during business hours, the car schedule speed is limited by slow-downs and blockades resulting from vehicular traffic. However, this hindrance practically is eliminated at night. For this reason, a car well-loaded with a crowd coming from the theaters can be operated and its patrons distributed over a given route in much better time than otherwise, even if the total number of passenger stops is the same as during the day. The late rider is especially appreciative of high speed during the wee, sma' hours. From the standpoint of the railway company, a raising of the schedule speed by say 10 per cent to 20 per cent means a corresponding reduction in night equipment and crews. This consideration appears too obvious for comment. Nevertheless, it is a fact that there are plenty of places where an inflexible time card needlessly is in force throughout the day and night. On such lines, one may frequently see the motormen amuse themselves by running ahead of their schedules and then crawling for a stretch merely to kill time. No particular complications are involved in the operation of a variable schedule system. On one large railway, for example, each route is divided into time-point sections and the individual motormen simply are instructed that after a given hour and minute they must raise their average speed to get over the given divisions in certain stated periods of time.

Instructing the Jury in Accident Cases

The use of models of electric railway equipment in the court room is often helpful to a company in a closely contested accident case. Out of this method of handling complex situations involving considerable sums of money has grown the plan of bringing into court the actual parts of the car equipment which are involved in the dispute between the plaintiff and the defendant. This practice has, of course, been followed for hundreds of years in criminal cases, but its adaptability to electric railway damage suits is of comparatively recent origin. In a recent case where a large number of passengers brought suit in connection with the derailment of a double-truck car on account of a broken axle the company took the truck parts most intimately concerned into the court room and thus the jury was enabled to study the situation at first hand, with the benefit of thorough non-technical discussion of the conditions by expert metallurgical engineers summoned by the company as witnesses. The company contended that the accident was unavoidable and of the kind which could not be foreseen, and while the experts for the plaintiffs had the opportunity to examine the broken parts at length, the weight of evidence supported the company's position. The trouble and expense to which the company went in carrying a set of wheels, axle, and gearing into the court room, showed the jury that it had nothing to conceal, and enabled the jurymen to grasp the conditions under discussion far more easily than would have been possible by the use of photographs and drawings alone. A similar course in connection with controller flashing suits, circuit breaker accidents, and the like, has given good results in the conduct of damage cases. The company always has to meet severe conditions of inquiry in cases where the causes of the accident are at all obscure, and when it is possible to bring the whole matter within a few feet or inches of the jury, the opportunities for proper instruction are greatly enhanced and a doubtful case often can be won.

THE UNIVERSITY AND BUSINESS

This is the month of college commencements, as well as of the annual meetings of engineering organizations, which are as truly national universities devoted to higher branches of technical education and study as the undergraduate institutions are of the lower branches. It is interesting and instructive therefore to notice that the relations between the university and the extension of university work as represented both in engineering and industrial lines are growing closer yearly. This is as it should be, because if a university is most fully to live up to its opportunities—we might almost say to its real purposes of being—it should grow with the community which it is aiming to serve. To do this, it should direct its energies so as best to fit its students after graduation to solve those problems which the outside world most needs to have answered and should be so closely in touch with these outside events as to modify its curriculum of undergraduate instruction from time to time so as to accomplish this most desirable result.

Two incidents during the latter part of the past month exemplify the closer connection between the college and business, the scholar and the man of affairs, to which we have been referring. One was the inauguration as president of the American Institute of Electrical Engineers of the professor of electrical engineering at one of our leading technical schools. The other was the award to James J. Hill by Yale University of the degree of LL.D. We do not mean that either incident was without precedent. Other professors have filled the same office as that to which Prof. Jackson was elected, but none perhaps had devoted his activities to so great an extent purely to the purposes of education. In a similar way, the degree to Mr. Hill was not the first of its kind at Yale. Indeed, in his case, the incident was noteworthy, not because it was unusual, but because it followed similar bestowals of the same degree during the last few years to Mr. Mellen and Mr. Morgan, in both cases for distinguished achievements in railroad organization. The repetition this year indicates that the policy of the university is to include among those to whom its highest honors are awarded the creators of industries as well as those who have distinguished themselves in scholarship or have achieved success in political life. We do not propose to draw comparisons between the intellectual effort required in these different kinds of human endeavor or between the benefits conferrd by them upon humanity. But if college honors are to retain the respect which is and should be held for them, they will recognize genius equally whether directed toward the design of machinery, which adds materially to a nation's comfort, to the creation of a railway system or an industry which increases its wealth, or to the production of treatises which widen its knowledge.

CONSERVATION OF WATER POWERS

It is a striking evidence of the interest now felt in the policy of conservation of water powers pursued by the Government that the subject should have been made by Mr. Stillwell the topic of his presidential address at the annual convention of the American Institute of Electrical Engineers. Foresighted engineers have long realized the important part which water powers will play in the generation of power in the future, as the supply of coal decreases and its cost increases. A very large proportion of water powers which have not yet been utilized are, however, either located upon government lands or are dependent wholly or in part upon the run-off from government lands; therefore the policy adopted by the government in permitting utilization of these powers is of practically controlling force so far as future hydroelectric development in this country is concerned.

While Mr. Stillwell believes that the presence of forest cover on a watershed regulates the rate of run-off to an extent which, in many cases materially affects the value of a water power, he dissents from the theory enunciated by the late chief forester that forests are the principal and determining factor in the valve of such a plant. It was upon this latter assumption that the present rates charged for water power rights on streams dependent upon government forest reserves were established. These rates are based on the kilowatt-hour. They vary with the proportion of the water supply which comes from reserved and unreserved lands, but the maximum is 2 cents per 1000 kw-hours for the first year, increasing to 32½ cents for the fiftieth, that is, the last year of the permit issued by the government.

To this rate Mr. Stillwell files exception, not because it is excessive for a fully developed enterprise, but because it penalizes the builders of efficient plants and the owner who sells his power at a low rate, because it makes no allowance, like the corresponding Italian law, for long distance transmission losses, and because it is imposed regardless of the actual condition of the forestation upon which it is based. He also charges the form of permit with being unnecessarily rigorous, in that it prevents the owner of one water-power plant combining with others, often a step toward general economy; because it requires continuous operation up to a specified percentage of the full hydraulic capacity of the works, and because the permit is revokable at the discretion of the government. A better plan, according to Mr. Stillwell, providing a tax upon natural resources to be used in conserving and developing these resources is desirable, would be to impose a tax on all sources of power found upon public lands such as coal lands, which are now sold by the government at the equivalent of a tax of 0.5 cent per thousand kw-hours, instead of for an average rental of 20.86 cents per thousand kw-hours as in the case of water power; the income thus derived to be devoted to conservation purposes as with water power rentals. Mr. Stillwell also believes that the charge for water-power should be based upon the power appropriated and the effective head resulting from the topography of the government lands concerned or that, as commercial conditions of cost and development differ so widely, that the government lease different powers to the highest bidders.

The relation between electric railway operation and water-power service can no longer be considered remote. To cite a single instance, although the most conspicuous one, Niagara power is now operating electric lines 150 miles from the Falls, and with the development of appliances and insulators which are capable of use on voltages up to 100,000 or more, New York may be said to be almost as near Niagara electrically as was Buffalo 15 years ago. Mr. Stillwell took a most prominent part in the development of Niagara power and it is extremely appropriate that he should now utter a word of caution as to the policy to be adopted by the government as to future hydroelectric development.

REVISION OF THE INTERURBAN RULES

It is surprising probably to many interurban railway operating officers to learn that the committee on interurban rules of the Transportation and Traffic Association has decided to recommend in its report this year radical changes in the code of rules adopted at the Denver convention in order to make them conform almost exactly in numbering and wording with the American Railway Association code of steam railway rules. The 1909 code of interurban rules included the wording or intent of many of the steam railway rules, but at the time of its adoption there was a decided difference of opinion among members of the association and the vote was not unanimous. Representatives of a number of interurban electric railways which operate with the steam railway rules strongly urged the adoption of those rules as a whole instead of the modified rules recommended by the committee. Their arguments and those which have been presented at a number of recent meetings of sectional associations where the subject of interurban rules has been discussed seem to have brought the members of this year's committee around to the same point of view. The revised interurban code as approved by the committee will be as nearly like the standard steam railway code as most of the amplified codes in use by individual steam railway companies.

The committee had two questions to consider. Can the steam railway code of rules be adapted for electric railway operation with a few slight modifications? Is it the best code which can be prepared? The experience of several interurban roads which are using the steam railway code practically without alteration is a good answer in the affirmative to the first question. Argument will develop on the second question. Judging from replies received to a circular letter sent out by the committee about half of the roads heard from consider the steam railway rules preferable to last year's code of interurban rules.

The steam rules have much to commend in them. They are concise, practical and safe to use and have stood the test of time under every conceivable condition of steam railway operation. They are thoroughly familiar to a large body of experienced steam railway trainmen and officers and many of these men are being recruited into electric interurban service. The 1909 interurban code was faulty in some respects and doubtless could have been improved upon with careful study. The committee in abandoning many of the rules which it formulated last year and confining its efforts to adapting the well-tried steam rules to electric railway conditions has taken a radical step which no doubt will meet with strong opposition from many managers who are satisfied with the interurban rules as they stand. At any rate, we believe that the proposed revision has not been made merely to satisfy the wishes of a few companies which have argued strongly in favor of the steam rules. There has been no sectional or partisan influence exerted by the individual members of the com-

mittee during the discussions. In considering the comparative merits of proposed rules each member has tried not to let his decision be swayed by the operating conditions of his own road, but has drawn upon his general knowledge of operating methods throughout the country.

The revised code will be simple in wording and so should meet the criticism made of the 1909 code at the meeting of the Iowa Street and Interurban Railway Association that it was so voluminous and full of detailed explanations and instructions as almost to imply an insult to the intelligence of the average trainman. These explanations and instructions frequently are necessary, but the bulletin board affords a suitable place for posting them and if conditions arise which require changes in the rules or putting into effect special rules the standard rule book need not be revised.

On a number of important principles of practice the committee has not been able to agree as to the best method. In such cases optional rules have been framed and will be included in the code as such. Rule 207c, for example, does not permit a train to proceed when it arrives at a meeting point and finds that the opposing train has not arrived and that communication cannot be established with the dispatches. An optional rule, 207c, provides that the train may proceed if protected by flag. Here are two methods of procedure directly opposed to each other in principle. One or the other is best practice and the rules should outline only best practice. It is perfectly proper for the committee to present both rules to the association for consideration, but only that rule which in the opinion of the majority represents best practice should be allowed to appear in the code as finally adopted and issued as the standard of the association.

The interest with which the present situation concerning the interurban code is followed is indicated by the proceedings this week at the meeting of the Street Railway Association of the State of New York. Before it was known that the Transportation & Traffic Association committee would recommend important changes at the next Atlantic City meeting, notice had been served that the New York association would be asked to approve the Denver code. It appears that the adoption of the Denver code by the New York association after the discussion, of which an abstract is given in another part of this issue, is due to a desire to support the American Association in its endeavor to compile a code that shall best meet the requirements of the industry and that if that code shall be changed further so as to represent later judgment of the majority than that of 1909, the subject will be brought again before the New York organization. The New York Association has followed with approval the last recorded action of the American Association on this topic and if, at this time or later, the associations of other States or sections will adopt a similar course concerning the rules as amended in 1910, a definite step toward uniformity of practice will have been taken.

Copies of the report of the committee this year will be in the hands of all members of the association five or six weeks before the convention, and the rules should be carefully studied in advance of the meeting. Such an important question ought not to be disposed of by a vote of only those members who may be able to attend the meeting at which the report is presented. Every member company is affected and upon each company rests a moral obligation to assist in the work of standardizing the rules by putting them into use. Each company, therefore, should have the right to cast a vote or at least to express an opinion for or against their adoption as the standard of the association. A letter ballot after the convention may not be possible under the constitution of the association, but in its place it might bring out an expression of opinion if each company received with the advance copy of the committee's report an urgent request from the executive committee of the association to send in a letter of approval or criticism if no representative can attend the convention and vote in person. It would be most unfortunate if the code as revised this year should be subjected to the same amount of adverse criticism after the convention has adjourned as was the case last year.

A STANDARD SYSTEM OF ELECTRIC TRACTION

The presidential address of George Westinghouse to be read next month at the joint meeting of the American Society of Mechanical Engineers and the British Institute of Mechanical Engineers in London is an unbiased and non-partisan plea for the immediate selection of a standard system of electric traction for universal use by all steam railways which in the future may convert their lines for electric operation. Enormous sums of money have already been invested in the electric equipment of a few terminal zones and, as Mr. Westinghouse points out, the future development of heavy electric traction will be the expansion of these terminal zones until they reach out and touch each other. When that time comes, if there is such a diversity of electric equipment that it will be impossible for the motor cars or locomotives of one road to run over the tracks of a connecting road, interchange of traffic as it is carried on to-day will be difficult, if not impossible. The steam railroads would long since have been in bankruptcy or have been compelled to increase their rates enormously if interchange arrangements had not been perfected many years ago. The financial burdens under which some of the weaker steam roads are staggering at the present are due in no small measure to the expenditures required to change their track and equipment years ago to conform to the standard gage of 4 ft. 8½ in.

All of the steam railroad equipment operated in the United States is fitted with interchangeable types of car couplings and uniformly operative brake apparatus. For electrically operated railways Mr. Westinghouse mentions three additional requirements of interchange. These are a uniform supply of electricity, a uniform type and location of conductors for supplying electricity to the motors, and uniform control apparatus for multiple-unit trains. There is at the present time a wide diversity of practice on existing electrified steam roads in all three of these particulars.

It might appear that a consideration of this subject at the present time was borrowing trouble because of the comparatively few installations which already have been made. Nevertheless, within the last two years there have been two striking instances of the influence which the necessity for interchangeability has had in determining the selection of a system of electric traction. In the case of the Pennsylvania tunnels in New York City, while there were perhaps other reasons for the adoption of 600-volt direct current, the principal reason was the necessity for accommodating the suburban trains operating in the Long Island Railroad electric zone which had already

been equipped with this system. Had any other system been selected the only alternatives would have been to have segregated the trackage over which the Long Island trains could enter the terminal or to replace the entire electric equipment of the Long Island Railroad. The decision of the Illinois Central Railroad to defer electrification of its terminal zone in Chicago was based largely on the difficulties which might be encountered in future interchange of traffic if the other railroads entering Chicago should adopt some other system different from that which the Illinois Central might install.

There are at the present time four systems in use in the United States and only two are interchangeable with any of the others. The 1200-volt, direct-current system can be operated in connection with a 600-volt, direct-current system and a single-phase system can be operated in connection with a 600-volt, direct-current system, but expensive complications of apparatus are involved in either case. Mr. Westinghouse says that the great difficulty in the electrification of steam railways is no longer an engineering problem, but is a broad question of financial and general policy. It is true that the engineering details of each of the four systems referred to have been perfected to a high degree, but unfortunately it is also true that the foremost electrical engineers are not agreed among themselves as to which system possesses the greatest advantages for universal application. Until the engineers reach an understanding on this point it will not be possible to develop the broader financial and general policies involved.

HANDLING SHOPWORK ECONOMICALLY IN CROWDED QUARTERS

The difficulties of economical maintenance of rolling stock are seriously increased by very limited shop capacity. The problem of making the most of restricted quarters is one which many master mechanics have been obliged to face, for it is seldom feasible to establish a new shop until the inconvenience of the old installation has made itself felt for a considerable period. Much can be done to improve old shops, however, by re-arranging machinery so as to avoid as far as possible interference with the main aisles of travel, by installing direct-connected motors in place of belt and shaft drives on various high-powered tools which may be in use a considerable portion of the time and by re-locating in some instances the stock room and quarters of the head of the department.

In the railway repair shop the sequence of operations found in ordinary manufacturing plants is conspicuous by its absence. While certain repair and maintenance work like the lining of bearings, straightening of shafts, winding of armature and fields into stock forms, undercutting of commutators, smoothing commutator surfaces, wheel grinding and trolley wheel turning is repetitive in character there are numerous other tasks in the shop which are seldom done precisely alike twice, and cannot be foreseen by either the operating or maintenance department in relation to any specific day or hour. Such work requires for its execution space which is variable in extent, hence is apt to interfere more or less with routine work.

Usually in a crowded shop, materials and supplies tend to accumulate around the machine tools, benches and sometimes the aisles. The working force requisition more material than is immediately necessary from the stock room and store it close by their tools, to save the trouble of more frequent trips through the shop. There is a temptation to load the telpher system close to its full capacity in delivering a set of spare parts to a lathe, drill or grinder, but in crowded quarters this practice leads to obstruction of aisles and spaces between tools and benches, thus hindering the general transit of materials and men through the shop. It is a better plan in a small shop, which is congested with work, to depend more upon the stock room and to avoid the accumulation of sub-storage in the vicinity of the tools. The distances to be traversed in small shops are so short that a clear and systematic arrangement of equipment spacing is preferable to any attempt to save time by assembling too many parts outside the stock room. In this connection a centralized location of the stock room is in general excellent practice; but if it means the sacrifice of machine capacity through restricted space and poor natural lighting it may be a better plan to locate the stock room at or near the end of the main repair division. With a well equipped telpher system and a first-class interior telephone installation, the immediate location of the stock room in a small shop becomes less important.

There is considerable room for improvement in the driving of tools by motors in small, crowded shops, which have long since outgrown the limitations of group driving by a single motor of antiquated design. The saving in power through direct connection must be experienced to be fully appreciated, but more than this is the clearing of the shop from cumbersome hangers, belts and shafting, and the possibility of forcing the output of individual machines according to the character of work under the tool. A valuable feature of the individual drive which has been applied in not a few shops of the long, rambling shape, is the facility with which a large tool handling a single class of service may be isolated from the rest of the equipment and operated in a compartment sufficiently large for the specific service but too small for other machines. The individuality of the different jobs in the repair shop greatly facilitates such an arrangement. Nothing aids production efficiency in a crowded shop more than a separation of tools which tend to limit each other's capacity, combined with adequate facilities for telpher transportation. If it is important to reduce muscular labor to the lowest limit in a spacious shop having a modern arrangement of quarters, it is still more so in the congested repair plant where the limitations of area and often of height, obstruction of belts, pipes and often columns impede rapid preparation of work for machining and intensify all the adverse conditions which surround the worker. Supplies must be kept off the floor in such shops if work is to be handled quickly in the long run. The use of higher powered lighting with modern scientific reflectors pays a high return on its cost in the congested shop. It is often hard to know where to keep supplies in limited quarters, but the construction of a narrow overhead platform or mezzanine floor is far preferable to the use of the pits as a general storehouse. It should not be overlooked that hand work can be performed under less favorable location conditions than machine operations, provided the lighting is adequate. The possibilities of re-arrangement are generally much wider in scope than often appears evident to the man whose horizon is limited by constant association with quarters and facilities which have gradually fallen below the standards of efficient production which would be demanded in a new installation of the same area.

REGULATION OF TRANSPORTATION SERVICE BY THE METROPOLITAN STREET RAILWAY, NEW YORK

In the first article on the transportation department of the Metropolitan Street Railway, New York, published in last week's issue, information was given principally with reference to the organization of this department, its emergency service and to the employment, instruction and comfort of the employees. The present article concludes the entire series on this company* with a description of the transportation service.

REGULATION OF SERVICE

It is only within recent years that the extent to which the finances of a company may be affected, both negatively and positively, by the operation of the transportation department, has been fully appreciated, and that the affairs of such a department, even more than any other department of a street railway company, must be subjected to keen scrutiny in every detail of income and outgo, in order that the net income item of the annual balance sheet may be satisfactory to the owners of the property. In addition to the net income derived from the operation of the property two other factors have also to be considered in the preparation of schedules, namely: the necessity of arranging the runs so that each man will receive a reasonable amount of work, and the regulations of the Public Service Commission which are peculiar to New York State. On the Metropolitan system a great deal of attention is given to the preparation of the schedules. Observations are made and statistics compiled to indicate the volume of riding at various times of day on each section of every line. The point of heaviest riding on such sections is determined and tallies are taken to indicate the number of cars passing in each direction during each 15 minute interval, their seating capacity, the relation of such capacity to the passenger traffic, and the limits of the sections where the heaviest riding is to be found.

Considerations of economy of operation as well as adequacy of service require, in the case of the avenue lines traversing Manhattan Island in a northerly and southerly direction, that there should be a number of intermediate terminals. For instance, in the case of the Lexington Avenue line the northern terminals are at Ninety-ninth Street and Lexington Avenue, 130th Street and Lexington Avenue and 146th Street and Lenox Avenue. The southern terminals are at Twenty-third Street and Lexington Avenue, Twenty-second Street and Broadway, Houston Street and Broadway, Murray Street and Broadway, Bowling Green and South Ferry. In compiling the schedules, the volume of traffic between these different terminals at different hours of the day has to be taken into account, as well as the physical capacity of the different sections of the line as measured by intersections with other lines, joint routes with other lines and vehicular and pedestrian congestion. A certain amount of short service between intermediate terminals is both necessary and desirable, but a certain amount of surplus or tag-end service is also unavoidable as otherwise cars would be switched back every few blocks. This would cause delays to car movement along the entire line and create undesirable complications far offsetting the advantages accruing from saving in mileage.

SHORT SERVICE

The question of short service is perhaps one of the most important phases of car movement which has been thoroughly investigated since the appointment of the receivers. As a result, a material decrease in operating expenses has been effected without sacrificing the facilities afforded the travelling public, but on the contrary, improving them.

These switch-back points were determined upon after a series of most exhaustive observations, and have, in some instances, not only resulted in the improvement of the facilities on the line where this policy has been followed, but have bettered conditions on other lines. For instance, the operation of cars from Twenty-third Street north on Lexington Avenue at night has not only provided a better service on the northbound Lexington avenue line, but has reduced the congestion on the track between Lexington Avenue and Broadway on Twenty-third Street, used jointly by the Lexington Avenue line and the Twenty-third Street line, where cars are operated on a headway of about 15 seconds during the period of maximum service.

The intermediate service on Fourth and Madison Avenues between Thirty-second Street and Fourth Avenue on the south and Eighty-sixth Street and Madison Avenue, as well as 116th Street and Madison Avenue on the north, has been a distinct improvement over the old method of operation. The short service in the morning on Sixth Avenue, between Fourth Street and Twenty-third Street, a distance of about one mile, has been of great benefit in carrying passengers from the Eighth Street and Fourteenth Street crosstown lines to the stores and factories lying between Fourth Street and Twenty-third Street. There is a very heavy volume of riding in this particular locality.

A better theater service on Broadway has been rendered by operating a short service from Fifteenth Street and Broadway northbound, instead of from a point farther south as heretofore, where there was no demand for such frequency of car movement. On Eighth Avenue the intermediate service between 116th Street and Fiftieth Street has greatly improved the conditions along that section of the line over what was the case when the cars were operated from Thirteenth Street to 158th Street.

It must not be misunderstood that the long service between the terminals farthest separated is discontinued during the period of short service, for such is not the case, but rather the car movement is regulated in accordance with the relative demands of traffic along the entire line which fluctuate with the season, the opening of new transportation lines and other causes.

The failure of the Metropolitan receivers to adopt certain leases and agreements has involved some changes in operated routes, but new service has been inaugurated to afford facilities in place of those necessarily abandoned. For instance, the Broadway and Amsterdam Avenue line provides accommodations to persons who used the line of cars which formerly traversed Broadway from 130th Street to Houston Street.

The analysis of the service as shown by the street observations to which reference has been made above has been supplemented by a detailed study of the riding over entire lines during different periods of the day. This information furnishes from another viewpoint light on the question as to whether the service is being operated economically and efficiently.

The accompanying statement, Table I, illustrates the principle of such an analysis. A careful study of these analyses early in the receivership indicated that during certain periods of the day the service was unnecessarily great, as, for example, on Sunday morning prior to the church riding. Adjustments were accordingly made in the schedules with very satisfactory results.

In connection with the more economical regulation of the service, as mentioned above, there has come about an improvement in the receipts per car-mile for individual lines and for the system, and these figures in general have shown a gratifying and consistent improvement. In other words, this means the elimination of unprofitable mileage, which may be summarized as follows, as nearly as may be estimated:

Monthly saving due to the inauguration of short service, 100,000 car miles.

Monthly saving through a reduction in unprofitable car mileage, i. e., elimination of service not required, 300,000 car miles.

These figures are based on a comparison with conditions prevailing prior to the receivership.

The inauguration of the short service method of operation has rendered it possible to distribute the equipment to much better advantage than was previously practicable in that one car can make several short trips in the time which would be consumed in the making of one long trip.

*See Electric Railway Journal, March 26, April 2, April 9, April 16, April 23, May 7, May 14, May 21, May 28 and June 25, 1910.

CHECKING BY STATISTICS

The third method of checking the service consists in a comparison which is made of the car-seat miles from month to month. This is of value, particularly in cases where cars of more than one type are being operated, as, for instance, long closed, short closed, long open and short open cars. Obviously the car mileage on a given line for a certain period might be precisely the same as for any other period, but the actual service measured in seating capacity might be radically different due to the different types of cars operated.

Not only is the record of revenue car miles closely analyzed, but the idle mileage is subjected to the same scrutiny and its ratio to the active mileage closely observed, the analysis as in the active mileage being made for each operated line of the system and a comparison being made with other periods, such as the previous month and the same month for the previous year. Every effort has been made to reduce to a minimum the amount of idle mileage and cars are housed in those localities which will bring about this result, due consideration being given to all of the factors entering into this situation, such as special track work, interference with the operation of other lines, time table requirements, etc., etc. It is estimated that a close study of this situation has made possible the saving of from 65,000 to 80,000 car miles a year.

A record is also kept of the idle mileage operated in connection with the running of a disabled car off the road, and comparisons with other periods are also drawn for the purpose of closely checking up this phase of operation. For the year ended Dec. 31, 1909, this disabled car mileage was reduced by about 20 per cent from the figure of the previous year. The car mileage reports are so arranged as to show the mileage operated by each of the various types of cars used.

COMPETITION BETWEEN SURFACE, ELEVATED AND SUBWAY LINES

Notwithstanding an impression which has existed to the contrary, there is competition between the surface car lines and the elevated and subway lines, particularly with regard to travel between two given points which may be reached in relatively the same time by either means of transportation. Of course, weather conditions and personal choice enter largely into a decision on the part of the passenger, but the Metropolitan management has been making a constant effort to build up the speed of its lines so far as is consistent with the requirements of safety in order that the service may be as attractive as possible to the travelling public. Tests have been made on different sections of different lines at different times of the day and measures are being adopted to prevent unnecessary loafing or dragging of the road, with consequent impairment of the service. The close relation between the speed of the cars on a given line and the receipts is too manifest to require discussion, particularly when the element of competition enters in to so great an extent as is the case on Manhattan Island. On the other hand, stringent measures are taken to eliminate reckless or careless operation of cars.

AVERAGE SPEED OF CARS

It is of interest to state that the average speed of the electric cars on the Metropolitan System is about 7 1-3 m.p.h., and this average speed is maintained under the congested conditions which prevail practically from one end of a line to the other over the whole system. In this respect the surface lines on Manhattan Island are operated under conditions differing radically from those to be found in any other city in the country. In Chicago, in Boston and even in Brooklyn a very large portion of the routes traversed by the street cars run through territory where there is absolutely no congestion by either vehicles or pedestrians. The congested sections are proportionately small as compared with the whole territory covered by the street car systems in these cities, and in this respect conditions on Manhattan Island present a striking contrast. On such a line as the Eighth Avenue, for instance, from South Ferry to Thirteenth Street there is frequent blocking

TABLE I.—BROADWAY AND COLUMBUS AVENUE DIVISION. ANALYSIS OF MILES OPERATED AND PASSENGERS CARRIED FOR THE 24 HOURS ENDED AT 12.00 MIDNIGHT, TUESDAY, SEPT. 28, 1909; WITH CENTS PER CAR MILE AND PERCENTAGE OF TRANSFER PASSENGERS TO TOTAL PASSENGERS CARRIED. WEATHER CLEAR. TEMPERATURE 58 DEG. CARS IN SERVICE, 161.

Southbound Hour		Cash passgrs.	Transfer passgrs.	Total passgrs.	Per cent transfer to total	Total miles	Dark miles	Receipts	Cents per car mile	Passgrs. per car mile
12.00MN to	1.00AM	266	59	325	.1815	104.86	21.66	13.30	.1268	3
1.00AM	2.00	397	34	431	.0789	103.28	13.54	19.85	.1921	4
2.00	3.00	133	22	155	.1419	68.06	3.74	6.65	.0977	2
3.00	4.00	66	14	80	.1750	64.32	...	3.30	.0513	1
4.00	5.00	94	71	165	.4303	64.32	...	4.70	.0730	3
5.00	6.00	374	377	751	.5020	132.12	...	18.70	.1415	6
6.00	7.00	1087	1368	2455	.5572	376.90	...	54.35	.1442	7
7.00	8.00	2280	2157	4437	.4861	424.21	3.52	114.00	.2687	10
8.00	9.00	3283	1365	4648	.2937	455.33	7.48	164.15	.3605	10
9.00	10.00	3875	1281	5156	.2484	380.28	7.84	193.75	.5095	14
10.00	11.00	5053	1049	6102	.1719	452.61	9.96	252.65	.5582	13
11.00	12.00N	5316	1089	6405	.1700	471.14	5.29	265.80	.5642	14
12.00N	1.00PM	6109	1193	7302	.1634	488.82	6.09	305.45	.6249	15
1.00PM	2.00	5423	1215	6638	.1830	491.29	5.55	271.15	.5519	14
2.00	3.00	5050	1114	6164	.1807	559.47	.43	252.50	.4513	11
3.00	4.00	5137	623	5760	.1082	436.30	1.37	256.85	.5887	1
4.00	5.00	6182	662	6844	.0967	514.74	7.07	309.10	.6005	13
5.00	6.00	4651	619	5270	.1175	479.99	.86	232.55	.4845	11
6.00	7.00	3067	461	3528	.1307	354.71	28.05	153.35	.4323	10
7.00	8.00	5758	763	6521	.1170	523.38	13.33	287.90	.5501	12
8.00	9.00	3883	544	4427	.1229	382.68	6.88	194.15	.5073	12
9.00	10.00	3806	514	4320	.1190	448.88	8.20	190.30	.4239	10
10.00	11.00	3214	362	3576	.1012	402.10	6.96	160.70	.3997	9
11.00	12.00MN	1623	185	1808	.1023	305.83	62.28	81.15	.2653	6
Total		76.127	17.141	93,268	.1838	8485.62	220.10	3806.35	.4486	11
Northbound.										
12.00MN to	1.00AM	836	113	949	.1191	213.53	6.82	41.80	.1958	4
1.00AM	2.00	291	55	346	.1590	81.69	7.31	14.55	.1781	4
2.00	3.00	151	23	174	.1322	68.91	...	7.55	.1096	3
3.00	4.00	71	19	90	.2111	63.21	...	3.55	.0562	1
4.00	5.00	88	26	114	.2281	60.84	...	4.40	.0723	2
5.00	6.00	154	197	351	.5613	101.28	...	7.70	.0760	3
6.00	7.00	569	1243	1812	.6860	172.57	...	28.45	.1649	1
7.00	8.00	1769	4383	6152	.7125	396.78	5.65	88.45	.2229	15
8.00	9.00	2150	1947	4097	.4752	367.88	7.18	107.50	.2922	11
9.00	10.00	3783	1178	4961	.2375	462.02	2.04	189.15	.4094	11
10.00	11.00	4924	1052	5976	.1760	399.45	5.65	246.20	.6163	15
11.00	12.00N	5789	1171	6960	.1682	420.85	6.20	289.45	.6878	17
12.00N	1.00PM	8835	1673	10,508	.1592	557.01	1.28	441.75	.7931	19
1.00PM	2.00	6732	1547	8279	.1869	532.49	5.10	336.60	.6321	16
2.00	3.00	5424	955	6379	.1497	486.46	...	271.20	.5575	13
3.00	4.00	6589	983	7572	.1298	486.22	.51	329.45	.6776	16
4.00	5.00	5273	859	6132	.1401	406.44	...	263.65	.6487	15
5.00	6.00	5262	814	6076	.1340	418.06	...	263.10	.6293	14
6.00	7.00	4132	818	4950	.1652	583.00	1.53	206.60	.3544	8
7.00	8.00	4275	981	5256	.1866	456.95	14.28	213.75	.4678	12
8.00	9.00	4601	789	5390	.1464	402.48	5.61	230.05	.5716	13
9.00	10.00	4360	549	4909	.1118	475.18	.51	218.00	.4588	10
10.00	11.00	2527	394	2921	.1349	429.56	1.02	126.35	.2941	7
11.00	12.00MN	1319	256	1575	.1625	399.87	14.21	65.95	.1649	4
Total		79,904	22,025	101,929	.2161	8442.73	84.90	3995.20	.4732	12

occasioned by the large number of heavy trucks which use the thoroughfares traversed by the Eighth Avenue cars. From Thirteenth Street to Fifty-ninth Street, while the character of the vehicular traffic is different from that south of Thirteenth Street, it is neverthless a source of great congestion. From Fifty-ninth Street to 110th Street, along the western side of Central Park, are to be found pleasure vehicles of all descriptions and of great number, besides the vehicles which use this thoroughfare more than any other in the conveying of goods, merchandise, etc., between lower Manhattan and Harlem. From 110th Street to the terminus at 158th Street the route lies through one of the most congested sections of Harlem, and is furthermore located beneath the elevated railway. The Eighth Avenue line is but an illustration of conditions more or less analogous in character which might be cited with reference to the routes traversed by cars of other Metropolitan lines. In many instances where the numbers of vehicles are relatively small, the swarms of children who utilize the streets for play grounds render the conditions of operation extremely difficult, particularly in the lower section of the Island and along the East Side of the city from the Harlem River to the Battery.

TABLE II.—DELAYS TO ELECTRIC CARS OF FIVE MINUTES OR OVER DUE TO FOLLOWING CLASSIFIED CAUSES, ENTIRE SYSTEM, APRIL, 1910.

	Number of delays	Minutes delayed	Proportion of total delays	Proportion of total minutes	Average length of delays—minutes
Blocking by vehicles	329	3,109	.235	.258	9
Carelessness of transportation dept. employees	123	1,116	.088	.092	9
Miscellaneous car trouble	161	1,255	.115	.104	8
Accidents	181	1,206	.129	.100	7
Plow trouble	87	803	.062	.067	9
Electrical car trouble other than plow trouble	54	388	.039	.032	7
Electrical transmission trouble	40	410	.029	.034	10
Mechanical defects (cars)	90	860	.064	.071	10
Faulty track	133	1,096	.095	.091	8
Fires	39	607	.028	.050	16
Delays caused by outside lines	68	511	.049	.042	8
Miscellaneous trouble	65	470	.047	.039	7
Delays due to outside construction work	14	106	.010	.009	8
Delays due to obstruction in slot	14	132	.010	.011	9
Totals	1,398	12,069	1.000	1.000	9
Delays of five minutes or over, July, 1909, to April, 1910, inclusive.					
Blocking by vehicles	4,045	36,672	.300	.289	9
Carelessness of transportation dept. employees	1,296	13,480	.096	.106	10
Miscellaneous car trouble	1,714	13,063	.127	.103	8
Accidents	1,372	10,759	.102	.085	8
Plow trouble	871	9,603	.065	.076	11
Electric car trouble other than plow trouble	384	2,807	.028	.022	7
Electrical transmission trouble	499	6,395	.037	.050	13
Mechanical defect (cars	781	7,464	.058	.059	10
Faulty track	490	5,234	.036	.041	11
Fires	351	6,943	.026	.055	20
Delays caused by outside lines	695	5,693	.052	.045	8
Miscellaneous trouble	753	6,296	.056	.049	8
Delays due to outside construction work	110	1,106	.008	.009	10
Delays due to obstruction in slot	126	1,390	.009	.011	11
Totals	13,487	126,905	1.000	1.000	9

The two most congested lines are probably Broadway below Fourteenth Street and Canal Street. On lower Broadway the average speed is less than 6 m.p.h. On Canal Street the average speed is even lower, being about 5 m.p.h., but of course the number of cars on this line is much less than on lower Broadway.

CLASSIFICATION OF DELAYS

In this connection it is of interest to note that a classification is made every month of the delays to the operation of the cars and a cumulative statement is prepared giving the same information for a given period to date. In both cases these statements are compared with the previous year, so far as it is practicable to obtain the data for the earlier period from the records which were then taken. Table II indicates this information for the month of April, 1910, and for the 10 months ended April 30, 1910. As will be seen, this statement relates only to delays which are of five minutes' duration or greater.

The efficient work of the traffic squad of the police department is of material assistance in the maintenance of regular and continuous operation, but the physical difficulties due to the narrowness of many of the streets on the lower part of Manhattan Island, taken in connection with the extreme congestion of vehicular and pedestrian traffic, set a certain limitation beyond which no amount of skillful guidance of traffic will increase the volume of traffic movement within a given period. Even north of Fourteenth Street much congestion is encountered, and in this connection the figures in tables III and IV are of interest as showing conditions prevailing at different points.

TABLE III.—TALLY OF TRAFFIC AT THIRTY-FOURTH STREET AND BROADWAY.

Vehicles and pedestrians taken on Nov. 18, 1908, 7 A. M.—7 P. M. Cars taken on Dec. 8, 1908, and Dec. 10, 1908, 7 A. M.—7 P. M.

	Street cars	Vehicles	Pedestrians
North	1,573	3,442	58,525
South	1,611	4,064	57,716
East	708	569	10,348
West	727	693	15,608
Totals	4,619	8,768	142,197

Note: North and south bound traffic includes both Broadway and Sixth Avenue lines. East and west bound traffic, Thirty-fourth Street line only.

The figures in Table IV indicate the conditions prevailing at the above point during the maximum hour as shown by observations taken since the first of the year:

TABLE IV.—TALLY OF TRAFFIC AT THIRTY-FOURTH STREET AND BROADWAY, MAXIMUM HOUR, 6.00 P. M. TO 7.00 P. M., TAKEN ON THREE DAYS IN JANUARY, APRIL AND MAY, 1910.

	Street cars	Vehicles	Pedestrians
North	199	308	3,509
South	123	338	4,636
East	81	33	3,055
West	94	71	
Totals	497	750	11,200

Thirty-fourth Street and Broadway is the heaviest transfer point in the system as transfers are given betwen three lines. The number of passengers who transferred at this location was shown by the result of a single day's tally to be 27,833 persons. This condition, of course, adds materially to the difficulties of rapid operation of cars past this point.

As in other cities the time of the day has a very important influence on the traffic at different localities, but it is doubtful whether any other city in the United States can show any such figures of theater traffic as those given in Table VI. Tables V and VI give the conditions at Forty-second Street and Broadway during a half hour of the rush hour period as compared with the half hour after the theaters have closed at night:

TABLE V.—TALLY OF TRAFFIC AT FORTY-SECOND STREET AND BROADWAY, TAKEN FEB. 5, 1910, BETWEEN 5.15 P. M. AND 5.45 P. M.

	Street cars	Vehicles	Pedestrians
North	52	234	4,614
South	46	155	2,028
East	38	28	3,825
West	39	96	1,363
Totals	175	513	11,830

TABLE VI.—TALLY OF TRAFFIC AT FORTY-SECOND STREET AND BROADWAY, TAKEN FEB. 5, 1910, BETWEEN 11.00 P. M. AND 11.30 P. M.

	Street cars	Vehicles	Pedestrians
North	35	211	3,406
South	30	225	3,683
East	27	38	4,676
West	26	18	1,395
Totals	118	492	13,160

INFLUENCE OF WEATHER ON TRAFFIC

Weather conditions also play their part in increasing or decreasing traffic. The dense crowd of people which walks to and from work south of Forty-second Street is in marked contrast to the number which follows such a course in inclement weather. This is well illustrated by a comparison of the business of four avenue lines and two crosstown lines in Table VII, which gives the traffic on April 6, 1910, when the weather was rainy, and on March 30, 1910, when the weather was fair. They relate only to the rush hour period from 5:00 p. m. to 7:00 p. m., and show how rain increases the travel.

These tables are but instances of many analyses which the transportation department of the Metropolitan Street Railway makes to determine what results will follow the creation of certain conditions and how to cope with them.

During the period of the Hudson-Fulton Celebration last fall, approximately 11,000,000 persons were carried in eight days on the Metropolitan lines without a single fatality. This statement is significant of the efficiency of the service rendered.

ACCIDENTS

For a number of years it has been the experience of the Metropolitan management that the expense of the settlement of injury and damage claims, suits and judgments, has been between 10 per cent and 11 per cent of the annual gross receipts from operation. Throughout the period of the receivership a systematic campaign has been carried on having for its object the reduction of this excessive drain on the finances of the property. The following comparative accident statement is significant in this connection. The figures for the year 1907 are those only, which relate to the lines now under the jurisdiction of the receivers of the Metropolitan system.

	Years ended June 30, 1909	June 30, 1907
Total accidents	14,561	20,553
Car collisions	242	596

This means that during the fiscal year ended June 30, 1909, the total number of accidents was 30 per cent less than on the same lines during the fiscal year ended June 30, 1907, which was the fiscal year immediately preceding the receivership. Car collisions alone, which constitute a more serious type of accident, have been cut down approximately 60 per cent.

The accident prevention campaign has been actively conducted through the co-operation of the legal department and the transportation department. The methods so far as they relate to the education of the employees have already been referred to, but the form in which accident data is assembled is of interest.

ACCIDENT RECORDS

A monthly report is compiled indicating the number of accidents occurring on each line, under approximately 30 different classifications, showing a comparison with the figures for the corresponding period of the previous year.

Another report divides the accidents on each line into three general classifications, namely, personal accidents, collisions between cars and wagons, and collisions between cars, indicating the ratio between the number of accidents of each class, and the number of passengers carried and car miles operated during the month in question, a comparison being made between the ratios of the month under consideration and those applying to the corresponding month of the previous year.

Similar ratios are also compiled with reference to the frequency of cases in which pedestrians are struck by the cars of each line.

Boarding and alighting accidents are made the subject of a special monthly report which shows the total miles operated, and the total number of passengers carried on open cars, closed cars other than prepayment cars, and prepayment cars, on each operated line of the system, the number of accidents in which each type of car was involved and the ratios of passengers carried and miles operated, respectively, to boarding cases and to alighting cases. These figures are tabulated so as to apply to each line and to each type of car.

Data are also compiled to indicate the location and character of the serious accidents which have occurred during the month, for the purpose of determining the frequency with which serious accidents occur in congested districts as compared with sections which are less crowded, and whether there is any relation between the character of the accidents and the character of the location in which they occur.

CLASSIFICATION OF ACCIDENT DATA

For the purpose of determining the relative seriousness of the various accidents under the 30 odd different classifications, a record is kept which indicates the number of accidents under each such classification on each line in the system during each month, the number of such cases upon which payments in the nature of claims, suits or judgments, are made, and the total amounts of such payments. This record is of a cumulative character For instance, a certain number of accidents occurring in June may not be disposed of until some time after that month, but the amount of claims, suits and judgments for each class of accident for each line is debited against the month in which the accident actually occurred without regard to the date of settlement. This information is proving of value as indicating not only the average cost of each character of accident on the whole system, but also because it sets forth the same data with reference to each line and shows to what particular phases of the situation special care should be given.

CLASSIFICATION AS TO APPARATUS

Records are also kept with reference to the efficiency of certain devices. For instance, front fenders are not used on any of the cars of the Metropolitan system, all of which are equipped with automatic wheel guards. Some years ago it became apparent that the conditions on Manhattan Island were such as to render it impracticable to attempt to operate cars with projecting front fenders. It was next to impossible to keep these devices in serviceable condtion, and experience demonstrated that they were a more potent factor in causing accidents than they were in preventing casualties. The Metropolitan has been a pioneer among the street railways of Greater New York in the testing of wheel guards, and during the receivership particular attention has been given to this feature of car equipment.

A very careful analysis is made of the relative efficiency of the different types of wheel guard as measured by the seriousness of the accidents in which they are concerned, and the percentage of cases in which they operate satisfactorily. According to the records which have been compiled the automatic wheel guards now used by the Metropolitan are from 60 per cent to 70 per cent more efficient than was the rigid wheel guard which was formerly used, and it is quite apparent that these improved devices will in a relatively short time pay for themselves, on account of the saving which will thereby be effected in the amount which otherwise would have been paid out in injury and damage claims.

CLASSIFICATION AS TO EMPLOYEES

The personality of the employees concerned in accidents is also made the subject of investigation. The records of two years pertaining to cases as a result of which the injured party died or suffered amputation of a limb, are given in Table VIII.

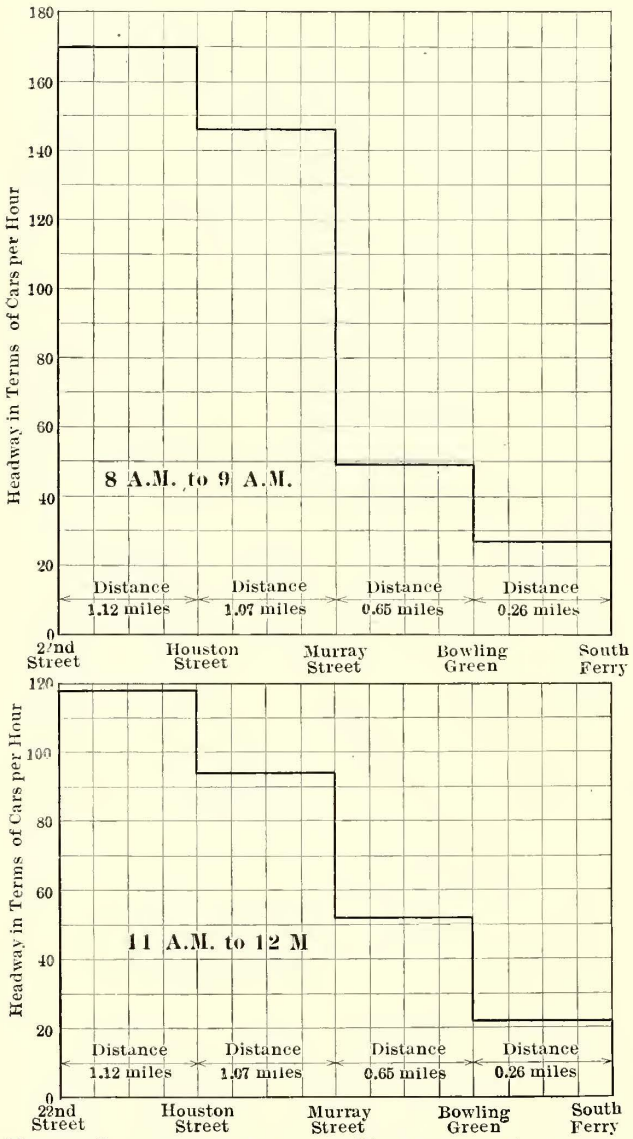
TABLE VII.—SHOWING PERCENTAGE OF INCREASE IN RIDING BETWEEN 5 P. M. AND 7 P. M., ON WEDNESDAY, APRIL 6, 1910—WEATHER RAINY, TEMPERATURE 64 DEG., COMPARED WITH SAME PERIOD ON WEDNESDAY, MARCH 30, 1910—WEATHER FAIR, TEMPERATURE 64 DEG.

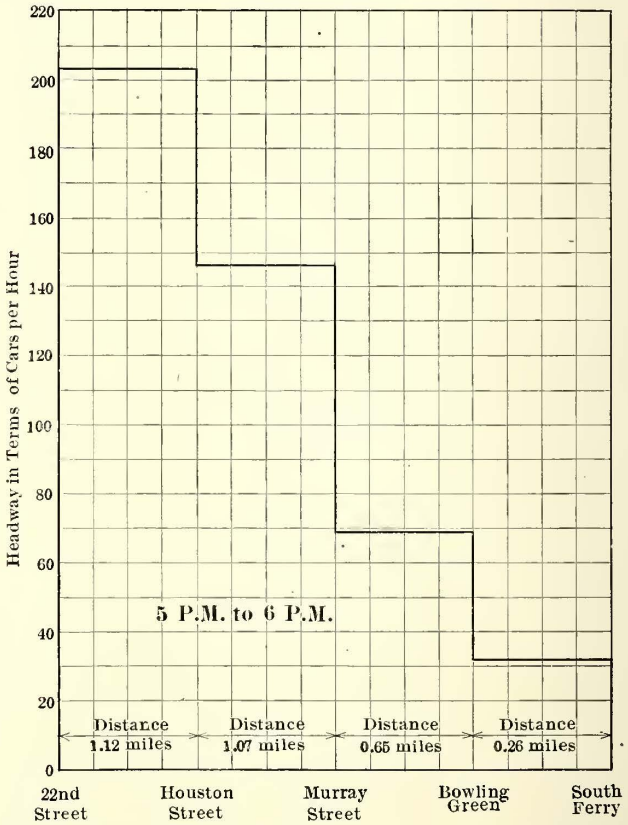
Line	Per cent increase cash pass.	Per cent increase trans. pass.	Per cent increase total pass.	Per cent increase cash pass.	Per cent increase trans. pass.	Per cent increase total pass.	Per cent increase total pass. North and south bound
	South bound	South bound	South bound	North bound	North bound	North bound	
Lexington Avenue	44.57	8.35	34.43	25.88	3.58	17.18	22.97
Fourth and Madison Avenue	33.61	21.35	29.74	25.16	21.45	24.05	26.22
Sixth and Amsterdam Avenues	43.18	41.68	42.90	45.67	17.31	38.16	40.74
Eighth Avenue	33.00	32.56	32.86	11.07	8.67	10.28	18.56
Totals	38.98	24.77	35.10	25.21	11.20	20.58	26.35
Increase south bound over north bound	13.77	13.57	14.52				
	East bound	East bound	East bound	West bound	West bound	West bound	East and west bound
Thirty-Fourth Street Crosstown	28.59	40.81	33.56	58.59	36.67	45.52	38.61
Fourteenth Street Crosstown	43.92	24.69	33.23	40.07	50.99	42.27	35.26
Totals	37.02	29.68	33.36	48.23	39.22	44.25	36.77
Increase west bound over east bound				11.21	9.54	10.89	

TABLE VIII.—PERCENTAGES OF MEN INVOLVED IN SERIOUS ACCIDENTS AND LENGTH OF THEIR EMPLOYMENT.

Period of employment	Percentage of motormen and conductors to total force of motormen and conductors	Percentage of total number of accidents in which men of each class were involved
Less than 1 year	34	49
Less than 2, but more than 1 year.	15	19.2
Less than 3, but more than 2 years	11	9.3
Less than 4, but more than 3 years.	7	2.6
Less than 5, but more than 4 years.	4	.7
Five years and over	29	19.2
	100	100

Table VIII, which for the uses of the company was prepared in considerable detail but which is printed only in summary,





Metropolitan Street Railway— Headway on Various Sections of Broadway, Expressed in Terms of Cars Per Hour

indicates that the new men, who constitute about one-third of the entire force, were concerned in about one-half of the serious accidents, that the second-year men were concerned in slightly more accidents than should have been the case based on the number of men of this class to the total number of employees, and that the men of more than two years' experience, who constitute about one-half of the operating force of motormen and conductors, were concerned in slightly less than one-third of the serious accidents. These figures serve to illustrate forcibly the necessity of carefully training the new men.

As another sidelight on the situation, the serious accidents covering a period of two years, were made the basis of an inquiry regarding the general character of the records of the men therein concerned, both from the standpoint of accident records and general records of the men. This analysis resulted as shown in Table IX.

TABLE IX.—PERCENTAGES OF MEN ENGAGED IN SERIOUS ACCIDENTS AND CHARACTER OF THEIR PREVIOUS RECORD.

Character of record.	Accident records of men involved in serious cases, per cent.	General records of men involved in serious cases, per cent.
Excellent	5.96	3.3
Good	35.76	28.48
Fair	44.37	54.97
Poor	13.91	13.25
	100.00	100.00

These figures are of interest as indicating one of the many points of view from which the accident situation is considered.

TRANSFERS

The interpretation which has been given by the courts to the transfer statute of the State of New York is such as to render the unfair use of the transfer privilege by individuals comparatively easy of accomplishment, and the difficulties in the way of obtaining sufficient evidence to secure convictions are so great that it is impracticable to put a stop to all abuses. Certain dishonest practices, however, have been ferreted out and the guilty parties prosecuted. Notices have been posted in the cars calling the attention of the public to the illegality of the wrongful use of a transfer, and the backs of transfer tickets have also been used to a certain extent for this purpose. Special inspectors have been engaged in obtaining evidence against persons guilty of transfer imposition, and while, unfortunately, the courts have not seen fit to impose penalties commensurate with the gravity of the offense, there has resulted considerable publicity, and apparently there has been a certain amount of reduction in the extent of this illegal practice. All phases of this proposition

TABLE X.—SHOWING PENALTIES IMPOSED FOR TRANSFER FRAUDS ON METROPOLITAN STREET RAILWAY. BETWEEN NOV. 26, 1909, and JUNE 7, 1910.

Penalty	No. of Cases
$1.00	29
2.00	1
3.00	2
5.00	21
10.00	2
One day in prison	1
Sentence suspended	32
Paroled	4
Acquitted	3
Discharged with reprimand	19
Total	114

are being closely followed up by both the transportation department and the legal department.

A statement of the disposition made of cases in which the defendant was charged with the illegal use of transfers is given in Table X.

The statement as shown covers a period of approximately six months. A number of cases are now awaiting final action. In those instances in which the defendants were held for trial by the Court of Special Sessions, the defendant was subjected to the alternative of procuring bail or being imprisoned awaiting trial by the higher court.

PRE-PAYMENT CARS

Upon the whole, the operation of the pre-payment cars on the Metropolitan lines has been satisfactory, broadly speaking, and of such a character as to have justified their introduction in New York. They have been thoroughly successful as far as operation proper is concerned and very satisfactory to the traveling public and to the employees. The air-brake and the enclosed vestibule have greatly assisted in producing this result. From a financial standpoint the results of pre-payment car operation have fallen far short from what was prophesied at the time when these cars were introduced. All phases of pre-payment car operation, including the non-registration of fares, the additional weight of the car, the time consumed in the loading and unloading of passengers are being carefully watched and the present indications are to the effect that the benefit from a revenue and financial standpoint is slight. The situation is still being studied and some time must necessarily elapse before definite conclusions can be reached with reference to the net total result of pre-payment car operation.

Following closely the introduction of the pre-payment car in this country came the production of the fare box. Many types of these boxes have been tested and examined by the Metropolitan management, but in all of them have been found defects of such a nature as to preclude the final adoption of any box for general use. The management, however, is now testing out a fare box which registers the coins received and then allows the money to pass into the possession of the conductor, thereby doing away with the necessity of the conductor carrying a large amount of change beyond which he might be reasonably expected to furnish. This fare box has been quite successful in its operation and in the opinion of the management possesses sufficient merit to warrant its continued use for further test.

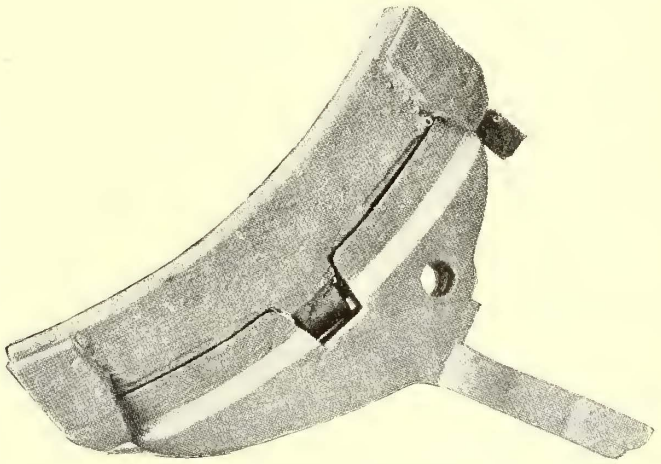
The Metropolitan company has in service approximately 550 pre-payment cars. Of these approximately one-half are cars originally constructed for pre-payment operation; the remainder are standard closed cars which have been converted to adapt them for pre-payment operation. These converted cars have been working satisfactorily up to date, but the period of their use has been too limited as yet to warrant the making of any definite statement regarding the net financial result of the change.

ELECTRIC RAILWAYS OF CANADA

An interesting report on electric railways in Canada for the year ended June 30, 1909, by J. L. Payne, Comptroller of Statistics, has been issued. It gives the total mileage of electric railways in 1909 as 988.97 miles. Confusion that has heretofore prevailed due to the different methods employed by the railways in computing mileage will be removed hereafter by the adoption of a uniform basis. The foregoing mileage is the length of first main track. The length of second main track in 1909 was 215.057 miles, and the length of sidings and turn-outs 83.624 miles. The paid-up capital on June 30, 1909, aggregated $91,604,989, an increase of $4,195,104 over 1908. The gross earnings were $14,824,936, showing a gain of $817,887 over the preceding year. Passenger earnings amounted to $14,080,755, freight earnings to $386,092, and mail and express earnings to $54,185. The net income was $4,716,308, or the equivalent of 5.13 per cent on the electric railway capitalization of $91,604,989. The operating expenses were $8,884,690, and include $246,192 of net loss to certain railways. The operating expenses were equal to about 59.93 per cent of the gross earnings, as against 62.08 per cent the previous year. The electric railways carried 314,026,671 fare passengers, and 81,670,945 transfer passengers. The number of employees in 1909 was 10,557, a gain of 603, and the salaries and wages paid aggregated $6,761,281, or 77.84 per cent of the total operating expenses. The accident statistics show that 68 persons were killed, as against 69 in 1908, and 2139 were injured, an increase of 256. Of those killed, 11 were passengers, 7 were employees and 50 were other persons. Of those injured, 1303 were passengers, 218 were employees and 618 were other persons.

BRAKE SHOE STANDARDIZATION IN ENGLAND

At a recent meeting of the British Tramways & Light Railways Association, J. A. Panton, superintendent rolling stock, Liverpool Overhead Railway, presented a paper on "Brake Shoe Standardization." The author drew attention to the outlay connected with brake shoes which was 10 per cent of the car maintenance. At the present time some 40 per cent to 60 per cent of the material received in the brake-shoes was sent to the scrap-heap only partly worn. The fault usually lay in the length and adjustment of the hangers, and design of brake-shoe used, which did not permit it to be worn out. It would probably surprise many to know that wheels wore more



English Standard Brake Shoe

quickly without brake-shoes than with them. Brake-shoes assisted in preserving the wheel camber. Although effective, cast-iron shoes unfortunately showed two very distinct objections and disadvantages for general use—namely, rapid wearing qualities and lack of strength against breakage. It was these two disadvantages, as experienced in steam railroads, which induced the brake-shoe manufacturers to attempt to produce shoes possessing the advantages of cast-iron shoes without their disadvantages, resulting in the introduction of the various types of shoes which had become so generally known during the past few years. The plan of the accompanying standard brake-head and brake-shoe which the author submitted contemplated keying the contacts at the center lug of the brake-head, while the ends of the brake-head fitted close to the full length and width of the brake-shoe back, the result being a great support to the shoe. The raised recess at each side of the iron lug, in conjunction with the end abutments, was merely to keep the shoe in vertical alignment, and should fit the holder and lug so as to prevent any upward or downward movement of the shoe, the center lug transmitting the load directly to the beam, by virtue of the usual wedge-shaped key. Quite a little unnecessary metal had been removed from the flange and back of the shoe. The proposed standard shoe could safely be worn down to the steel back while the old style shoe had to be removed when only half worn to prevent the wheel flange from wearing out the brake-head.

GEORGE WESTINGHOUSE ON RAILWAY ELECTRIFICATION

In an address which George Westinghouse, president of the American Society of Mechanical Engineers, will deliver at the joint meeting of that society with the British Institute of Mechanical Engineers in London on July 26, he presents some strong arguments for the immediate standardization of such details of electric railway apparatus as will affect future interchange of equipment. The tendency at the present time seems to be toward diversity, rather than standardization. Unless a selection of some standard system is made soon the extension of the existing diversified systems will continue so far as to forever prevent general interchange. In the opinion of Mr. Westinghouse, the great difficulty in the electrification of steam railways is no longer the engineering problem of developing a locomotive and an electrical system which will operate trains, but it is a broad question of financial and general policy of far-reaching scope. The future electrification of railways in general will require a combination of the highest engineering and commercial skill.

To insure interchange of traffic the following requirements are fundamental for both steam and electrical operation:

1. Standard gage of track.
2. Standard types of couplings between cars.
3. Uniform and interchangeable types of brake apparatus.
4. Interchangeable heating apparatus.
5. Uniform system of train signals.

For electrically operated railways the following additional requirements are fundamental:

(A.) A supply of electricity of uniform voltage and frequency.

(B.) Uniform location of conductors to convey this electricity so that without any change an electrically equipped locomotive or car of any railway can collect its supply of current and run on the lines of any other railway.

(C.) Uniform apparatus for the control of electric motors whereby trains of two or more electric locomotives or motor cars from different lines can be operated as a unit from one locomotive or car.

Mr. Westinghouse compares the single-phase alternating current system, the three-phase alternating current system and the direct-current system from the standpoint of the motors and transmission devices. The limitations of speed control of the direct-current railway motor with a fairly uniform line voltage are contrasted with the constant speed characteristics of the three-phase motors which have the advantage, however, that they become generators in running down grade and act as a perfect brake at the head of the train. The single-phase railway motor has speed characteristics very similar to those of the d.c.-motor, but the control apparatus employed permits of maintaining the desired speed under almost any conditions of load and without rheostatic losses. The limit of capacity of the motors is determined only by the safe temperature rise. With a properly designed single-phase control apparatus any desired voltage may be impressed on the motors regardless of fluctuations in the line voltage which is stepped down in a ratio approximately 30 to 1. The determination of the frequency to be used on single-phase railways is of great importance. For general use in power transmission 25 cycles is the standard and this has been adopted by nearly all of the single-phase railways now in operation. The Midi Railway of France, however, has adopted 15 cycles and this lower frequency permits of a marked reduction in the size of the motors required for a given output. Nearly all three-phase systems, which have been installed, employ 15 cycles. The choice of frequency to be used is one of the most involved and difficult problems now presented for solution.

Referring to the transmission of power from the power house to the locomotive, Mr. Westinghouse says that the controlling factor in the cost of electrification in nearly all cases is the system of transmitting power and not the cost of the locomotives themselves. Current for all existing systems is usually generated as high-tension alternating current, so that the type and capacity of the power house does not enter into the problem.

In selecting a proper electrical system for railway operation, Mr. Westinghouse presents the following outline of elements which are of prime importance:

A. The electric locomotive should be capable of performing the same kinds of service which the steam locomotives now perform. This will most readily be secured by electric locomotives which can practically duplicate the steam locomotives in speed and power characteristics. This includes a wide range of performance, embracing through passenger service at different schedule speeds; local passenger service; through freight service in heavy trains; the handling of local freight by short trains; and a variety of switching, terminal and transfer movements. This, naturally, calls for wide variation in tractive effort and in speed, both for the operation of different kinds of trains, and, also, for the operation of the same train under the varying conditions usually incident to railway service.

B. The electric locomotive should be capable of exceeding the steam locomotive in its power capacity. It should be made to handle heavier trains and loads, to operate at higher speeds, and, in general, to exceed the ordinary limits of the steam locomotive in these respects. The readiness with which several electric locomotives can be operated as a single unit enables any amount of power to be applied to a train.

TABLE 1.—RECORD OF SINGLE-PHASE SERVICE.
NEW YORK, NEW HAVEN & HARTFORD RAILROAD FOR 12 MONTHS.

	Total Miles Run.	No. Locomotive Delays.	Miles Run per Locomotive Delay.	Number of Power House Delays.	Number of Line Delays.
1909					
April	146,189	9	16,243	..	3
May	155,551	25	6,222	1	3
June	166,759	14	11,911	..	4
July	183,434	13	14,110	..	2
August	177,714	14	12,694	..	5
September	189,656	14	13,547	..	1
October	174,490	11	15,854	1	4
November	173,370	10	17,337	..	1
December	167,808	23	7,296	..	3
1910					
January	163,274	28	5,831	..	2
February	138,929	12	11,577	..	1
March	156,901	12	13,075	..	1

C. The electric system should adapt itself to requirements beyond the ordinary limitations of the steam locomotive in small, as well as large, things. It should be adapted for use on branch lines, and for light passenger and freight service similar to that so profitably conducted by interurban electric roads, which in many cases run parallel to steam roads, not only taking away the traffic of the steam roads, but building up a new and highly profitable traffic, both in passenger and in express service.

D. A universal electric system requires that power should be transmitted economically over long distances and supplied to the contact conductor. The system should utilize the most highly perfected apparatus for the electric transmission of energy and its transformation into suitable pressures for use.

E. The contact conductor in an ideal system should be economical to construct, both for the heaviest locomotives, where the traffic is dense, and for light service on branch lines. It should impose minimum inconvenience to track maintenance; should give minimum probability of disarrangement in case of detailment, or in case of snow and sleet, and should in general be so placed and constructed as to give a maximum assurance of the continuity of service.

The future electrification of steam railways, in the opinion of Mr. Westinghouse, will be the extension of limited zones, until these zones after a time meet each other. If the systems employed on different zones, which ultimately may connect, are unlike, great inconvenience and expense will arise. It may be a matter of little moment at the present time whether different systems are in use, just as in the early days of railroading it was of little consequence whether the tracks were all of the same or of different gage.

The complete electrification of a railway will necessitate a

rearrangement of ideas and practices in regard to operation. Coaling and water stations will not be needed; passenger trains will be differently composed, some classes being of less weight; and they will operate more frequently, thus promoting travel; other trains will be heavier than at present, or will operate at higher speeds; and branch lines, by the use of electrically equipped motor cars, can be given a through service not now enjoyed.

The movement of freight will undergo great changes, due to the fact that electric locomotives can be constructed with great excess capacity, enabling them to move longer trains at schedule speed on rising gradients.

The large percentage of shunting operations due entirely to the use of steam locomotives will no longer be required.

The railway companies can combine upon some co-operative plan for the generation of electricity, thereby effecting large savings in capital expenditures; and can utilize their own rights of way for the transmission of the current, not only for the operation of trains, but for many other useful purposes.

Notwithstanding the fact that great strides have already been made in cheapening the cost of generating electricity by steam engines from the progress already made in the development of gas and oil engine power, a still further reduction in cost may be expected, which will accelerate the work of electrifying existing railways.

One important aspect of this great question will engage the thoughtful consideration of every government, namely, the military necessity for uniform railway equipment in time of war.

There will be serious difficulties to surmount in the selection of a general system. There naturally will be arguments in favor of one or another of the systems now in use and the inclination of those who have adopted a particular system will be to advocate its general use. There will be enthusiastic inventors, and there will be many advocates of the common view, namely, that there is room for several systems, and that each system will best meet the requirements of a particular case. There will be those who give undue weight to some feature of minor importance, such as a particular type of motor or of locomotive, instead of giving a broad consideration to the whole system, and recognizing that, in the general problem of railway electrification, facility and economy in

TABLE 2 DATA ON ELECTRIC LOCOMOTIVES OF AMERICAN DESIGN
BUILT BY THE WESTINGHOUSE ELECTRIC & MFG. CO.

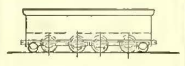
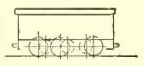
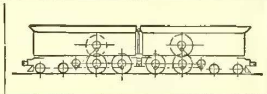
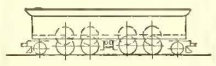
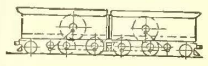
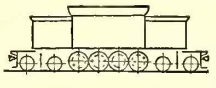
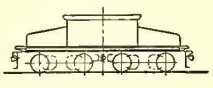
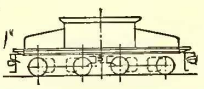
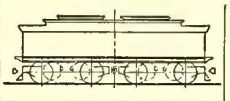
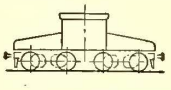
					
Built for	New Haven	Grand Trunk St. Clair Tunnel	Pennsylvania	New Haven	New Haven
Electric system	A.C., D.C.	A.C.	D.C.	A.C., D.C.	A.C., D.C.
Service	Passenger	Frt. & Pass.	Passenger	Frt. & Pass.	Frt. & Pass.
First placed in service	July 1907	February 1908	17,000-mile test	3000-mile test	building
No. in service or on order May 1910	41	6	24	1	1
No. motors per locomotive	4	3	2	4	2
Armature diameter, inches	39½	30	56	39½	76
Core length, including vent opening, inches	18	14¾	23	13	13
Weight one motor, pounds	16,420	15,660	45,000	19,770	41,600
Weight all motors on locomotive	65,680	46,980	90,000	79,080	83,200
Weight all electrical parts	110,400	58,400	127,200	130,000	135,000
Weight all mechanical parts	94,100	73,600	204,800	130,000	125,000
Weight complete locomotive	204,500	132,000	332,000	260,000	260,000
Weight on driving wheels	162,000	132,000	207,800	180,000	180,000
Weight complete locomotive for A.C. operation	196,000	132,000	D.C.	241,000	240,000
Max. guar't'd speed, miles per hr.	about 86	30	about 80	45	45
Feature limiting speed	track	armatures	connecting rod	armatures	armatures
Max. tractive effort	19,200	43,800	69,300	40,000	40,000
Loco. wt. in excess of 18% adhesion Max. T.E., A.C. operation	88,700	none	none	18,500	17,500
Designed for trailing load, tons	250	500	550	{1500 freight { 800 pass.	{1500 freight { 800 pass.
Balance speed on level with above load	about 75	about 25	60	{35 freight {45 pass.	{35 freight {45 pass.

TABLE 3 DATA ON ELECTRIC LOCOMOTIVES OF AMERICAN DESIGN
BUILT BY THE GENERAL ELECTRIC COMPANY

					
Built for	N. Y. C. & H. R. R.	Detroit River Tunnel	B. & O. R. R.	Great Northern	Paris-Orleans
Electric system	D.C.	D.C	D.C.	3-phase	D.C.
Service	Passenger	Frt. & Pass.	Frt. & Pass.	Frt. & Pass.	Passenger
First placed in service	July 1906	tests completed	March 1910	July 1909	1899
No. in service or on order May 1910	47	6	2	4	11
No. motors per locomotive	4	4	4	4	4
Armature diameter, inches	29	25	25	35¾	23½
Core length, including vent. opening, inches	19	11½	11½	16¼	12
Weight one motor, pounds	18,150	10,560	10,560	15,000	8,855
Weight all motors on locomotive	72,600	42,240	42,240	60,000	35,420
Weight all electrical parts	91,200	54,000	54,000	109,000	42,500
Weight all mechanical parts	138,800	146,000	130,000	12,,000	67,500
Weight complete locomotive	230,000	200,000	184,000	230,000	110,000
Weight on driving wheels	141,000	200,000	184,000	230,000	110,000
Weight complete locomotive for A.C. operation	D.C.	D.C.	D.C.	230,000	D.C.
Max. guar't'd speed, miles per hr.	75	30	55	30	45
Feature limiting speed	track	armature	armature	armature	armature
Max. tractive effort	47,000	67,000	61,000	77,000	37,000
Loco. wt. in excess of 18% adhesion Max. T.E., A.C. operation	none	none	none	none	none
Designed for trailing load, tons...					
Freight		900} on	850} on	500 on 2.2% grade	
Passenger		600} 2% grade	500} 1½% grade		
Balance speed on level with above load	{ 45 } { 63 }	{ Freight 20.5 } { Pass. 22 }	{ Freight 26 } { Pass. 30 }	15	{ 300 } { 32 }

transmitting power from the power house to the locomotive are of controlling importance.

Were there now only one system to be considered, there would be a concentration of the energy of thousands on the perfecting and simplifying of the apparatus for that system, to the advantage of railway companies and of manufacturers.

There is pressing need of determining the system which admits of the largest extension of railway electrification and of a prompt selection of those standards of electrification, which will render possible a complete interchange of traffic, in order to save expense in the future and to avoid difficulties and delays certain to arise unless some common understanding is arrived at very shortly.

In an appendix which forms part of the address, the author gives a complete record of locomotive, line and power house delays during the 12 months from April, 1909, to March, 1910, on the New York, New Haven & Hartford Railroad. This record is given in table on page 12. The commutation on the motors with which the New Haven locomotives are equipped is excellent, many of the locomotives having made over 100,000 miles without turning or sandpapering of the commutators. The brushes show an average life of 40,000 to 45,000 miles. Most of the locomotives have now run more than 100,000 miles, and the cost of maintenance per mile, and the number of miles per failure, are much more favorable than with the steam locomotives formerly used.

The operating record of the St. Clair tunnel locomotives

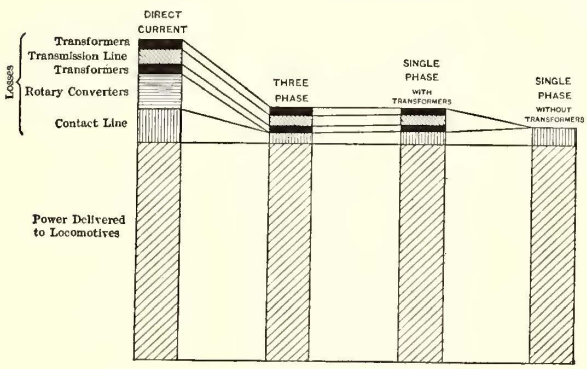


Fig. 1

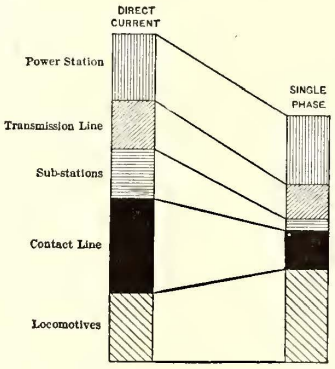


Fig. 2

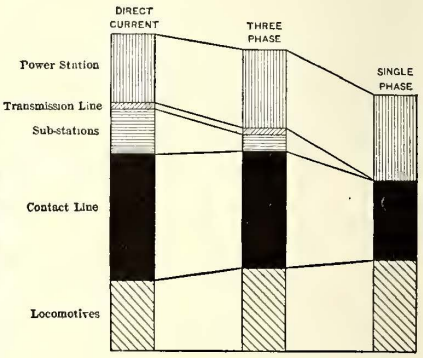


Fig. 3

is also briefly referred to in the same appendix. During the past 12 months the electric locomotives, which average 25 trips of 4 miles each per day, have been responsible for but one delay of 8 minutes.

In a second appendix to the address are given two tables of descriptive data of electric locomotives built by the Westinghouse Electric & Manufacturing Company and the General Electric Company. These two tables are reproduced herewith.

In a third appendix Mr. Westinghouse compares, by means of diagrams, the losses between the generators and the locomotives for a direct-current system, a single-phase system and a three-phase system based on a class of service where the input to the locomotive by the several systems is practically the same. This diagram is reproduced in Fig. 1. The total height of the different columns in the diagram indicates the total power delivered by the power house in the systems designated and the loss between the power station and the locomotive is represented by the upper shaded areas. The loss is smallest in the case of a single-phase system without transformers, which is the method of distribution employed on the New York, New Haven & Hartford Railroad.

The comparative first costs of a single-phase and a direct-current system for a particular case are shown diagramatically in Fig. 2. The estimates cover a single-track road 100 miles long, operating freight and passenger trains with 20 locomotives.

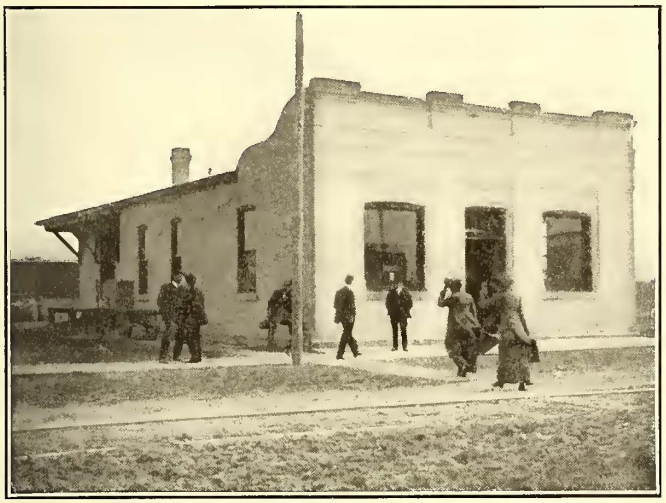
Fig. 3 shows the comparative first costs for the three different systems in a particular case of pusher service on mountain grades where 12 locomotives are required, the total length of the line being 32 miles. In addition to the main line a large yard was to be electrified, making a total of 90 miles of single track. The location of the power station was such that substations were required for either direct current or three-phase current, but not for single-phase current.

TRACKLESS TROLLEYS ABROAD

In a paper on "Railless Traction," presented at the Dublin meeting of the British Tramways & Light Railways Association on May 12 and 13, Harry England remarked that on the Continent there were three systems of railless cars working successfully, both in an engineering and commercial sense. In Italy the Filovia system was in operation over a total route mileage of more than 60 miles. The trolley, built on the "Cantono" patent, consisted of an ordinry trolley pole fixed to the car by a trolley base similar to the bases used on single-deck and covered cars. The trolley head consisted of a four-wheeled truck, which was affixed to the trolley pole by means of a ball and socket joint. This allowed the trolley head to move easily and to adapt itself to any irregularities in the overhead line. The overhead work was similar to that for ordinary rail traction, with the difference that there were both positive and negative wires. The trolley showed no disposition to leave the wires at high speeds, or when the vehicle had to move laterally to pass other vehicles traveling in the same direction. In the Mercédès-Stoll system, at Vienna, motors of 20 hp each were fitted in the hubs of the rear driving wheels, so that the motors formed an integral part of the driving wheels themselves, thus doing away with the necessity for any mechanical transmission. The cable was carried through the interior of the axle, and the armature of the motor was fixed by means of keys on the axle itself, and so acted as the nave of the wheel. The trolley consisted of a frame or carriage fitted with four wheels, which ran on the tops of the wires, the current-collecting device being attached to the car by flexible cables. A pendulum weight was attached to the center of the trolley carriage to keep the carriage balanced and the wheels well pressed down on the wires. The conducting cable was wound round a small drum mounted upon the chassis, and about 12 yd. of spare cable were carried which could be played out to allow the car to run on the whole width of the road. In the Max Schiemann system, installed at Mulhausen, the trolley was similar to that used on tramways, with a pole from 14½ ft. to 16 ft. in length. It was fitted with two sliding contacts, and the car could deviate for distances of 10 ft. on either side of the wires. The overhead work was similar in all respects to ordinary tramway practice, except that two wires were used. It was estimated that a trackless trolley system could be fully equipped, provided current was purchased from a supply authority, at about £3,000 per mile of route, though much would depend upon local conditions. With overhead line and cables at £1,500 per mile, five motor cars at £600 each, five trailer cars at £250 each, land and depot, £800, and spare parts, tools, etc., £950, 4 miles of railless traction would cost £12,000, as against an expenditure of £40,000 for a tramway of a similar length. The author stated that the cost of working a railless traction system in Great Britain had been estimated at 6.164d. per car-mile, as against 6.494d. in the case of a tramway.

WINNIPEG, SELKIRK & LAKE WINNIPEG INTERURBAN RAILWAY

The Winnipeg, Selkirk & Lake Winnipeg Railway, operated by the Winnipeg Electric Railway Company, is 22 miles long connecting the northern terminus of the Main Street lines of the Winnipeg Electric Railway with the town of Selkirk, on the Red River. The present line is built at one side of a highway 132 ft. wide and the franchise rights and track arrangements contemplate the addition of a second track. This 22-mile road is notable in that it has no curves or grades of sufficient degree to limit the speed of the cars at any point on the line. The route follows the course of the Red River from Winnipeg to Selkirk, but the tracks conform very closely to a



Winnipeg & Selkirk—Passenger and Freight Station at Selkirk

tangent. The track is of such character and the obstructions to fast running are so slight that the local cars on this line, some of which haul trailers, are easily able to make the 22 miles, including all stops, in 45 minutes. The roadway is constructed according to interurban standards accepted in this section. On account of the severe winter weather special care has been taken to raise the track level above the surrounding country, and as there are no cuts on the entire line, the borrowed excavation has served to make deep ditches parallel with the track, which afford excellent drainage. The route lies over a broad, level plain with the view unobstructed for miles except by infrequent sections of timber.

A franchise has been obtained and it is proposed in the near future to extend this interurban line from Selkirk to Winnipeg Beach, about 15 miles north of Selkirk. The company is also considering the construction of a line to Victoria Park. Winnipeg Beach is a well-patronized summer resort on the west side of Lake Winnipeg, which now is served only by a steam railway. Victoria Park is said to be an excellent site for the development of an attractive pleasure resort, and this also is located on Winnipeg Lake, but on the eastern shore. Winnipeg Lake is a navigable body of water nearly 500 miles long, into the southern end of which the Red River flows to offer a route for freight boats into Winnipeg.

The track of the interurban line is laid with an English rail weighing 56 lb. per yard. The rail is supported by cedar and tamarack ties, ballasted with white gravel of good quality, obtained from a large pit owned by the company. Steam railway special work, with spring switches and frogs, is used. The joints are made with six-hole angle bars. A portion of the line was first bonded with round wire and bonding caps, but these more crude bonds are being replaced with electrically welded bonds applied with a special car leased from the Electric Railway Improvement Company, Cleveland, Ohio.

The southern terminus of the interurban line is at the north Main Street car house and division headquarters of the Winnipeg Electric Railway system. At this station passengers are transferred to the city cars and the interurban cars are Y-d. Some of the more important stops along the line of the interurban are Middle Church, Parkdale, St. Andrews and Lower Fort Gary. The northern terminus, Selkirk, is a town of about 3500 inhabitants, which also is served by the Canadian Pacific Railway.

The interurban company has built an attractive passenger and freight station in the center of Selkirk. An illustration of this building is presented. At the northern end of the track in Selkirk a car house and headquarters for the interurban division has beeen erected. Provision is made here for doing light car-repair work, but the heavy repairs are made in the shops of the Winnipeg Electric Railway.

POWER SUPPLY AND STEP-UP STATION

Current for the operation of the Selkirk interurban line is received from the hydroelectric generating station of the Winnipeg Electric Railway Company. This plant delivers power to a receiving station in Winnipeg over a 65-mile transmission line. From the receiving station current is transmitted at 2200 volts to a step-up station located on the interurban line at the north city limits of Winnipeg. Here transformers raise the potential to 13,000 volts for transmission along the right-of-way to converting substations located at Middle Church, 5 miles north of Winnipeg, and at Lockport, 10 miles farther north.

The step-up station near the Winnipeg end is a fireproof building of brick and concrete located about 1600 ft. north of the south end of the interurban line at which point direct current is fed to the interurban trolley wire from a substation of the city railway. The transformer station has ground dimensions of 44 ft. x 21 ft. 6 in. The equipment of the step-up station includes four air-blast transformers of 300-kw capacity each. One transformer is for emergency use. The transformers are furnished with cooling air by two induction motor-driven Buffalo Forge Company fans, which receive air from outside the building and discharge it into an air-tight concrete basement compartment over which the transformers stand.

The power supply is received as 2200-volt, three-phase, 60-cycle current delivered by weatherproof cables to a hand-throw oil switch installed in a brick compartment on the station floor near the wire entrance. The switchboard carries a voltmeter

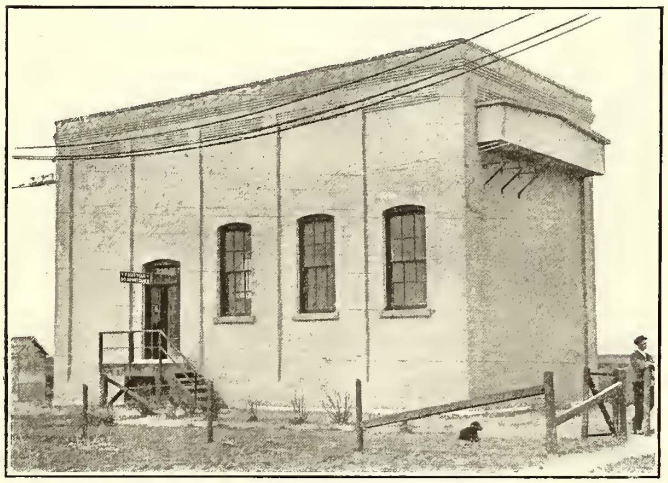
Winnipeg & Selkirk—Substation at Middle Church

and three ammeters on the incoming line. From the terminals of the power switch a set of bus wires connects with the low-tension side of the step-up transformer. The secondary (13,000 volts) side of the transformers is connected with the transmission-line outlets at the track end of the building. The 13,000-volt, three-phase transmission circuit is carried on a single arm at the top of the trolley pole and a lightning rod is installed on every other pole.

SUBSTATIONS

The two substations which supply 650-volt current to the

middle and northern sections of the Selkirk interurban line are similar in design. Each is a fireproof structure of steel, concrete and brick. The building and equipment at Middle Church is typical. This building is located on an acre of ground adjacent to the track roadway. Apartments for the station operator and his family are provided by a two-story extension of the substation building. The parcel of land about the station is used by the operator as a kitchen garden. Current at transmission voltage is led into the substation through a wire tower at the rear of the building. The transmission wires extend across the upper part of the tower and out of the opposite side and on to the Lockport substation. Provision for disconnecting the line on either side of the substation taps is afforded by hand-throw switches. Lightning arresters are installed on both incoming and outgoing transmission terminals. The high-tension connections lead to a set of bus wires to which, in turn, two duplicate sets of converting apparatus are connected. Each set includes line and machine oil switches, a starting compensator and a 300-kw General Electric motor-generator set. The motors of these sets operate with current at transmission voltage and are rated at 436 hp. Each has its own exciter with the armature carried on an extension of the motor-generator shaft. Two starting compensators are provided in this substation, al-



Winnipeg & Selkirk—Step-Up Transformer Station at North Winnipeg

though the connections are such that either compensator may be used in starting either motor-generator set.

ROLLING STOCK

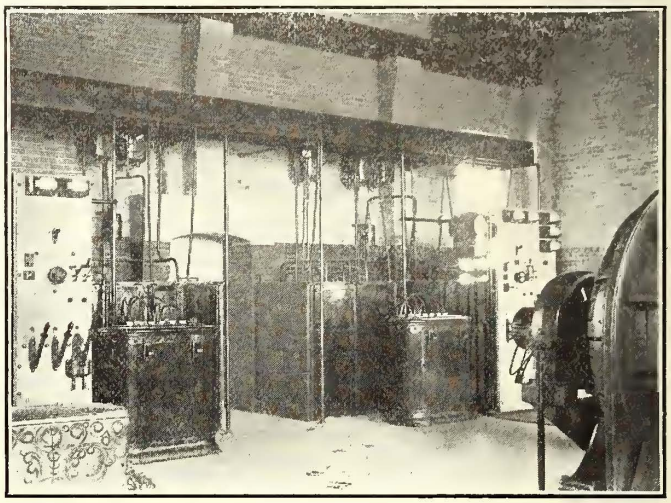
The rolling stock equipment for the Selkirk interurban line now comprises six large double-truck cars, designed and built in the shops of the Winnipeg Electric Railway. These cars are arranged for operation in trains, having end doors, multiple-unit control and M. C. B. couplers. All the equipment is built for single-end operation. All the interurban passenger cars are of similar type except that two of the six car bodies are provided with baggage compartments. Each car body is 55 ft. long over vestibules and provides seats for 64 passengers. The front vestibule is reserved for the motorman and the control and hot-water heater. Hale & Kilburn "walkover" seats with mahogany arm rests and red plush upholstering are used. The interiors are illuminated with a row of 20 16-cp lamps placed directly above the bell rope along the center of the upper deck. The windows are fitted with pantasote curtains carried on Curtain Supply Company fixtures.

Two methods are provided for heating these cars. During the severe winter weather they are heated with Peter Smith hot-water heaters and in the milder weather heat is furnished by an equipment of Consolidated electric heaters. It is stated that both methods of heating are never required at one time, but the electric heaters are installed for use in mild weather because current is available at practically no additional cost from the large water-power generating station.

Each interurban car is mounted on two trucks of Curtis design. Thirty-three-inch wheels, of Midvale and Carnegie manufacture, are used. The axles are 5½ in. in diameter, and each car is equipped with four GE-73 motors and type M control. Other parts of the equipment are as follows: Washburn M. C. B. couplers; Crouse-Hinds arc headlights; Knutson trolley retrievers; Kalamazoo trolley wheels; General Electric automatic air brakes; Peacock hand brakes; Ohio Brass sanders; Ottawa Car Company parcel racks and trimmings.

SERVICE

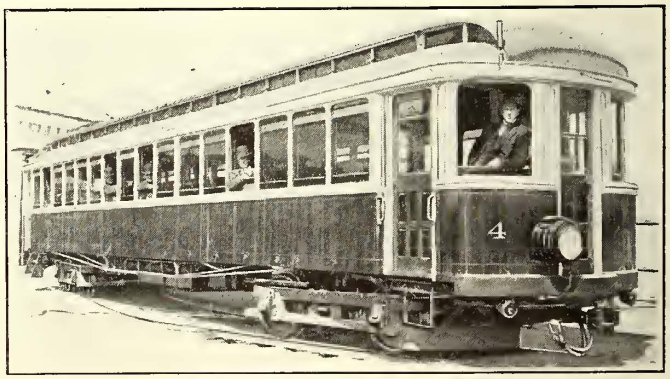
The Winnipeg, Selkirk & Lake Winnipeg Railway operates



Winnipeg & Selkirk—A. C. Boards and Line Switches in Sub-Station

six trains in each direction daily between Winnipeg and Selkirk, one of which is a mixed passenger and freight train. One train a day is operated in each direction between Middle Church and Winnipeg. All of the through trains make the run of 22 miles in 45 minutes, except the freight train, which requires an hour on its southbound trip and 1 hour and 20 minutes on its northbound trip. During the summer the afternoon runs require two-car trains, which are made up of one motor and one trail car, and which cover the route in the same time as single-car trains. The movement of all trains is controlled by a dispatcher at Selkirk, who transmits his orders over a telephone line.

The financial report of the Winnipeg, Selkirk & Lake Winni-



Winnipeg & Selkirk—Standard Car

peg Railway for the year 1909 showed receipts of $67,420 and expenses of $31,148, and net earnings for the year of $36,272, against which were charges of $20,000 for interest on bonds and $2,698 for taxes, etc., leaving a surplus of $13,574. This new interurban road was built by company forces under the supervision of Wilford Phillips, general manager, and Wilson Phillips, superintendent of construction of the Winnipeg Electric Railway, to whom acknowledgment is made for the foregoing information.

CLEVELAND MEETING OF COMMITTEE ON INTERURBAN RULES

The committee on interurban rules of the Transportation and Traffic Association, as reported in last week's issue of the ELECTRIC RAILWAY JOURNAL, page 1105, held a second meeting at Cleveland, Ohio, on June 22. An account of the first meeting of the rules committee held at Fort Wayne, Ind., June 7, 1910, appeared in the ELECTRIC RAILWAY JOURNAL for June 11. At the Cleveland meeting the committee continued the consideration of adapting to interurban service the American Railway Association standard code of train rules and rule numbers, beginning with the section on "Movement of Trains."

Mr. Emmons, the chairman, first announced that additional data sheets had been received and that the total mileage of the 65 roads which had replied to the data sheets sent out by this committee was 6396. The vote on the question of whether the Transportation and Traffic Association should adopt the steam railway code insofar as it was applicable to electric interurban service stood 19 for adoption and 23 against adoption. Mr. Emmons then read correspondence that he had carried on with F. C. Rice, chairman of the committee on transportation of the American Railway Association. Following the instructions of the Denver meeting of the Transportation and Traffic Associaiton, Mr. Emmons, as chairman of the committee on interurban rules, had asked Mr. Rice for a joint meeting with the rules committee of the steam railway association for the purpose of suggesting any modifications in the steam railroad code which would make it more adaptable for both steam and electric operation. Mr. Rice thought it was not possible to arrange for a joint meeting of the full committees at which sufficient time could be given to consideration of all proposed revisions. He, therefore, suggested that one representative from the steam and electric railway associations meet with some railway commissioner to discuss the need for changes. The interurban rules committee instructed Mr. Emmons to represent it at such a meeting.

RECONSIDERATION OF RULES

Before passing to the rules for movement of trains the committee reconsidered Rule 128 of the interurban code which had been discussed but not adopted at the Fort Wayne meeting. This rule was approved with the substitution of the words "proper stop signal" and "proper proceed signal" for "one bell and "two bells" to make it conform to Rule 16 defining "Communication Signals." The rule was numbered 37 and now reads as follows:

"37. Motormen approaching any siding used for meeting-point purposes will blow one long blast of whistle when approaching same, in all respects, as required when approaching a regular station stop. The conductor shall answer such blast with the proper stop signal if a train is to be met at such siding, or if any order is to be taken at such siding, and with the proper proceed signal if the train is to proceed."

At the Fort Wayne meeting Rules 81 to 86, covering the movement of trains were formulated. At the Cleveland meeting, however, this portion of the work was reviewed and some slight changes were made as follows:

Rule 81 was approved to read as follows:

"81. (Double, Three or more tracks.) Trains must run with the current of traffic, unless otherwise directed by proper authority."

Rule 82 of the steam code was approved. It follows:

"82. Time-table schedules, unless fulfilled, are in effect for 12 hours after their time at each station.

"Regular trains 12 hours behind either their schedule arriving or leaving time at any station lose both right and schedule, and can thereafter proceed only as authorized by train order."

Rule 203 of the interurban code was approved and renumbered 83.

In a discussion of interurban Rule 203, which permits the movement of a train, protected by flag, when the dispatcher cannot be reached, Mr. Griffin and Mr. Handshy expressed disapproval of this procedure, because they did not believe it wise to use any rule whereby trains might approach each other between telephone stations. Because of this difference of opinion steam code rule 83 was inserted as optional and renumbered 83a. This reads:

"83a. A train must not leave its initial station on any division (or subdivision), or a junction, or pass from double to single track, until it has been ascertained whether all trains due, which are superior, or of the same class, have arrived or left."

Interurban Rule 203a, explaining "Protected by Flag," as used in interurban Rule 203, was numbered 83b.

Steam code Rule 87 was approved with the use of a five-minute clearance. It reads:

"87. An inferior train must keep out of the way of opposing superior trains and failing to clear the main track by the time required by rule must be protected as prescribed by Rule 99.

"Extra trains must clear the time of regular trains five minutes unless otherwise provided, and will be governed by train orders with respect to opposing extra trains."

Steam code Rule 88 was approved with the same number and with the addition of the following foot note: "Your committee does not recommend the use of superiority by direction in interurban train service." Rule 88 reads:

"88. At meeting points between trains of the same class, the inferior train must clear the main track before the leaving time of the superior train.

"At meeting points between extra trains, the train in the inferior time-table direction must take the siding unless otherwise provided."

"Trains must pull into the siding when practicable; if necessary to back in, the train must first be protected as prescribed by Rule 99, unless otherwise provided."

Interurban Rule 206 was approved and numbered 88 (optional) for use when superiority by direction is not used.

The following rule was approved for No. 88a:

"88a. (Single track.) At meeting points between trains, either by schedule or train order, should the train that is to to occupy the main track arrive first, it will be the duty of the conductor of such train to promptly set switch for the siding, so that the train to be met can take the siding with the least possible delay."

Steam code Rule 89 was adopted with the following note which will apply both to Rules 88 and 89. "Your committee recommends that where greater clearance is necessary Rule 88 shall require a clearance of five minutes and Rule 89 of 10 minutes." Rule 89 reads:

"89. At meeting points between trains of different classes the inferior train must take the siding and clear the superior train at least five minutes, and must pull into the siding when practicable. If necessary to back in, the train must first be protected as prescribed by Rule 99, unless otherwise provided."

Steam code Rule 90 was approved with the same number, with a foot note stating that the committee does not recommend superiority by direction. Rule 90 reads:

"90. Trains must stop at schedule meeting stations, if the train to be met is of the same class, unless the switch is right and the track clear.

"When the expected train of the same class is not found at the schedule meeting station, the superior train must approach all sidings prepared to stop, unless the expected train is met.

"Trains must stop clear of the switch used by the train to be met in going on the siding."

The committee approved the following steam code rules retaining the steam code numbers: 91, 92, 93, 94, 95 (same as interurban Rule 201), 96 (same as interurban Rule 214), 97, 98 and 99. The steam code rules which are not duplicates of the interurban code rules read as follows:

"91. Unless some form of block signals is used, trains in the same direction must keep at least five minutes apart, except in closing up at stations."

"92. A train must not arrive at a station in advance of its schedule arriving time.

"A train must not leave a station in advance of its schedule leaving time."

"93. Within yard limits the main track may be used protecting against ——— class trains.

"——— class and extra trains must move within yard limits prepared to stop unless the main track is seen or known to be clear."

"94. A train which overtakes another train so disabled that it cannot proceed will pass it, if practicable, and if necessary will assume the schedule and take the train orders of the disabled train, proceed to the next open telegraph office, and there report to the ———. The disabled train will assume the right or schedule and take the train orders of the last train with which it has exchanged, and will, when able, proceed to and report from the next open telegraph office.

"When a train, unable to proceed against the right or schedule of an opposing train, is overtaken between telegraph stations by an inferior train or a train of the same class having right or schedule which permits it to proceed, the delayed train may, after proper consultation with the following train, precede it to the next telegraph station, where it must report to ———. When opposing trains are met under these circumstances, it must be fully explained to them by the leading train that the expected train is following."

"97. Extra trains must not be run without orders from the ———."

"98. Trains must approach the end of double track, junctions, railroad crossings at grade, and drawbridges, prepared to stop, unless the switches and signals are right and the track is clear. Where required by law, trains must stop."

"99. When a train stops or is delayed, under circumstances in which it may be overtaken by another train, the flagman must go back immediately with stop signals, a sufficient distance to insure full protection. When recalled he may return to his train, first placing two torpedoes on the rail when the conditions require it.

"The front of the train must be protected in the same way, when necessary, by the ———."

Interurban Rule 218 will be inserted as Rule 99a because no similar precautionary rule appears in the steam railway code.

The committee also approved steam code Rules 100 to 104, retaining the same numbers. These read:

"100. When the flagman goes back to protect the rear of the train, the ——— must, in the case of passenger trains, and the next brakeman, in the case of other trains, take his place on the train.

"101. If a train should part while in motion, trainmen must, if possible, prevent damage to the detached portions. The signals prescribed by Rules 12 (d) and 14 (f) must be given.

"The detached portions must not be moved or passed until the front portion comes back."

"102. When cars are pushed by an engine (except when shifting and making up trains in yards) a flagman must take a conspicuous position on the front of the leading car."

"103. Messages or orders respecting the movement of trains or the condition of track or bridges must be in writing."

"104. Switches must be left in proper position after having been used. Conductors are responsible for the position of the switches used by them and their trainmen, except where switch tenders are stationed.

"A switch must not be left open for a following train unless in charge of a trainman of such train."

Interurban code Rule 255, defining the responsibility for the safety of trains, will be renumbered and used as Rule 105.

Rule 106 of the steam code was approved with its present number. It reads:

"106. In all cases of doubt or uncertainty the safe course must be taken and no risks run."

Additional rules were formulated to follow Rule 106, because they are necessary for interurban operating conditions with telephone train dispatching. In all cases where the steam code uses the word "engine" the revised interurban code will use "engine or motor."

Rules 107 to 114, inclusive, were approved to read as follows:

"107. When unable to reach the dispatcher on account of defective telephone, all extra trains will lose their rights as extra trains and such extra trains whose movement is essential to the maintenance of the passenger service will become sections of regular scheduled trains as provided in Rule 108, all other extras at once clearing main track and remaining clear until telephone service is restored."

"108. When telephone line is out of order, any scheduled train, when requested by conductor of any train, may carry signals for such, as a section following, without first obtaining orders from the ———. The conductor of train desiring signals displayed shall issue second section order in duplicate, as per No. 3, form F, Rule —, to be duly signed by the respective conductors. Both copies of order to be turned in by the conductors of the respective trains. Scheduled train, under such arrangement, will immediately display signals, though second section must not proceed until it is certain that signals are so displayed by the first section."

"109. Where extra trains are assigned working limits, such trains must move within these limits with the current of traffic unless train orders otherwise direct."

"110. Every train must be brought to a full stop before crossing the tracks of any railroad at grade, at a distance of not less than fifty (50) ft. from the railroad track, except when such crossing is provided with interlocking apparatus or other system of signals, and must not proceed until proper signal is received from the conductor, and crossing is seen to be clear, and no train approaching and about to pass over crossing. The conductor shall be responsible for the motorman having in front vestibule, for immediate use in case of necessity, a red flag by day and a red light by night. This order strictly prohibits the motorman from taking a signal or order from any one else but his own conductor, and conductors must not permit any one else to perform their duties at these crossings unless authority has been conferred upon another employee by the ———."

"111. A train about to enter or leave a siding must approach the switch under full control."

"112. A train meeting another train at a siding open at both ends must enter at the nearest end, and under no circumstances run by and back in without special orders from the ———."

"113. Tongue switches, wherever located, must be approached with train under full control, and must not be run over unless the tongue is known to be properly set. Motormen and conductors will be held equally responsible for the proper setting of switches used by them, and they must take every precaution for the protection of their trains, even if not provided by the rules."

"114. All regular trains, or sections of a regular train, when becoming —— minutes late, must report to the dispatcher, and will also report for each successive —— minutes lost. If unable to get the dispatcher by company or long-distance telephone, the train may proceed on its time-card rights until it is ——minutes late, after which it must not proceed except by flagging, according to rule 83a.

Rule 115 will be the same as steam code double-track Rule D-153. It reads:

"115. Trains must use caution in passing a train receiving or discharging passengers at a station, and must not pass between it and the platform at which the passengers are being received or discharged."

Rule 116 regarding approaching at meeting points was approved to read as follows:

"116. All trains must approach meeting or passing points under full control, and must not attempt to pass until switches and signals are seen to be right and the train to be met or passed is clear of the main track.

RULES FOR MOVEMENT BY TRAIN ORDERS

Steam code Rules 201, 202 and 203 were approved with their numbers. They read:

"201. For movements not provided for by timetable, train orders will be issued by authority and over the signature of the ———. They must contain neither information nor instructions not essential to such movements."

"They must be brief and clear; in the prescribed forms when applicable; and without erasure, alteration or interlineation."

"202. Each train order must be given in the same words to all persons on trains addressed."

"203. Train orders will be numbered consecutively each day, beginning with No. — at midnight."

Interurban code Rules 252 and 253 were approved and renumbered 204 and 205.

Steam code Rule 206 was approved with its number. It reads:

"206. Regular trains will be designated in train orders by their numbers, as 'No. 10' or '2d No. 10,' adding engine or motor numbers if desired. Extra trains will be designated by engine or motor numbers, and the direction as 'Extra 798 "East" or "West."' Other numbers and time will be stated in figures only."

Interurban code Rule 255 was approved and renumbered 206a.

The committee spent considerable time in formulating rules covering instructions for obtaining train orders over telephone lines from stations with or without operators. Some members favored having the conductor read the order to the dispatcher for completion after the order had been taken by the motorman and read back for O. K. Other members held that the introduction of a third party in the handling of the order was too great a refinement. Because of the continued difference of opinion between the members of the committee the rules which will be submitted will include optional rules, so that a choice can be made of either method.

Interurban code Rule 256 with the elimination of the last paragraph which reads: "If for any reason the line shall fail before the dispatcher completes an order, it is of no effect, and must then be treated as though it had not been given," and interurban Rule 257 were combined and renumbered 207a.

Interurban code Rules 256 (Optional), including the last paragraph, and Rule 257, were combined and renumbered 207a (Optional).

The first paragraph of interurban code Rule 258 was approved with the following supplement and was numbered 207b. The supplement reads:

"207b. To obtain orders at stations where there are operators the operator will call up the dispatcher upon approach of train, who will give such orders as are necessary, whereupon the operator will write same plainly and without abbreviations on a blank provided for that purpose with two carbon copies and as many additional carbon copies as may be ordered by the dispatcher and when the operator has finished writing the order he shall repeat it to the train dispatcher, who will O. K. same, if correct. The operator shall sign same and repeat his signature with the number of the order to the dispatcher, who will then give the time at which the order is O. K.'d, which shall be entered upon the order by the operator. The operator will hand the order to the conductor of the train for whom it is intended, who shall sign same with name and train number, and read the order in full without abbreviation back to the dispatcher. The dispatcher will, if the order is correct, complete the order by giving his initials and the time of completion to the conductor, who will immediately write same on the order, which will then be in full force and effect. If, for any reason, the line should fail before the dispatcher completes the order, it is of no effect and must then be treated as if it had not been sent."

The first sentence of interurban Rule 261, with the proper references, will be renumbered as Rule 207c.

The entire interurban Rule 261, inserting the proper reference numbers, was approved as 207c (Optional).

Rule 208b of the steam code was approved and renumbered 208. It reads:

"208. A train order to be sent to two or more offices must be transmitted simultaneously to as many of them as practicable.

"The several addresses must be in the order of superiority of trains and when practicable must include the operator at the meeting or waiting point, each office taking its proper address.

"When not sent simultaneously to all, the order must be sent first to the superior train.

"Copies of the order addressed to the operator at the meeting or waiting point must be delivered to all trains affected until all have arrived from one direction."

Rule 262 of the interurban code was approved as Rule 209.

The committee agreed to leave blank the numbers from 210 to 213 inclusive, to permit individual properties to insert any special rules required.

Steam code Rules 214, 215 and 216 were approved and the numbers retained. They read:

"214. When a train order has been repeated or 'X' response sent, and before 'complete' has been given, the order must be treated as a holding order for the train addressed, but must not be otherwise acted on until 'complete' has been given.

"If the line fail before an office has repeated an order or has sent the 'X' response, the order at that office is of no effect and must be there treated as if it had not been sent."

"215. The operator who receives and delivers a train order must preserve the lowest copy."

"216. For train orders delivered by the train dispatcher the requirements as to the record and delivery are the same as at other offices."

Steam code Rule 217, which is not contained in the interurban code, was approved with its number. It reads:

"217. A train order to be delivered to a train at a point not a telegraph station, or at one at which the telegraph office is closed, must be addressed to

'C. & M———— (at ————), care of ————,'

and forwarded and delivered by the conductor or other person in whose care it is addressed. When form 31 is used 'complete' will be given upon the signature of the person by whom the order is to be delivered, who must be supplied with copies for the conductor and motorman addressed, and a copy upon which he shall take their signatures. This copy he must deliver to the first operator accessible, who must preserve it, and at once transmit the signatures of the conductor and engineman to the train dispatcher.

"Orders so delivered must be acted on as if 'complete' had been given in the usual way.

"For orders which are sent, in the manner herein provided, to a train, the superiority of which is thereby restricted, 'complete' must not be given to an inferior train until the signatures of the conductor and engineman of the superior train have been sent to the ————."

Interurban code Rule 265 was approved and renumbered 218.

Rule 219 was accepted as follows:

"219. Unless otherwise directed, an operator must not repeat a train order for a train, the motor of which has passed his train order signal or station, until he has ascertained that the conductor and motorman have been notified that he has orders for them."

Steam code Rules 220, 221a, 221b and 222 were approved with their numbers. They read:

"220. Train orders once in effect continue so until fulfilled, superseded or annulled. Any part of an order specifying a particular movement may be either superseded or annulled.

"Orders held by or issued for, or any part of an order relating to a regular train become void when such train loses both right and schedule as prescribed by rules 4 and 82, or is annulled."

"221a. A fixed signal must be used at each train-order office, which shall indicate 'stop' when there is an operator on duty, except when changed to 'proceed' to allow a train to pass after getting train orders, or for which there are no orders. A train must not pass the signal while 'stop' is indicated. The signal must be returned to 'stop' as soon as a train has passed. It must be fastened at 'proceed' only when no operator is on duty.

"Operators must have the proper appliances for hand signaling ready for immediate use if the fixed signal should fail to work properly. If a signal is not displayed at a night office trains which have not been notified must stop and ascertain the cause and report the facts to the ———— from the next open telegraph office.

"Where the semaphore is used the arm indicates 'stop' when horizontal and 'proceed' when in an inclined position."

Note to rule 221a.—The conditions which affect trains at stations vary so much that it is recommended each road adopt such regulations supplementary to this rule as may best suit its own requirements.

"221b. A fixed signal must be used at each train-order office, which shall indicate 'stop' when trains are to be stopped for train orders. When there are no orders the signal must indicate 'proceed.'

"When an operator receives the signal '31,' or '19,' followed by the direction, he must immediately display the 'stop' signal for the direction indicated and then reply 'stop displayed,' adding the direction; and until the orders have been delivered or annulled the signal must not be restored to 'proceed.' While 'stop' is indicated trains must not proceed without a clearance card (from ——— (A)).

"Operators must have the proper appliances for hand signaling ready for immediate use if the fixed signal should fail to work properly. If a signal is not displayed at a night office trains which have not been notified must stop and ascertain the cause and report the facts to the ——— from the next open telegraph office.

"Where the semaphore is used the arm indicates 'stop' when horizontal and 'proceed' when in an inclined position."

"Notes to rules 221a and 221b.—The committee has recommended two forms of Rule 221, leaving it discretionary to adopt one or both of these forms according to the circumstances of the traffic."

"222. Operators will promptly record and report to the ——— the time of departure of all trains and the direction of extra trains. They will record the time of arrival of trains and report it when so directed."

Interurban code Rule 276, indicating signs and abbreviations, was approved as No. 223 with the exception of the use of "Jct." for junction.

Interurban code Rule 263 was approved and renumbered 224.

Interurban code Rule 271 was approved and renumbered 225.

Interurban code Rule 270 was approved and renumbered 226.

Interurban code Rule 266 was approved and renumbered 227.

FORMS OF TRAIN ORDERS

The committee next discussed the advantages of "run late" orders. It was voted to approve the American Railway Association standard forms of train orders for single and double-track operation, with the exception that the words "motor number" be indicated in addition to "train number" in the form for each order.

The committee recommended the use of the standard "31" and "19" order forms of the American Railway Association and a modified form with certain printing on the body of the blank, similar to that used by the Indiana Union Traction Company. It also recommended that the train-order numbers of the American Railway Association be adopted and that the examples of orders quoted be printed in italics, as in the American Railway Association standard code of rules.

The chairman announced that he would have copies of the minutes of the Ft. Wayne and Cleveland meetings of the committee forwarded as soon as possible to each member so that they could carefully reconsider the rules as a whole and designate whether another meeting of the committee was needed.

DATA SHEET OF ENGINEERING ASSOCIATION COMMITTEE ON WAY MATTERS.

The committee on way matters of the American Street & Interurban Railway Engineering Association is sending out to all member-companies a data sheet containing 10 questions relating to economical maintenance of track and roadway, car clearance and specifications for steel rails. Replies should be addressed to E. O. Ackerman, engineer of maintenance of way, Columbus Railway & Light Company, Columbus, Ohio, who is chairman of the committee.

MEETING OF CENTRAL ELECTRIC ACCOUNTING CONFERENCE

The meeting of the Central Electric Accounting Conference, held on board the White Star Line steamer *Greyhound,* en route between Toledo and Detroit, on Saturday, June 25, 1910, was attended by over two-thirds of the membership of the conference, and was one of the most successful meetings that the conference has held. O. Burgett, Western Ohio Railway, suggested holding the meeting on the steamer. It was an unique idea, and resulted not only in a large attendance, but a most interesting and profitable meeting. Irwin Fullerton, auditor, Detroit United Railway, entertained the members of the conference during the afternoon and evening. Mrs. Fullerton was present to entertain the ladies.

The report of the executive committee indicated that the finances of the conference were in excellent condition, and recommended for the consideration of the conference the acceptance of the invitation extended by C. E. Thompson, auditor, Chicago & Milwaukee Railway, to hold the September meeting in Chicago. A letter from the Illinois Traction System was read in which an invitation was extended to the conference to hold a meeting in St. Louis, upon the completion of the company's terminal building. It is possible that the spring meeting will be held in St. Louis. It was also recommended that the proceedings of the meeting be published in pamphlet form for distribution among the members, and that in the interest of the membership, a competent man be employed to prepare a classified list of items chargeable to the several operating expense accounts provided in the Interstate Commerce Commission classification.

The recommendations of the executive committee were approved and the question of holding the next meeting in Chicago is to be submitted to a vote by mail. S. C. Rogers extended an invitation to the conference to hold the December meeting in Youngstown, Ohio.

H. S. Swift, president of the American Street and Interurban Railway Accountants' Association, was introduced by A. F. Elkins, auditor of the Columbus, Marion & Delaware Railway. Mr. Swift said in part that the length of life of way, structures and equipment and the determination of the proper amount to be added above ordinary maintenance to cover depreciation were great questions to those companies whose franchises were nearing maturity, to others who have been over sanguine in the inauguration of charges too low to cover cost and to give a reasonable return on their investment, and to those who are subject to rate regulation. In the past, changes due to obsolescence have been so frequent that the owners had not had the chance to wear out their property but he hoped that this condition would not continue in the future. Consequently, there ought to be available better length of service data to give a correct basis for figuring depreciation. He said that the American Street & Interurban Railway Association recognized the good work the Central Electric Accounting Conference was doing, and believed that other localities should organize similar associations. There were many problems which could best be discussed in such meetings, particularly those arising from interchange of traffic. However, all should be members and attend the meetings of the national association which needed their help and influence to bring about more uniform practice and a more general recognition of the value of the services given to the public, and a better knowledge of the fact that after proper allowance for depreciation and similar charges is made, the profits on the investment are seldom greater than the usual returns in other lines of business. However he had great confidence in the justice of the public when it is correctly informed, but the concentrated effort of all companies would be required to remove the false impression formed from past reports on profits.

The auditors might sometimes be consulted in reference to the financial policy of their companies, with good results. As a class they were conservative. Certainly the errors of the

past had not, as a rule, been that of conservatism, the auditors had long advocated those principles of accounting which were now recognized by bankers and investors. He thought that the auditors often were too modest when they spoke about their duties and responsibilities. Perhaps their great failing was to assume that their reports and statements showed as much to their executive officers as they did to themselves. This was not true in some cases and he wished to emphasize the importance of discussing such reports with the manager, and bringing to his attention the value of details which could be easily overlooked. Concluding, President Swift said the auditors should avoid the false idea that they could best serve their companies by endeavoring to do a large amount of clerical work. In smaller companies the auditor must necessarily give much of his time to the detail work of the office, but it is false economy to try to save a clerk's salary if this prevents the auditor having sufficient time to familiarize himself with the property and to analyze his own figures intelligently.

At the close of his address a resolution of thanks was given to Mr. Swift.

A paper on "Park Accounting," by E. L. Schmock, assistant secretary and treasurer, Cleveland, Painesville & Eastern Railroad, was productive of an animated discussion that brought out the fact that very few companies interested in parks owned and operated the parks themselves. This paper will be found on page 20. Some parks were operated by a separate company, others were operated under lease. In but few instances were parks operated at a profit except such profit as might be derived from the increased travel attracted by the park. Mr. Rogers was asked to outline the organization and plan of park accounting in his company, and stated that the Mahoning & Shenango Railway & Light Company owns and operates Cascade Park in New Castle and one of its underlying companies, the Youngstown Park & Falls Street Railway, owns and operates Idora Park in Youngstown. The company actually operates all the refreshment stands and amusement features of the parks, except the roller coaster, circle swing and old mill. Each park has its own superintendent, who has jurisdiction over everything but the receipts, a representative of the treasury department collecting all money daily, giving written receipts to the persons from whom he receives the money. He also attends to the daily collection of cancelled tickets and their subsequent destruction. A detailed daily report is prepared, duplicate copies of all receipts issued being attached. One copy of this report goes to the operating officer and the other to the accounting department. There is attached to this report also a duplicate deposit slip issued by the bank for the total amount of money called for by the report. The representative of the treasury department who attends to the daily collection of the receipts is the only person who handles the money from the time it leaves the park until it is actually deposited in the bank. The park revenue and expense accounts, some 30 in number, are kept in a loose leaf abstract form with a separate sheet for each account. In the general ledger one general account with the park is provided to which is credited all revenue and charged all operating expenses. Included in the operating expenses is every item of expense incident to the park management, including a proportion of the salary of the treasury and auditing department clerks engaged in the keeping of park accounts. At the close of the year the net revenue derived from the operation of parks is credited under the head of miscellaneous income, or if there should be a deficit, this under the Interstate Commerce Commission classification is charged to account No. 46, advertising. While the direct operation of the parks involves many difficulties it has been found that the company has been able to give the public better value for the money expended than through the medium of lessees or concessionaires, and has been able, in addition to the large increase in travel, to make a net profit on the operation of the parks themselves. To do this it requires people adapted to this class of work, but Mr. Rogers' company had been fortunate in that respect. It takes care of the park superintendents during the winter season by employing them in other work.

The paper, "Comparative Statements," by W. B. Wright, auditor, Indianapolis & Cincinnati Traction Company, which is printed in abstract below, treated of a subject of great importance and value at this time. At the close of the discussion on this paper a motion was made that the chairman appoint a committee of three, of which W. B. Wright should be chairman, to look into this matter further, and submit forms of comparative statements at the next meeting of the conference with the intention of adopting standard forms in this connection. The president appointed E. L. Kassemeir and S. C. Rogers to serve with Mr. Wright.

Walter Shroyer, auditor, Indiana Union Traction Company, led a discussion on accounting of interline baggage. Two points were brought out in the discussion:

1st. Advisability of adopting an interline baggage check, since both local and interline baggage are now handled on the same form, providing additional coupons for each road over which such baggage is handled, thus conforming with the present method of handling interline tickets and way bills.

2d. Proper method of accounting in connection with the checking of interline baggage on Central Electric Traffic Association mileage. It is not permissible to check baggage interline on C. E. T. A. mileage at the present time, but it is understood that the Traffic Association expects to arrange for such checking in the near future.

A. F. Elkins paid a tribute of respect to the memory of W. I. McLure, who at the time of his death was auditor of the Toledo Urban & Interurban Railway and a member of the conference. On motion Mr. Elkins was appointed a committee of one to prepare resolutions expressing the sympathy of the conference, to be forwarded to the family.

UNIFORM COMPARATIVE MONTHLY STATEMENTS*

BY W. B. WRIGHT, AUDITOR, INDIANAPOLIS & CINCINNATI TRACTION COMPANY

It may be trite to say that standardization, concentration or centralization if you will, is the order of the day; that the production of the greatest amount of "useful work," with the least expenditure of energy must be the end and aim of those directing the expenditures of such energy, whether that energy be the electrical output of the power station or the mental product of the office. With the coming of fixed system and accurate records in the production department, and further with the strong tendency now manifested by the executive himself to come closely in touch with actual operating conditions, instead of reaching his conclusions through reports from his operating officers, we find a continued call for better and cleaner cut work from the accounting department. The latter in turn is asking and getting better office room, better furniture, better mechanical equipment and better men. I believe that these conditions will continue until accounting shall have broadened and developed into one of the recognized professions, calling into its field of effort men of high mental attainment and force of character. There are large problems ahead of us that must be solved through scientific accountancy. The men who solve them must have a training which will make them the equal of the engineer in technique and give them the acumen of the financier and the finesse of the statesman.

The original idea of a comparative monthly statement for a manufacturing concern seemed to include a comparison of the *cash receipts, cash disbursements, total shipments, total pay-roll* and a showing of cash balances on hand; this with a trial balance (no balance sheet was ordinarily made) completed the list as required by many concerns with high commercial rating. From what I have seen of the earlier accounting of our traction companies, I should say that a goodly number of them are possessed of records of scarcely greater value. For instance, I remember one item on the books of a company not now in existence, where an accommodation loan was made at the local

*Abstract of a paper presented at the Central Electric Accounting Conference, Toledo, Ohio, June 25, 1910

bank, the bank properly charged and *earnings* account for the day *credited;* the entry had never been corrected and apparently never discovered. A comparative analysis of the earnings account, in the hands of a competent executive, would undoubtedly have brought to light what in charity we will call an error.

Granting the necessity for a uniform system and admitting that we now have a standardized classification, imposed by government, on which to build our system work, there still remains one step to be taken—the adoption of a standardized statement which shall at fixed times and for definite periods compare in an orderly and concise manner the data accumulated through the working of the standardized methods now in use, and which shall in addition show such data deduced therefrom as may be deemed necessary or desirable. With a view to furnishing ground for discussion I will suggest that this statement should show first the income account in the most condensed form possible, using *grand totals only.* For instance, give gross earnings from operation, total operating expenses, net earnings from operations, miscellaneous income, gross income less operating expenses, deductions from income (showing taxes separately if desired), net income, etc. In addition, as the data mentioned will occupy but small space, there might be made an analysis of the earnings from operation showing *by divisions,* the value of various classes of tickets sold and items of revenue other than passenger. Following the condensed income statement, should appear the usual income statement, showing the footings of the various revenue accounts, the footings of the five divisions of the operating accounts as shown by the standard classification, and such detail as to taxes, bond interest and other fixed charges, and deductions from net income as the conditions peculiar to each company may indicate.

Next to and supporting the income account should be the statement of operating expenses, this showing footings for each of the five groups, with footings of subdivisions in group 4, and a grand total of all these footings showing total operating expenses. In addition it might be convenient to show on this page immediately below the footing of each group its "Per Car Mile Cost" and also the percentage of the *group total* to the *total operating expenses.* This latter percentage is, I think, usually computed on gross earnings as a base, but I can see no logical connection between gross earnings and these operating group totals, while there is an approximately fixed ratio between the group totals and the grand total of the operating expenses. In comparison with gross earnings, where the latter show a sudden increase caused by interesting events inducing the people to ride freely with little increased cost to the operation account, the group per cent will fall. If the latter condition is continued for any length of time it would be possible for expenditures in one or more of the groups to be in reality extravagant while the percentages would appear to show by their lessening, that economies were being practiced. With the total operating expense as the base, this would not be the case, but the nominal ratio once established, any serious variation from month to month would be justified to the inspecting officer by known traffic conditions. Lacking this, the responsible official would be called upon for an explanation.

Following this should, I think, come the data sheet bearing the revenue and traffic statistics. Standardized data should be carefully worked out and in the planning should be reduced to the fewest possible number of items that will reasonably and safely give the necessary information. In cases where additional information is necessary on account of local conditions, this may be added by the individual company without prejudice to the standard. After the data sheets would logically come the statement of expenditures for road and equipment which should also conform to the requirements of the Interstate Commerce Commission's classification.

Last should be shown the balance sheet carrying assets and liabilities. If desired the general ledger may be so sectionalized and the items on the balance sheet so grouped that the latter will each month show the conditions of capital stock account, bonded debt, sinking funds, etc. This would make unnecessary, with the monthly showing, any separate statement or schedule carrying this information. In addition to the double columns usually carried on the comparative statement, showing the amounts for each month and for each yearly period, I should suggest that the standard form might show two additional columns, one to contain the increases and decreases, the other the percentages of same based on the previous year; these latter, however, would probably be worked out only for the more important items and for the group and total footings. With the appliances now available for "mechanical arithmetic" the additional time required would be small, even with the larger companies.

As to the method to be followed in getting any proposed form of report in concrete shape for consideration, I believe that this is a most important subject and feel that it should be thoroughly discussed at this or a subsequent meeting—that each member should inform himself fully as to the ideas of his executive officers and that this conference possibly through its officers, should by correspondence or otherwise place itself in touch with other like associations and learn their practices and wishes. I take this position as it seems to me there is too much tendency to standardize *locally* and *sectionally,* without due reference to conditions beyond the limits of our immediate interest, forgetting that our business is a progressive one, that our borders are rapidly enlarging, that the stranger of to-day may be our neighbor to-morrow, and that shortly his lines may become a portion of our own systems. Under such conditions standardization in all departments, not sectional, but national, is the end for which we should strive.

PARK ACCOUNTING*

BY E. L. SCHMOCK, ASSISTANT SECRETARY, CLEVEVLAND, PAINESVILLE & EASTERN RAILROAD

The park accounting methods of the Cleveland, Painesville & Eastern Railroad probably are different from those of other roads, because a small company has been incorporated to operate Willoughbeach Park. A separate set of books is used by the park company, although they are not as elaborate as the railroad company's books. On the ledger is kept a separate account for the receipts of each of the different amusements and concessions. In the operating and maintenance accounts is kept a separate account from each of the amusements and concessions showing labor separate from material and supplies. The man in charge of each amusement and concession makes out a report each evening covering his receipts for the day. This report, together with the cash and tickets collected, is turned in to the superintendent of the park.

There is only one ticket booth in the park; it is in the main pavilion. On holidays another ticket booth is opened on the grounds. The ticket seller at the main pavilion also acts as cashier and makes out a report each evening, showing the number of tickets sold, turning in this report with the cash to the superintendent. The superintendent then takes each of the individual reports and the cashier's report and makes one final report for the day's business covering all of the amusements and concessions. Each morning the individual reports, superintendent's report, tickets and cash collected are sent to the general office, where they are checked up by the cashier of the railroad company and the money deposited in the bank.

Owing to the fact that some of the concessions and amusements are scattered around the grounds, and the park not being large enough to have several ticket sellers stationed around the grounds, both tickets and cash are accepted at some of the concessions and amusements.

In the large parks where the business justifies employing several ticket sellers, no cash should be taken at the concessions and amusements. Each amusement and concession should be provided with a ticket box (one which cancels the tickets being preferred) in which the people can deposit their tickets

*Abstract of a paper read at a meeting of the Central Electric Accounting Conference, June 25, 1910.

without having the attendant handle them. Some persons in authority should at the close of each day's business go around and collect these tickets, and in order to get at the receipts of each amusement the tickets can be weighed, and the receipts approximated in this way.

The dining-room and confectionery privileges, also the cane-rack, doll-rack, etc., in Willoughbeach Park are leased on a percentage basis. The superintendent of the park makes a settlement with the manager of each of these concessions every evening, redeeming the tickets which are taken in, less the percentage which belongs to the park.

The railroad company's linemen take care of the wires, lamps, etc., at the park, and occasionally some of the trackmen are sent to the park to help fix up the grounds, when it is necessary. The railroad company bills the park company each month for this labor, and any material used.

In the matter of advertising attractions at the park or any special event, the railroad company does this advertising and charges one-half of the cost to the park company. This is billed to them at the end of the month. At the end of each month a statement is made comparing the receipts of each amusement and concession with those of the preceding year, and a trial balance is also taken showing the condition of the company at that time. In order not to make the bookkeeping of the park company a burden no attempt is made to get out a detail statement of operation each month.

FARE CASE AFFECTING EAST ST. LOUIS & SUBURBAN RAILWAY

A case involving the rate of fare charged in Belleville, Ill., by the East St. Louis & Suburban Railway, is now pending in the United States Courts. The company seeks to enjoin the city of Belleville against the enforcement of an ordinance reducing the rates of fare previously collected by the railway in certain territory.

The company formerly made four fare collections between the city of St. Louis (Eads Bridge) and the city of Belleville. Two of these collections were within the limits of the two cities as they existed at that time and the other two collections were in the intervening territory and were equally divided geographically. Largely for the purpose of effecting a reduction in the rate of fare on the lines of the railway, the city of Belleville annexed a strip of territory about 6 miles long by 2000 ft. wide, extending from its former city limits to the dividing point of the inter-city fare collections and passed an ordinance prohibiting a charge of more than a 5-cent fare within the city limits as extended. By agreement, the railway operated under this plan for over a year in order to determine the actual results. It was found that the net receipts from operation were from $40,000 to $50,000 per annum less than the amount required to pay 6 per cent on the actual cash cost of the property regardless of the issue of securities and 6 per cent for depreciation and amortization.

The company then entered suit in the United States Court for an injunction against the enforcement of the ordinance. It was alleged that the ordinance would take the property of the company without compensation and also that the ordinance violated the contract agreement originally existing between the city and the company. The court denied a temporary injunction pending the hearing of the case and since Jan. 1, 1907, the company has been operating the 17 miles of single track within the extended city limits of Belleville at substantially the rate of loss mentioned.

Efforts to secure a compromise of the matter failed and testimony was taken recently by a special master. Testimony was presented by disinterested accounting and engineering experts. The company presented evidence and facts to show that insufficient revenue was derived form the 5-cent fare basis to meet operating expenses, interest and depreciation on either the original cash cost of the construction, etc., or the present estimated replacement value of the property.

THE PROBLEM OF THE FIVE-CENT FARE*

BY HENRY W. BLAKE, EDITOR, ELECTRIC RAILWAY JOURNAL

During the past two months announcements have been made by all of the steam railroad companies entering New York from the north and west that they would advance their suburban passenger rates. Some of these rates have already gone into effect; others were to begin, according to announcement, on July 1 or earlier, although the request made by the Interstate Commerce Commission of the presidents of the railroads in New Jersey to delay the establishment of their advances in rates until August 1 may postpone action by those roads.

It is probable that no such general increase of suburban railroad rates or one affecting so many individuals has ever been proposed before in this country. Those most severely affected by the policy outlined will be the commuters, as the charges for commutation tickets have been increased from a few per cent to, in at least one case, that of New Haven, practically 80 per cent. It is difficult, without official data of the number of commuters from each station, to determine the total percentage of the increases on the different roads, but in the case of one company doing a very large suburban business, the increased income from the higher fares, based upon the present number of commuting passengers, is estimated at about 10 per cent, and it is probable that the average of all of the roads would not be far from this figure. The effect, if the proposed changes are carried out, will undoubtedly be to compel the suburban steam railroad passenger near New York to pay more for his transportation than he has had to do for a long time.

A significant fact in connection with the increases proposed has been that all of the roads have given the same reasons for their contemplated advances, namely, that for a long time the former rates were inadequate and owing to the advance in unit costs which go to make up operating expenses it has become no longer possible to carry passengers at the low rates except at a large loss. This explanation has been given irrespective of the financial condition of the company advancing the rates. It applies to the Erie Railroad, which has paid no dividend on its common stock and a total of only 8 per cent on its second preferred stock since the company was reorganized in 1895, and none on either its first preferred or second preferred since April, 1907; to the Delaware, Lackawanna & Western Railroad, whose stock is quoted at about 550 and which pays regular dividends at 20 per cent and declared an extra dividend of 50 per cent in July, 1909, and to the Central Railroad of New Jersey which has paid 8 per cent annually since 1902 and at the two last quarterly meetings declared extra dividends of 2 per cent. It applies also to the New York Central and Pennsylvania railroads, which are installing magnificent city terminals at tremendous expense, and to the West Shore Railroad, whose passengers can reach New York only by ferry across the river.

Changes in policy of this extensive kind possess more than ordinary significance and it is interesting to consider more in detail some of the reasons which have been advanced for making the changes described. The general passenger agent of the Erie Railroad in discussing the matter said: "When the old rates were made, the tracks were laid with 67-lb. rails at $15 a ton, now 85-lb. to 100-lb. rails are laid, costing $28 a ton, with 30 more tons to the mile. Ties were 30 cents, now they are 75 cents. Labor was a dollar a day, now it is $1.75 to $2. Passenger cars formerly cost $4,700 each; the 60 coaches bought a year or two ago cost $8,800 apiece. Locomotives were $8,000, to-day the average price is $15,000. The cost of labor of all descriptions has doubled, yet up to a certain point the full effect was not had, due to the gradual increase of travel. It may be interesting to know that, despite the Erie's relatively heavy local passenger business, last year the average number of passengers per coach was 16 and a fraction, while the seating capacity was 52. If all the seats were filled fares could come down. * * * Going still further into the question of increasing costs, the

*Abstract of paper read at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 28, 1910.

Erie's taxes, a charge against income, have gone up $500,000 in New Jersey in four years, whether justly or not need not be discussed. They have to be paid from the traffic receipts and the proper proportion charged to the suburban traffic."

Gerrit Fort, general passenger agent of the New York Central & Hudson River Railroad says: "The advance in our commutation fares was made because of a sharp increase in the cost of everything that enters into the conduct of our business, not only wages, but all kinds of supplies. For example, fuel has increased 38 per cent; ties, 76.4 per cent; steel rails, 47.4 per cent; angle bars, 52 per cent; gray-iron castings, 46.9 per cent; bar iron, 49.9 per cent; cast-iron pipe, 62.8 per cent; track spikes, 37.3 per cent; cast-iron wheels, 39.2 per cent; barbed wire, 47.1 per cent; bridge timber, 77.3 per cent; car axles, 41.4 per cent; locomotive steel forgings, 45.4 per cent; stationery, paper, etc., 20 per cent; locomotives, 50 per cent; cars, 72 per cent.

"The general effect of the new tariff is to place our fares on a harmonious and consistent basis. This is due to the fact that we have adopted a uniform scale in figuring the fares on all divisions, the maximum rate per mile being 1 cent, and the minimum rate 3.85 mills. To nearby points the maximum rate per mile obtains, and the rate per mile is gradually diminished until the minimum rate is reached at the most remote station in the commutation district. The percentage of increase varies from nothing to as high as 15 per cent."

Several of the steam railroad companies have issued leaflets giving statistics justifying the proposed increase.

Coincidently with this increase in passenger rates, which has been most marked on the roads centering in New York, there has been a general movement on the part of the steam railroads, both in the East and the West, toward an increase of their freight rates. The action of the Government in connection with this increase is well known. The reasons given by the railroads in their official explanation of these proposed increases are the same offered by railroads around New York to justify the increase in passenger rates; namely, the inadequacy of the old rates and increased "living expenses," the complaint which is made by a very large body of individuals to-day.

THE SITUATION OF THE ELECTRIC ROADS

In some respects the electric railways are in a worse condition than steam railroads. They are not only confronted by the same economic situation with regard to the higher cost of labor and of nearly all of the materials which are used in construction, operation and maintenance, but for a number of years past the city roads have witnessed a steadily decreasing income per passenger for the service which they render. Whether they can counteract this condition by an increase of unit charges as easily as the steam railroads have done or hope to do is another question.

INADEQUACY OF THE 5-CENT FARE

The present standard unit fare for city electric railway transportation has grown to be inadequate principally for the following reasons:

1. The increased length of ride which is obtained by the passenger for a single fare.

2. The decreased receipts per passenger owing principally to the issue of transfers.

3. The increased cost of operation per passenger.

4. The increased cost of raising capital for extensions and improvements and for retiring maturing issues of bonds.

INCREASE OF TRANSPORTATION FURNISHED

This is shown most clearly by the greatly increased size of the systems over which it is possible to ride for a single fare. As late as in 1890 there were as many as five separate and independent street railway companies in the Albany and Troy district, 12 in the territory comprised in the present borough of Brooklyn, 18 in Manhattan and Bronx, 10 in Syracuse and three in Utica. The tendency toward the consolidation of all of the electric railway companies in one city which was initiated on a large scale first in Boston soon extended during the early nineties to many other large cities until, in 1900, there were few cities in the country in which more than one company was giving purely city service. Before these consolidations, passengers, in most cases, had to pay a separate fare every time they changed from one road to another. After the consolidations, either by agreement with the municipality, by charter or by State statute, a single fare was sufficient to purchase a ride from any given point within the city limits to any other point on the same system, and as extensions were built still longer rides became available. Tables I and II show in concrete form both the rapid increase in number of the large roads brought about by these consolidations and the disproportion between the increase in mileage and number of companies. The same conditions have prevailed throughout the country, as shown by Table III. These consolidations have been accompanied by a large increase in the length of the average road, which has grown from 7.4 miles in 1890 to 20.4 miles in 1902 and 27 miles in 1907. Coincidently with these consolidations there has been a large increase in the number of transfer points. Those in the United States increased between 1902 and 1907 from 4455 to 7376, or 65.6 per cent, and those in New York State increased during the same period from 1157 to 1942, or 67.8 per cent.

TABLE I—NUMBER OF COMPANIES IN NEW YORK STATE WITH DIFFERENT LENGTHS OF TRACK.

(ELEVATED AND SUBWAY INCLUDED.)

Miles of Track.	1908.	1902.	1896.	1890.	1884.
0 to 10	39	41	51	53	66
10 to 20	17	24	17	19	12
20 to 30	13	7	12	7	3
30 to 40	3	6	7	6	..
40 to 50	5	2	4	3	1
50 to 60	2	1	..	..	..
60 to 70	2	2	..	2	..
70 to 80	1	3	1	2	..
80 to 90	3	..	..	..	..
90 to 100	3	1	2	..	..
100 and over	10	6	4	3	..
Totals	98	93	98	95	82

Note: Statistics from New York State reports, years ended June 30.

TABLE II—NUMBER OF COMPANIES IN NEW YORK STATE, WITH AVERAGE LENGTH OF TRACK.

(EXCLUSIVE OF ELEVATED RAILWAYS AND SUBWAYS.)

	Number of companies.	Average length of track, miles.
1894	83	16
1898	99	20
1900	102	22
1902	92	29
1904	99	31
1906	105	33
1908	97	40

Note: Statistics from New York State reports, years ended June 30.

TABLE III—NUMBER OF COMPANIES IN UNITED STATES, WITH DIFFERENT LENGTHS OF TRACK.

Miles of track.	1907. Number of companies.	1902. Number of companies.	1890. Number of companies.
Total	945	817	691
0 to 10	399	394	557
10 to 20	229	219	99
20 to 30	101	76	16
30 to 40	61	34	7
40 to 50	33	25	4
50 to 60	27	16	2
60 to 70	16	12	2
70 to 80	17	7	1
80 to 90	7	6	1
90 to 100	8	3	..
100 and over	47	25	2

Note: Statistics from United States Census reports, years ended June 30.

DECREASED EARNINGS PER PASSENGER

With the enlargement of the 5-cent zones which have followed the extensions of roads into the suburbs the available transportation for a single fare has been increased independent of the issue of transfers. We can, therefore, properly say that in addition to the longer ride which is obtained by the passenger of to-day, the gross receipts per passenger have been steadily decreasing as the ratio of transfers issued to passengers carried has increased. In New York City there has been a slight decrease in the ratio between transfer passengers and fare passengers due to the segregation of several of the roads, but as late as 1908 the ratio of transfer passengers to fare passengers on the electric railways of New York State (exclusive of the subway and Manhattan elevated) was 38.8 per cent, compared with 33.2 per cent in 1906 and 30.4 per cent in 1904. It is interesting to note in this connection that in

1908 if each transfer passenger in New York State had paid 1 cent for his transfer instead of receiving it without charge, the amount paid to the companies for the transfer privilege would have been $4,596,800.

INCREASED OPERATING EXPENSES

While developments in the art have had a tendency to decrease the operating expenses of those railway companies which have been in a position to take advantage of the improvements thereby effected the benefits which have resulted from them have been more than counterbalanced by the causes which have acted to increase expenses. Thus in the five years from 1902 to 1907 while the earnings from operation of the operating companies in the United States increased 68.9 per cent, and the passengers carried increased 63.3 per cent, the operating expenses increased 76.6 per cent. During the same period the ratio of operating expenses to earnings from operation increased from 57.5 per cent to 60.1 per cent, and the ratio of net income to earnings from operation dropped from 12.2 per cent to 9.4 per cent.

Four of the principal causes for increased operating expenses have been the following:

1. Increased cost of materials.
2. Increased cost of labor.
3. Higher standards of service and of equipment required by the public and by the commissions, and
4. An inclusion in operating expenses of charges for various items formerly capitalized.

Ever since 1897 there has been a continuous general increase in the selling prices of both raw and manufactured commodities, interrupted only, as all such general advances are, by occasional reactions which have but emphasized the general upward trend of prices. Many explanations have been advanced to account for this general advance and the subject has been carefully studied by the committee of the United States Senate appointed to investigate wages and the prices of commodities. The majority of this committee has just rendered a report in which a number of reasons for the present high prices of labor and materials are given, among them: the increased cost of production of farm products, by reason of higher land values and higher wages; the shifting of population from food-producing to food consuming occupations and localities; reduced fertility of land, resulting in lower average production or in increased expenditures for fertilization; increased banking facilities in agricultural localities, which have enabled farmers to hold their crops and market them at higher average prices; increased cost of distribution; industrial combinations; increased money supply, and higher standard of living. Whatever the cause, the results have affected electric railway companies in common with other consumers. Many statistics have been published of the increased cost of raw and manufactured materials used in different industries. But the electric railway art has changed and is changing so continuously that tabular statistics of material used now and 10 or 20 years ago, such as cars, motors and rails, while interesting and instructive, would be between apparatus of entirely different characters and capacities. We could say with perfect propriety, for instance, that 20 years ago a box horse car with running gear such as was then standard for city service in New York could be purchased for $1,000 and an open car for operation by horses could be purchased for $550 or $600, whereas the price of a two-motor car with electrical equipment, like that used in city service in New York to-day, would be about $5,000, while a four-motor car, such as is employed in many cities, would cost considerably more. Comparisons between other classes of material used in electric railway work would also show great differences in cost, but great differences as well in the character of equipment and service rendered.

With certain possible exceptions relating particularly to portions of the steam and electrical machinery, it is reasonable to assume the cost of the materials used by electric railway companies has been governed by practically the same law as that which has occasioned the general advances in prices of materials in other industries. Statistics relating to the cost of materials are available through several publications of the Bureau of Labor, especially Bulletins 75, 77, 81 and 87. The relative prices of commodities as given in Bulletins 75, 77 and 81 have been widely published, but the latest figures, as given in Bulletin 87, have just appeared and are of especial interest as they show that the tendency to high prices recorded in these earlier tabulations still continues. Advance figures from Bulletin 87 show, for instance, that the average wholesale price during 1909 of all of the materials considered by the bureau was 26.5 per cent higher than the average price of the same materials during the decade from 1890 to 1899 and was 41 per cent higher than in 1897 which was the year of lowest prices between 1890 and 1900.

The prices in these tables are those of a selected series of articles, including farm products, food, cloths and clothing, fuel and lighting, metals and implements, lumber and building materials, drugs and chemicals, house furnishing goods and miscellaneous. Of the articles enumerated, those most closely related to electric railway industry are metals and implements and lumber and building material. Metals and implements increased in price in 1909 24.8 per cent over the average between 1890 and 1899, and lumber and building material increased 38.4 per cent during the same period.

There were, of course, fluctuations in the index price of all the materials quoted during the decade 1900-1909, and the maximum for any one year up to 1907 was reached in that year when the increase over the 1890-1899 period was 29.5 per cent. This average fell to 22.8 per cent in 1908 and again rose to 26.5 per cent for the year 1909. But the 1908 reduction was only temporary and as Table IV shows, the prices during the first quarter of this year were considerably higher even than in 1907. In other words prices are higher now than for any year during the 20 years for which the government has published comparative figures.

Bradstreet's "index number of staple articles" shows this same general tendency in the increase in the prices of materials. This index number is made up by taking the average cost during each month of 96 staple articles whose fluctuations in price have been found to follow fairly closely commercial conditions. These articles represent the following main groups: Breadstuffs, live stock, provisions, fruits, hides and leather, textiles, metals, coal and coke, oils, naval stores, building materials, chemicals and drugs, and miscellaneous. Bradstreet's index number follows: On Jan. 1, 1908, it was 8.2949; on July 1, 1908, it was 7.8224; on Jan. 1, 1909, it was 8.2631; on July 1, 1909, it was 8.4573; on Jan. 1, 1910, it was 9.2310.

TABLE IV—RELATIVE WHOLESALE PRICES OF MATERIALS CONSIDERED.

(Average price for 1890-1899 = 100.0%.)

Period.	All commodities.	Lumber and building materials.	Metals and implements.
Average, 1907*	129.5	146.9	143.4
Average, 1909	126.5	138.4	124.8
January, 1909	124.0	137.4	126.1
February, 1909	124.0	137.8	124.4
March, 1909	124.5	136.1	122.6
April, 1909	124.6	135.8	121.8
May, 1909	125.4	135.7	121.3
June, 1909	125.5	135.5	121.6
July, 1909	126.2	135.3	122.3
August, 1909	126.4	136.8	123.5
September, 1909	128.1	141.3	125.8
October, 1909	129.0	140.6	128.1
November, 1909	130.9	143.5	129.3
December, 1909	132.2	145.0	130.6
January, 1910	132.8	149.3	132.8
February, 1910	133.0	151.5	133.0
March, 1910	133.8	151.3	133.8

* Highest average yearly prices for all three groups for period 1890-1907.
Note: Statistics from Reports 81 and 87, Bureau of Labor.

Undoubtedly, as explained, improvements have been made in railway equipment during the past 10 years, and these improvements have had a tendency to overcome in some departments the increased cost of materials used in that department. For instance, it is probably true that the increased cost of fuel has been largely overcome by improvements in the efficiency of power-station equipment for those companies which have been in a position to install generating equipment of high efficiency. Invention and a better knowledge of the requirements have improved railway conditions in other branches, but the fact

must not be forgotten that this same march of improvement has brought with it an equally rapid rate of depreciation due to the obsolescence of the apparatus in use, a fact which has to be taken into consideration in determining the value of the benefits received.

INCREASED COST OF LABOR

In 1907 the wages paid employees constituted over three-fifths of the entire operating expenses of the electric railways of the country, so that any increase in this charge is a more serious matter in economical railway operation than probably in any other public utility. In this connection some figures on the hours and wages of employees in New York State during 1885, as shown by the report of the Board of Railroad Commissioners of New York State, may be of interest:

Albany Railway: Conductors, average number of hours on duty per day, 8 to 16 hours; wages per day, $0.78 to $1.82; per hour, 9.8 cents to 11.4 cents. Drivers, average number of hours on duty per day, 8 to 16; wages per day, $0.72 to $1.95; per hour, 9 cents to 12.2 cents.

Albany, Watervliet Turnpike and Railroad: Conductors, average number of hours on duty per day, 15; wages per day, $1.70; per hour, 11.3 cents. Drivers, average number of hours on duty per day, 15; wages per day, $1.45; per hour, 9.7 cents.

Brooklyn City Railway: Conductors and drivers, average number of hours on duty per day, 13¼; wages per day, $2; per hour, 15.1 cents.

Buffalo Street Railway: Conductors, average number of hours on duty per day, 12; wages per day, $1.80; per hour, 15 cents. Drivers, average number of hours per day, 12; wages per day, $1.60; per hour, 13.4 cents.

Coney Island and Brooklyn: Conductors and drivers, average number of hours on duty per day, 14; wages per day, $2; per hour, 14.3 cents.

Forty-second Street & Grand Street Ferry, New York: Conductors and drivers, average hours on duty per day, 13½; wages per day, $2; per hour, 14.8 cents.

Rochester City and Brighton: Conductors and drivers, average hours per day on duty, 13; wages per day, $1.87½; per hour, 14.4 cents.

Syracuse and Geddes: Conductors, average hours per day, 16; wages per day, $1.54; per hour, 9.6 cents. Drivers, average hours per day, 16; wages per day, $1.31; per hour, 8.2 cents.

The difference between these rates and those paid in the same cities now to street railway employees will be recognized.

The cost of labor, however, has increased steadily, not only in electric railway service, but in all industries in the United States, with the cost of food, and it is not surprising to find the striking correspondence between the two given in the accompanying chart, which is from Bulletin No. 77 of the Bureau of Labor. This shows an increase in 1907 of 28.8 per cent in wages per hour over the average rate between 1890 and 1899, inclusive. During this period, however, there was a reduction of 5 per cent in the average working hours per week, so that the average full-time wages per week showed an increase in 1907, as compared with the period 1890-1899, of 22.4 per cent. The corresponding increase in the cost of food was 20.6 per cent. This cost, also plotted on the chart, is based on retail prices and on weights of different articles proportioned according to their consumption in a workingman's family.

The figures on wages and employees for all the street railway companies in New York State for alternate years from 1898 to 1906, inclusive, are given in Table V. Table VI, which is from the United States census report, shows the number of different classes of employees in New York in 1907 and 1902. Complete statistics on wages since 1907, either for the entire country or New York State, are not available, but as with the price of materials, there has undoubtedly been a constant increase in the rate of wages paid in all industries. Certainly there has been a marked increase in the wages which have been paid in the electric railway industry.

TABLE V—SHOWING NUMBER OF EMPLOYEES AND WAGES PAID BY THE NEW YORK STATE STREET RAILWAYS. (INCLUDING BROOKLYN ELEVATED.)

	Number of employees (including officials).	Wages paid.	Average per employee.
1898	25,052	$13,080,651	$522
1900	28,075	16,968,907	604
1902	30,529	17,857,825	585
1904	32,646	19,812,227	607
1906	*43,285	*28,882,153	*667

*Including Manhattan Elevated Railway and Subway.
Note: Statistics from New York State reports, years ended June 30.

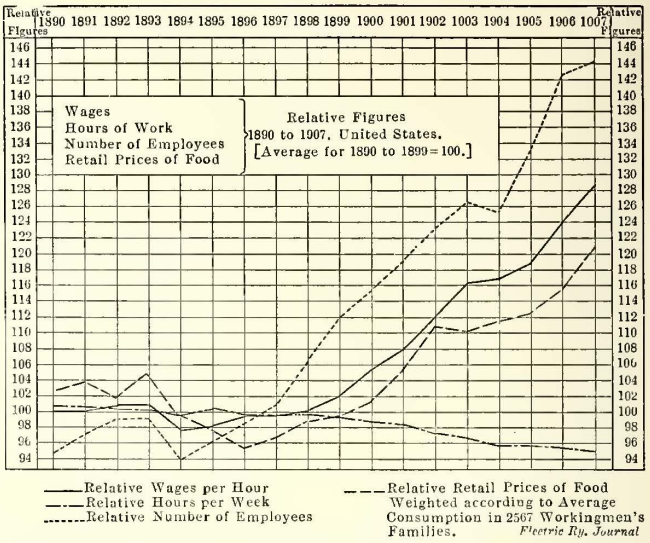


DIAGRAM SHOWING RELATION BETWEEN WAGES, HOURS OF LABOR, NUMBER OF EMPLOYEES AND RETAIL PRICES OF FOOD IN THE UNITED STATES, FROM 1890 TO 1907.

TABLE VI—SHOWING CLASSES OF STREET RAILWAY EMPLOYEES IN NEW YORK STATE IN 1907 AND 1902 AND PERCENTAGE OF TOTAL.

	Number.		Percent in number of total.	
	1907.	1902.	1907.	1902.
Number of companies	101	96	....	....
Salaried employees—				
Total	1,877	1,221	3.9	3.5
Officers of corporation	170	188	.4	.5
Other officers, managers, superintendents, etc	231	136	.5	.4
Clerks and bookkeepers	1,476	897	3.0	2.6
Wage earners—				
Total	46,001	33,192	96.1	96.5
Foremen	447	205	.9	.6
Inspectors	517	316	1.0	.9
Conductors	12,946	9,661	26.9	28.1
Motormen	9,748	9,204	20.2	26.7
Starters	317	262	.7	.8
Switchmen	767	591	1.6	1.7
Road and trackmen	4,921	2,778	10.2	8.1
Linemen	595	430	1.2	1.3
Electricians	481	320	1.0	.9
*Car and motor repairers	3,127	....	6.5	....
Engineers	225	209	.5	.6
Dynamo and switchmen	414	302	.9	.9
Firemen	503	578	1.0	1.7
Other mechanics	3,720	1,660	7.8	4.8
Hostlers and stablemen	518	546	1.1	1.6
Watchmen	409	173	.9	.5
All other employees	6,346	5,957	13.3	17.3

*Not separately reported in 1902.
Note: Statistics from United States Census reports, years ended June 30.

The claim may be made by some persons that most if not all of the wage increases of the past year were voluntary acts of the different companies and that consequently they constituted a burden which might have been avoided. But this is an erroneous conception of the situation. While the advances might not have been occasioned by strikes or even caused by fear of strikes, wages have increased so generally that those companies which were not paying the market price for competent labor had to increase their rates to retain their old men and attract new men and keep their cars in operation. The compulsion from an operating standpoint was as great as if the advance was forced by a strike while the result was better for the men, the company and the public.

HIGHER STANDARDS OF EQUIPMENT AND QUALITY OF SERVICE REQUIRED BY COMMISSIONS AND BY THE PUBLIC

It is impossible to estimate the exact effect of this factor in increasing expenses, but there is no doubt that the more expensive standards required by public service commissions, by

legislatures and by public opinion, in the way of increased safety and comfort of transportation and in the maintenance of unremunerative service on poorly patronized lines have increased materially the expenses of operation. For instance, between 1902 and 1907 there was an increase in number of cars in the United States of 25.2 per cent, whereas the number of cars equipped with fenders increased 36.2 per cent and the number equipped with air brakes increased 300.8 per cent. During the same time the number of cars other than open cars in the United States increased 43.7 per cent, the number of these cars which were heated increased 45.6 per cent and the number heated by electricity increased 65 per cent.

Under this heading also can be included the additional clerical and experienced accounting labor needed to compile the more elaborate financial and other statistics required now by the public and stockholders. Thus in the United States there was an increase between 1902 and 1907 of 4572 salaried employees, or 64.1 per cent. Of this number there was an increase of 38 officers, or 2.6 per cent; 767 managers, superintendents, etc., or 57.8 per cent, and 3767 clerks and bookkeepers, or 108.3 per cent. Table VI gives the classification of the employees in New York State, with the percentage of the total in each of the years mentioned.

OTHER FACTORS WHICH HAVE INCREASED OPERATING EXPENSES

Other charges against operating expenses which have increased rapidly during the past few years are:

(a) Requirements by commissions as to representation of companies at hearings, requiring attendance of principal officials, engagement of legal counsel, and often the engagement of outside engineering and accounting experts.

(b) Requirements of public service commissions, the State or public opinion in regard to hours and terms of labor, employers' liability, safety and sanitary precautions for employees and the public.

(c) Increase in charges for damages. This charge for all the electric railways in the country increased for 1902 to 1907 from 6.6 per cent to 7.2 per cent of the operating expenses in spite of the fact that in 1902 94.2 per cent of the gross income of the operating companies reported came from railway service and 5.8 per cent came from other activities while in 1907 only 90.9 per cent of the gross came from railway operation.

(d) Frequent legal obligation on the part of railway companies to defray the expenses of municipal or State regulation.

INCREASE IN TAXES

The direct taxes and license fees paid by operating electric railway companies in the United States decreased slightly in the period 1902-1907 when calculated as a percentage of the gross income, or from 5.2 per cent to 4.6 per cent, but if indirect taxation is included, such as paving, lighting, sprinkling, snow removal and similar requirements, it is probable that there has been an increase. Table VII shows the taxes paid by street railway companies in New York State in alternate years from 1894 to 1908, inclusive, per mile of track and percentage of earnings for operation, as given in the report of the Railroad and Public Service Commissions. The figures given do not include franchise taxes assessed but not paid. If added they would considerably increase the amounts of taxes during the past 10 years.

TABLE VII—SHOWING TAXES PAID BY STREET RAILWAY COMPANIES IN NEW YORK STATE (NOT INCLUDING MANHATTAN ELEVATED AND SUBWAY).

	Total.	Per mile of track.	Per cent. of earnings from operation.
1894	$959,542	$706	4.01
1896	1,164,820	671	4.04
1898	1,439.250	717	4.51
1900	2,311,303	1,009	5.66
1902	*2,456,881	*925	*5.24
1904	*2,656,233	*868	*5.24
1906	*2,895,408	*897	*4.89
1908	*3,784,299	*965	*5.79

*Including elevated in Brooklyn.
NOTE: Statistics from New York State reports, years ended June 30.

INCREASED COST OF CAPITAL

The deductions from income on account of interest and rentals of the electric railways in the United States increased between 1902 and 1907 from 25.8 per cent to 27.5 per cent of the gross income. It is well known that the rate of interest demanded by investors in all forms of investment securities is considerably larger than 5 or 10 years ago, and this has undoubtedly had an influence in reducing the net income of those electric railway companies which have had to borrow money during this period to make improvements or to meet maturing issues of bonds. It would be interesting in this connection to learn the proportional increase in funded and unfunded debt of the electric railway companies in the United States, but this condition is complicated by advances made by holding companies to leased companies. On the face of the returns while the interest paid on the funded debt of operating electric railway companies in the United States decreased between 1902 and 1907 from 14.1 per cent to 12.5 per cent of the gross income, the aggregate of the interest on other debt, rent of leased lines and terminals, and miscellaneous deductions increased from 11.7 per cent to 15. per cent of the gross income, so that, as quoted above, the deductions from income on account of interest and rentals increased from 25.8 per cent to 27.5 per cent.

REDUCED MILEAGE

The condition is admittedly a serious one, not only to the electric railway companies, but to the country which is dependent upon extensions of the transportation facilities to keep pace with the development in the industries, populations and transportation requirements of the community. But the ability to construct extensions involves the ability to sell securities and in the present state of the investment market it is extremely difficult to finance any new electric railway undertaking. As an example, the returns from New York State, as contained in the 1909 and 1910 editions of *American Street Railway Investments,* show during the year only 138.1 miles of new electric track were built, or less than 3 per cent of the total mileage of the State. Of these, 80 miles represented the interurban railway construction of one set of owners whose work was commenced several years ago, 15½ miles represented an interurban line built across Long Island and 6 miles were horse track, leaving less than 37 additional miles for the 160 or more other operating companies of the State. It is doubtful whether any one would have the temerity to claim that the needs for additional means of transportation in the territory served are limited to the pitiful amount of new mileage shown above.

CONCLUSION

A study of the situation of the average city electric railway company indicates, therefore, that, although it is enjoying an increase in gross receipts, this gain is being accompanied by such a large increase in expenses that the net receipts are becoming less. Unfortunately there are no radical improvements of either apparatus or practice in sight to promise material betterment of present conditions. The limit of size of cars which can be commercially operated has been reached, if indeed it has not been exceeded in many instances. The outlook for reducing expenses by increased car speeds is equally discouraging because as the business of our cities grows, street congestion will become worse rather than better. The prices for labor and materials, as a whole, are higher than at any other period in the history of electric traction. Such a condition means a general cessation of extensions and improvements—possibly of operation in some cases—unless some plan can be evolved by which the receipts per passenger can be increased. To secure this advance, special authority would probably be necessary, but if the advance is justified in public opinion the authority should not be difficult to secure. The form and extent of the increase would, of course, have to be determined, and might vary in individual cases. But the main facts of the higher costs of material and labor are matters of general knowledge and the movement to increase the rates on the steam railroads forms a precedent to similar action on the part of the electric roads. The final solution of the problem merits the most serious study on the part of legislatures, public service commissions and railway officials.

THE LATEST DEVELOPMENT IN CAR WHEELS FOR ELECTRIC RAILWAYS *

By V. S. Yarnell, Expert, Carnegie Steel Company.

The methods of manufacture, as will be explained in the paper, are those employed by the Carnegie Steel Company in the manufacture of Schoen solid forged and rolled steel wheels.

DEVELOPMENT

The solid steel wheel represents the result of evolution. The first wheels made were of wood sawed from the trunk of trees or fashioned from timber. These were later bound with iron to insure longer life and better service. The wooden wheel of a century or more ago was superseded in turn by the cast iron wheel as that material came into use as the result of improved methods in founding and casting, and continued to be the standard wheel for all classes of service so long as that service did not exceed the limit of its strength.

Wheels were then made from paper, compressed into solid form, with iron or steel rims. They in turn were superseded by wheels of cast iron or cast steel centers with rolled steel tires, the process of rolling not having been sufficiently far advanced to insure the immediate and satisfactory substitution of a solid steel wheel for cast iron, although more than 20 years ago a company was organized to forge and roll steel wheels from solid ingots. The solid steel wheel, whether forged or rolled, stands at the head of this chain of development. It may not be the ideal wheel of the future, but it is to-day the best wheel for all classes of service because it combines within itself those elements of strength, safety and homogeneity which characterize rolled steel over any other material of construction.

HISTORY

The first practical solid forged and rolled steel wheel manufactured in the United States was made in 1903, by Charles T. Schoen, the pioneer builder of steel cars, after a long series of experiments covering a period of five years. The Schoen Steel Wheel Company was organized in May, 1903, and was purchased by the Carnegie Steel Company in July, 1908. The Schoen plant is located at McKees Rocks, Pa., and is now a part of the Homestead Steel Works organization, which is one of the plants of the Carnegie Steel Company.

SELECTION OF MATERIAL

The chemistry of the steel used in the manufacture of Schoen steel wheels has been arrived at after careful consideration. The prescribed limits of the carbon, maganese, silicon, phosphorus and sulphur, as shown in the 1910 wheel catalogue, issued by the Carnegie Steel Company, we believe to be ideal for wheels manufactured by this process, to insure the proper degree of hardness and toughness, which means wearing quality combined with safety.

ROLLING THE SLAB

Ingots of the proper chemistry being selected, they are heated and rolled in the slab form, about 26 in. wide by 4¾ in. thick. The process of rolling the ingots into slabs is the first refining process in the manufacture of the wheel—the reduction being about 6 to 1.

SELECTING THE SLAB

This is one of the most important features in the manufacture of wheels. It is a well known fact that in all steel ingots there exists a certain amount of segregation and small gas pockets, usually in the center, extending from the top downward. To insure the elimination of the segregated portion, a liberal discard is invariably made. No slab is ever used in the manufacture of wheels that in any way shows surface or internal defects. The slabs that pass this rigid inspection are then stamped with the heat number from which they were rolled, also numbered serially, and marked with a letter indicating the position in the ingot from which the slab was cut.

PROCESS OF FORGING AND ROLLING THE WHEEL

The first operation in the wheel plant is heating the slab for forging, extreme care being exercised to bring the slab to the proper temperature by gradually heating, to insure that the structure of the metal when finished will be in the best possible condition. The slab after heating is forged in a 7000-ton hydraulic press.

This forging machine carries in addition to the top forging die, a heavy circular knife or shear, and after the first forging operation, the blank is sheared by the same machine to circular form. Fig. 1 is a sectional view of the wheel blank after the first forging operation. In this view can be seen the result of distributing the metal which is pressed into the hub from the portion that will eventually be the web, and this gives the blank its first form of a wheel.

REHEATING

After the blank has been reheated it is subjected to the second forging operation in a 5000-ton capacity hydraulic press. A ring is slipped over the hot blank and through this ring the rim alone is given an extra forging. The result of these two successive forgings is that the metal has been pressed from the center of the slab and condensed in the rim where density and homogeneity of material make possible uniformity of service wear. Fig. 2 is a sectional view of the blank after the second forging. From the second forging press the blank passes through the punch, where the metal left in the hub by the acorn-shaped dies of the forge is removed by a specially constructed punch. This punch exerts a pressure of 750 tons. Fig. 3 is a sectional view of the blank after coming from the punching machine. The blank comes from the punching machine at about

Fig. 1

Fig. 2

Fig. 3

Fig. 4

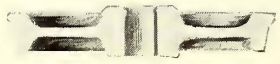
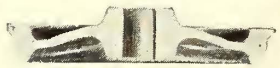


Fig. 5

Fig. 6



a cherry red, and again passes to another heating furnace, where it is heated uniformly, after which it is rolled in a specially constructed rolling mill, where the rim of the wheel receives a thorough working or rolling.

In the rolling operation a mandrel is placed through the hub and the wheel is supported in this manner during the rolling operation. There are five rolls, all bearing on the wheel at the same time. The two web rolls, which are power driven, have a bearing surface from directly under the rim extending to within 6 in. of the hub. The back roll formed to fit the trend and flange is on the same horizontal plane as the web rolls and directly in line with the center of the wheel. The two side rolls bearing on the edge of the rim work by friction. All the rolls are adjustable and during the rolling operation the back roll is forced towards the web rolls, compressing the metal in the rim to the required density, and can be varied according to the amount of rolling and the temperature at which the metal is finished. The web of the wheel, as it comes from the rolls, is flat and at right angles to the tread.

Fig. 4 is a sectional view of the wheel as it comes from the rolling mill, and shows the amount of work that has been done on the portion of the web nearest the rim of the wheel. It also shows the decreased area of the rim, indicating the amount of pressure brought to bear at this point in the rolling operation. The rolling of the rims is done principally to make the metal of the proper density to resist wear in service. The wheel is taken from the rolling mill at about a cherry red and

*Paper presented at annual meeting of Street Railway Association of State of New York, Cooperstown, June 28-29.

is given the proper amount of coning or dishing. Under the same press the wheel is made truly round by compressing its circumference in a die composed of segments of a circle. Fig. 5 is a sectional view of the wheel after coming from the coning and truing press. Fig. 6 is a sectional view of the wheel machined to a finish.

INSPECTION

The wheel after passing through the various operations, as described, is now ready for inspection. All wheels are carefully inspected, either by a representative of the purchaser, or by the inspectors of the manufacturer. All wheels are rejected that in any way show they have developed defects in the course of manufacture, also those that are not within the tolerances set forth in the specification.

RESULTS OF THE METHODS OF MANUFACTURE

The care exercised in selecting steel of a suitable grade, discarding a liberal amount from the top of each ingot used, the thorough, uniform working of the steel in the rolling mill, in the forging presses, and finally in rolling the wheels at proper temperature, results in the finished wheel being homogeneous and as free from inherent defects as it is possible to manufacture.

The proper chemical composition of the steel used, combined with the mechanical operation in the process of manufacture, insures durability.

Strength and hardness, combined with toughness, guard against failure from breakage in service, which means that the solid steel wheels, as being made to-day, under the supervision of experts, are safe, strong, durable and homogeneous and meet the hard service conditions of high speed and heavy wheel loads, as shown by the service records of the railways.

NUMBER OF WHEELS IN SERVICE

There are nearly 400,000 Schoen steel wheels in service, of which approximately 100,000 have been applied on electric railway cars, in addition to a large number of solid steel wheels of other makes. We are all striving after the same result—a perfect wheel.

To have wheels prove efficient in service, it is necessary that they be made well and treated well. The responsibility for the performance of wheels in service rests as much with the user as with the manufacturer.

SHOP PRACTICE AND MAINTENANCE OF WHEELS

In the maintenance of wheels, both for efficiency and economy, there are several points which might be considered which would increase the mileage of the life of the wheel. In selecting a pair of wheels to be mounted on an axle, the first thing to be taken into consideration is the diameter, in order that there may be as little variation in the wheels as possible.

In boring the wheel, it should be bored absolutely true and it should be known that the axle is perfectly straight. The wheels after being pressed on should be gaged properly at several different points on their circumference so as to be absolutely sure that the flanges run true to the rail at all points. A gage should also be furnished the wheel inspectors, whereby they could determine the exact wear of the tread and flange before the wheels are removed for re-turning.

It is very common practice for the interurban companies to allow the flanges to run until they are dangerously sharp. This is false economy, as in this way so much metal has to be removed in turning so as to again bring the tread and flange to its proper shape that the loss of metal is much greater than would be necessary were the wheels turned at the proper time.

Trucks should also be considered an important feature in the saving of wheel flanges. While from ordinary inspection it might appear that the truck was in fair condition, the placing of a tram diagonally across the truck from center to center of journal box will show a great many of these to be untrue, or in other words, the truck will be out of square. This also has a great deal to do with sharp flanges or the crowding of wheels. All of the above defects, to say nothing of bad track conditions, are important factors in the life or mileage of wheels.

STANDARDIZATION

A word as to standard designs for solid steel wheels. It is the desire of the Carnegie Steel Company to lend every assistance to its railway friends in their efforts to arrive at a limited number of standard designs for electric railway wheels. To this end the Carnegie Steel Company has recently issued a wheel and axle catalog, in which are shown wheels suitable for all classes of service. These are, with few exceptions, in accordance with the recommended practice of the Committee on Equipment of the American Street & Interurban Railway Association.

In this connection the speaker wishes to quote from the 1909 report of the Committee on Equipment, as follows:

PROPOSED STANDARDS FOR ROLLED STEEL WHEELS

"The demand for standardization of rolled steel wheels has been manifest for some time and now that their use is becoming so general, the necessity of some sort of standards becomes more and more urgent.

"Manufacturers of rolled steel wheels state that a large number of designs come in, which require large expenditure for dies and rolls. If the number of designs and sizes could be reduced, it would enable the manufacturers to avoid equipping with a multiplicity of dies, and what perhaps is even a more important feature, the use of a limited number of standards would obviate the necessity of frequent change of dies in running out small orders. It can readily be seen that a continuous day's run on one size and style of wheel means the maximum output and minimum cost of production, but if, after running out a few wheels, it is necessary to change dies, run out a few more and repeat this operation a few times, the day's output will be greatly curtailed and the cost of production rise to an unduly high figure.

"It is the belief of the wheel manufacturers, and of your committee, that certain representative dimensions of wheels can be adopted which will meet practically all railway requirements.

"The great advantage of standards to the railway company arises from the fact that fewer designs mean lower production cost to the manufacturer and correspondingly lower prices to the consumer."

ACTUAL SERVICE RECORD

Another quotation from the report of the committee on equipment of the American Street & Interurban Railway Engineering Association, which report was compiled from data received from 35 different street and interurban railway companies, is as follows: "That many of the larger companies are coming to the use of rolled steel wheels, deeming it safer and more economical."

The mileage obtained from rolled steel wheels is shown in committee's report by questions and answers, as follows:

Q. "How many turnings are given them?"

A. "The average is 3, with the exception of one large company, which gives 10."

Q. "What is the approximate mileage between each turning?"

A. "The large company above mentioned gets 10,500 miles between each turning. The rest of the companies give the wheels between three and four turnings and obtain an average of between 30,000 to 35,000 miles between each turning." The rim of the wheels ranges from 2 in. to 3¾ in. in thickness when new and were worn down to between ½ in. and 1¼ in. in thickness when scrapped. This record shows the life of the wheels to be 150,000 to 175,000 miles.

Although many of the roads using solid steel wheels are obtaining much greater mileage, one company has had several hundred Schoen rolled steel wheels in service for more than three years with a record of over 100,000 miles, without turning.

The large number of rolled steel wheels that are being used, and the growing demand for wheels of this type indicate that the railways are adopting them principally for reasons of safety and economy.

RAILWAY MOTOR GEARS AND PINIONS*

BY T. W. WILLIAMS, GENERAL ELECTRIC COMPANY

The involute or single curve tooth is used for railway motor gears and pinions in preference to the epicycloidal or two curve tooth for two reasons: Firstly, on account of the greater thickness of the dedendum, and, secondly, because the epicycloidal tooth cannot be operated unless the distance between the centers of the gear and pinion remain constant, which is impossible under present operating conditions. While the epicycloidal tooth affords as nearly a perfect roll and frictionless operation as can be obtained, this unfortunately is not true with respect to the involute tooth. In order to obtain a perfect roll it is obvious that the meshing teeth of the gear and pinion must have the same contour of face. This condition cannot obtain for the involute tooth unless both gear and pinion are made with 30 teeth or more, and practically all railway motor pinions are designed to have less. Pinions with less than 30 teeth have the dedendum undercut, which undercutting becomes greater as the number of teeth diminish. This is done to give a proper clearance for the gear teeth. It is, of course, quite clear that the smaller the diameter of a gear the greater is the space between the tops of the teeth.

A radial line passing through the pitch circle on the face of a tooth and another line at a tangent to the same point forms in the case of a standard involute tooth an angle of 14½ deg. It is obvious that the greater the angle the thicker does the tooth become at the base and any increase in this direction is a distinct gain in tooth strength. It is now fairly standard practice to make gear and pinion teeth with an angle of 20 deg. for all motors of over 150 hp capacity. They are generally known as stub teeth. No matter what angle of tooth, it is, of course, essential that the dimension at the pitch line shall remain constant. It is also the practice to have the dedendum or distance from the pitch line to the tooth base remain the same as the standard, while the addendum or part above the pitch line is reduced. It is claimed that on account of the increased angle of pressure the bearing linings will be the more readily affected, but from observations in actual practice this trouble does not seem to exist. Mention has already been made of change in tooth profile for pinions which have less than 30 teeth. Theoretically this change takes place as each tooth is eliminated, but the difference for each change is only a few thousandths of an inch. There is also a growing demand for considerable accuracy with respect to tooth dimensions. Such requirements are commendable and are being given careful and proper attention, and doubtless they would increase the efficiency of the gearing if all other vital requirements could be maintained, but when one considers the unsatisfactory conditions under which railway motor gearing is operated it is obvious that the change of a few thousandths of an inch in some part of the tooth dimensions is insignificant. Take as an instance the fact that the present design of trucks precludes the use of a bearing on both sides of the gear and pinion so that when power is transmitted from the pinion to the gear both the armature and axle shafts tend to spring away from one another. The armature shaft bearing adjacent to the pinion becomes worn on the side which is farthest from the axle shaft, while the bearing at the other end wears on the side near the axle shaft. This allows the pinion teeth to set at an angle to the gear teeth, which means that the ends of the teeth nearer the motor do the greater proportion of the work while the pitch lines at the other end of the gear and pinion teeth are so far apart that they do not transmit their share of the pressure. Furthermore, it must not be forgotten that the axle bearings on which the motor is mounted have also worn on the side away from the motor tending to carry the pitch lines of the gear and pinion teeth still further apart. Again an examination of teeth broken in service almost invariably shows the fracture to have started at the motor end and that only about one-third of the tooth is broken off. If the axle linings were more frequently replaced or an outboard bearing could be provided for both the armature and axle shafts, it would then be advisable to pay more detailed attention to the profile of the tooth face, but under existing conditions the tooth is unquestionably the most accurate part of the whole mechanism. A means for a partial elimination of bearing wear is the mounting of a pinion on each end of the armature shaft with two gears on the axle shaft. This throws equal stress on both trains and always keeps the pitch circles of the meshing gears and pinions parallel to one another. The writer recently had the opportunity to inspect an electric locomotive operating under such conditions and found that the wear across the whole of the face of the teeth was identical and for this reason alone they should give a much greater life than if only one gear and pinion were used of twice the tooth thickness or length of face.

A second fruitful cause of rapid wear of teeth is the amount of sand that drifts into the gear case. It is generally conceded that gears and pinions operated on elevated structures show a longer life than those run over paved streets, and a still far greater life than those run over unpaved streets especially in a sandy country. An analysis of grease taken from motor gear cases used on elevated structures shows about 1 per cent of gritty matter, while on paved streets the percentage of grit increases to 5 or 6 per cent and in sandy country it will run as high as 18 or 20 per cent. Rapid wear of gears and pinions can almost always be attributed to wear of bearing linings or an excessive amount of grit in the gear case. The question of a suitable gear lubricant has received careful attention from a number of prominent manufacturers. Unquestionably a lubricant of a heavy clinging character gives the best results, but it is quite possible to err too far in this direction and use one that is so heavy, that considerable energy has to be expended even to make the gearing turn round. To insure a maximum of clinging quality of lubricant at a minimum expenditure of power some companies manufacture two grades, a heavy one for summer use and a lighter one for winter.

Cedar chips and cork dust can also be added with quite beneficial results. What seems to be most needed is some agent which will form a cushion between the meshing teeth and prevent them from cutting one another, and for this reason oils and thin grease are not recommended.

The question often comes up as to the limit of wear of gear and pinion teeth. So far as efficiency is concerned, tests have indicated that there seems to be little difference between new and considerably worn teeth running together, so that the question seems to hang on two pegs. First and perhaps most important, the susceptibility of the nerves of the population living on the route over which the gears are operated and in the second place, upon the strength of the metal in the teeth.

It is the standard practice to manufacture gears from cast steel. Such steel contains about 30 points of carbon and has about the following physical characteristics:

Tensile strength	60,000 lb.
Elastic limit	25,000 lb.
Elongation in 2 in.	18 per cent
Reduction in area	20 per cent

This metal is of ample strength for gears to be used with motors up to a capacity of 75 hp, but for motors with a higher capacity greater strength is required. This can be attained by increasing the carbon content so as to obtain the following physical characteristics:

Tensile strength	70,000 lb.
Elastic limit	30,000 lb.
Elongation in 2 in.	20 per cent
Reduction in area	30 per cent

It will be noted that the reduction in area has been increased notwithstanding the increased content of carbon. This has been effected by annealing the metal after it has been cast, because

*Abstract of a paper read at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 28, 1910.

the extra carbon would make it too brittle if annealing were not resorted to.

Cast steel gears are made either split or solid and the split type are furnished with either four or eight bolts. In the case of the eight bolt gears, four are placed on each side of the hub, two alongside one another near the hub, the other two as near the rim as possible. A bad feature about the eight bolt gear is that the bolts cannot be made of sufficient diameter to prevent the metal being stretched beyond its elastic limit, when the gear is bolted on the shaft. This complaint cannot be raised with reference to four bolt gears because the diameter of the bolt can be sufficiently increased to prevent trouble. The bolts in four bolt gears can be located one on each side of the hub, and the other two out by the rim. In this case the hub bolts are about 8 in. long, while the rim bolts are less than half that length. Naturally there is more stretch to the longer bolt and a consequent difficulty to equalize the strains between them. Another method is to place the bolts side by side midway between the hub and rim. In this case all four bolts are of the same length.

It may be argued that on account of such a location the gear when under stress would tend to open either at the hub or at the rim. This trouble can be anticipated in the design and it does not occur in actual practice. In fact both are amply strong for the requirements.

Solid gears on account of their general design can be made both stronger and lighter than split gears and one excellent feature is the fact that if sufficient allowance is made for a pressing fit there is no necessity for weakening the wheel axle by key seating for the gear key. An allowance of 0.001 in. for every inch of axle diameter should require from 40 to 60 tons to force the gear in place, and such a fit is ample to prevent the gear from slipping. In order to obtain maximum strength of steel in a casting it is essential that all sections shall be as nearly the same thickness as possible. Therefore, when the outside finished hub diameter (or that portion around which the gear case fits) is large in comparison with the hub bore, it is advisable to core or groove the exterior of the hub. This will tend to leave all sections about the same thickness, reduce the weight, and allow all portions of the metal to cool equally. If the hub were left full size then it would cool more slowly than the spokes, excessive shrinkage strains would be set up at the junction and any excessive stress in operation would be liable to cause a fracture at that point. Similar care should be taken in the design of the juncture of the spokes and rim because when a gear rim breaks the fracture almost invariably occurs at this point.

During the early days of electric railroading when the capacity of motors did not exceed 40 or 50 hp. cast steel gears and soft machine steel pinions were ample for the work required of them, but with the advent of heavy interurban and suburban cars requiring greater capacity motors and running at much higher speeds, such metal was unable to cope with the demands, until at the present time every artifice known to the steel manufacturer is being used to produce a metal of sufficient hardness, strength and toughness to successfully take care of the service.

The first step in the direction of strengthening pinion steel was to increase the contents of carbon and manganese, the former to raise the elastic limit and the latter to increase the toughness and liability to wear. Also the pinion billets were forged in both directions to obtain equal physical characteristics in both longitudinal and transverse axes. This increased the elastic limit from 25,000 lb. per sq. inch, as is obtained in ordinary machine steel, up to about 40,000 lb. per sq. inch, but even this increase was insufficient to cope with the demands of some roads. It then became a choice of heat treating carbon steel or going over to alloy steels such as chrome nickel or chrome vanadium.

The highest requirement in tooth stresses is about 75,000 lb. per sq. inch. The elastic limit of heat treated carbon steel or chrome vanadium steel will exceed the value, but as the first cost of the carbon steel, also the cost of making it into a pinion, is much less, it has been generally adopted. Properly selected and carefully heat treated carbon steel has about the following physical characteristics:

Tensile strength	115 to 120,000 lb. per sq. in.
Elastic limit	80 to 85,000 lb. per sq. in.
Elongation	30 to 35 per cent
Reduction in Area	13 to 15 per cent

While before heat treatment the same metal would give only the following characteristics:

Tensile strength	85,000 lb. per sq. in.
Elastic limit	40,000 lb. per sq. in.
Elongation	18 per cent
Reduction in Area	40 per cent

To cope with similar high tooth stresses in gears, a steel rim of quite similar physical characteristics is shrunk on a cast steel center; a maximum allowance is made on the rim for a shrinkage fit of 0.001 in. for every inch of diameter of the cast steel center. The rim can be readily expanded in boiling water and this fit is sufficient to hold the rim in place without the aid of a key.

The method of heat treating steel is to raise it to a predetermined temperature depending on the carbon content. Care must be exercised to see that every portion of the metal is the same temperature, otherwise shrinkage strains will be set up when it is quenched. Experience shows that oil is the best quenching medium for gears and pinions since it cools the metal more slowly than water and allows the interior to receive the treatment before the outer skin has become hard and set. Water on the other hand cools the skin so quickly that it becomes rigid while the interior is still in a soft and ductile state; when the time comes for the interior portion to cool and harden it naturally contracts and pulls away from the already hardened skin. This sets up shrinkage strains and lowers the physical characteristics of the metal. The high physical properties of heat treated steel will recur to the original value if the temperature of the metal is raised to about 600 deg. F. or over and allowed to gradually cool. Therefore, it is most essential that no heat treated gears or pinions should be subjected to a greater heat when they are mounted on rims or shafts respectively. To obviate over heating when shrinking on gear rims and pinions, it is advisable to boil them in water or oil as such temperatures will expand sufficiently to meet all requirements.

Case hardening has also been successfully exploited. Steel of a very low carbon content is necessary for this process. After the pinion or gear has been cut it is placed in a metal box, bone dust is packed around the teeth and the bore is plugged or covered over in such a way as to prevent the process from affecting it. The metal box with the pinion and bone dust inside is placed in a furnace and kept at a bright heat for several hours, the time depending on the depth the hardness is required to penetrate the metal. During the heat the bone dust turns into almost pure carbon and by the action of heat this carbon becomes impregnated in the pinion teeth, so that about 1 per cent of carbon is found in the steel on the face of the pinion, and this gradually tapers off until the original 20 points are found at a depth of about 0.1 in. from the surface. It is only natural that the physical properties of this steel cannot be as high as are those of oil-quenched steel, but it is much harder and shows a long life for gears and pinions which are not subjected to excessive strains.

The destructive action of gritty matter which becomes mixed with the gear lubricant is very conspicuous when hardened pinions are operated with relatively softer cast steel gears, and strange though it may seem the hard pinion gets most of the wear. Hard gritty substances seem to embed themselves in the faces of the gear teeth and lap the harder pinion teeth. This action becomes so pronounced on some roads operating over sandy country that a longer life can be obtained by the use of a soft machine steel pinion.

The question of the rate of wear per thousand miles run is

one which does not seem to have been very fully investigated. The writer has several gears and pinions under observation to obtain such data, but this is a test which requires two or three years to complete. To show the relative wear of hardened gears and pinions operated in various combinations, the following approximated life has been obtained from gears and pinions on 100-hp motors under two cars running over the same route and identical as to weight, motor capacity and running schedule. The life has been estimated by subtracting the amount of wear on the pitch circle of the teeth after running 50,000 miles from the original thickness and then estimating how many more car miles the teeth could run before 0.1 in. had been worn from each face of the teeth, on the basis that the wear would be constant throughout their life. All teeth on these gears are cut to 2½ pitch.

Untreated high carbon pinion running with cast steel gear: Pinion life 70,000 miles; gear life 220,000 miles.

Heat-treated high carbon pinion running with cast steel gear: Pinion life 100,000 miles; gear life, 240,000 miles.

Heat treated high carbon pinion running with heat treated high carbon gear: Pinion life, 250,000 miles; gear life 750,000 miles.

Case-hardened pinion running with case-hardened gear: Pinion life 200,000 miles; gear life 650,000 miles.

With a view to discovering the relative merits of alloy steels both heat treated and untreated, also heat treated carbon steel a number of pinions were tried out on a road whose service conditions are about as severe as are known. After the pinions had been in service for over two years they unfortunately had to be removed on account of a change in the gearing, but as every one of them was given an opportunity to run over 100,000 miles the results obtained are quite interesting. All the pinions were made with 2½ pitch teeth, 14½ deg. angle. Chrome nickel steel was furnished by two companies, and for a matter of comparison they are given as No. 1 and No. 2.

UNTREATED CHROME NICKEL STEEL NO. 1, 4 PINIONS

One pinion broken after 33,300 miles.
One pinion worn out after 84,800 miles.
One pinion broken from outside causes after 85,600 miles.
One pinion, record lost.

CHROME NICKEL HEAT TREATED STEEL NO. 1, 4 PINIONS

Two pinions broken, one after 26,000 miles and the other after 82,000 miles.
Two pinions, record lost.

CHROME NICKEL NO. 2, UNTREATED, 4 PINIONS

None broken.
Two pinions worn out after an average of 98,500 miles.
Two pinions broken from outside causes after an average of 49,000 miles.

CHROME NICKEL HEAT TREATED STEEL NO. 2, 4 PINIONS

One broken after 48,500 miles.
One worn out after 33,000 miles.
One removed due to change in gearing after 117,000 miles.
One pinion, record lost.

CHROME TUNGSTEN NICKEL STEEL, UNTREATED, 4 PINIONS

None broken.
Two pinions broken from outside causes after an average of 82,000 miles.
One pinion removed due to change in gearing after 119,000 miles.
One pinion, record lost.

CARBON HEAT TREATED STEEL, 10 PINIONS

None broken, none worn out.
Three broken from outside causes after an average of 73,800 miles.
Five removed due to change in gearing after an average of approximately 115,000 miles.
Two pinions, record lost.

All tests and experiments clearly indicate the advisability of using high grade heat treated steel, or case hardened steel for gears and pinions used with railway motors which are of 75 hp. capacity or under, while heat treated carbon steel alone is best suited for gears and pinions which are subjected to higher tooth stresses by motors of larger capacity; for not only will the breakage of the teeth be reduced to a minimum, but the cost of the gearing per car mile run will be considerably lowered notwithstanding the relatively high price paid for it.

STANDARDIZATION OF TRACK CONSTRUCTION IN PAVED STREETS*

BY BENJAMIN E. TILTON, ENGINEER MAINTENANCE OF WAY, NEW YORK STATE RAILWAYS

The question of standardizing track construction in paved streets is both a general and a local one. As a general question it consists of standardizing the constituent parts of a track—the foundation, the substructure and the superstructure. As a local question it consists of standardizing the local conditions in each city; that is, in having a standard type of construction to fit any conditions under which the city desires to carry on a street improvement. I think it can safely be said that the measure of efficiency of any organization is the extent to which it is standardized. A poor standard is better than none at all, as it results in economy in expenditures.

A large majority of roads of the size of those in this State find themselves afflicted with the maintenance of from 25 to 75 different types of construction on their city lines. At certain times in their history they come face to face with a condition where it is necessary for them to make heavy track renewals. Then it becomes necessary to choose a type of construction which is the most efficient and at the same time the most economical to build and maintain.

On account of the great changes in street railroading in the past 20 years it is very difficult to decide between the various types of construction which have been put down in that time. Each type shows some point of superiority over the other types. The natural result, therefore, is to build an experimental piece of track embodying as many of the good points of the old types as possible and from the results shown by this construction derive what conclusions we can for our standard type. Such a section of track was built in Rochester in 1909. A good system of drainage was put in, 7½-in. concrete ballast, steel ties, T-rail and stone block pavement. The rail was laid of three kinds—Bessemer, open-hearth and nickel steel—held with continuous plates. The pavement was Medina block set on a mortar cushion instead of sand. The stones were 5 in. deep and the groove cut in them by hand. This structure is being used as the basis of an analysis of a track structure in Rochester.

The constituent parts of the track structure are its foundation, substructure and superstructure.

THE FOUNDATION

Let us first consider the foundation. The foundation of our track is ordinarily clay or sandy soil. It is the bottom of a trench from 15 in. to 21 in. below the surface of the street. It is, therefore, a natural sump for the collection of surface water. Obviously the first standard to perfect is the drainage system because an accumulation of confined water in this trench will destroy the best substructure and superstructure which can be built. One standard of construction for the drainage system which can be used with success consists in giving the bottom of the track trench a 6-in. crown at the center so as to form a natural path for the water to flow to the outside of each track. Outside of each outside rail and 12 in. below subgrade place a 4-in. sewer pipe drain carefully lined and joints wrapped with burlap. In this way the water is drained away from the center between tracks instead of toward it. Various schemes have been used by engineers for compacting the foundation. In some cases it is rolled; in other cases crushed stone is tamped into the ground to produce an arching effect in the

*Abstract of a paper read at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 28, 1910.

soil. This is a condition which cannot be standardized, as it depends on the nature of the soil.

THE SUBSTRUCTURE

The second part of the track structure is the substructure consisting of the ballast and ties. We have at our command three kinds of ballast which may be used; namely, sand, crushed stone or gravel and concrete, any of which will make a good substructure, the sand least of all on account of its tendency to wash under the action of water.

After drainage the life of a track probably depends more on the substructure than any other item. The question of reasonable life of track is a dangerous one to touch upon. I doubt if any engineer would give a greater life than 20 years to track as constructed at present. We hear a great deal about so-called permanent types of construction. Perhaps certain parts of a track structure can have a degree of permanency, but as a whole I think our standard should be one which can be maintained rather than a track which is permanent. There can be no greater reason why a track structure should be expected to be permanent than that other parts of the physical property should be permanent.

With the idea that whatever permanency we get in a standard track structure other than the drainage is to be had in the substructure we are left to choose that material which has the greatest rigidity, namely, concrete. With concrete as our standard ballast construction we are at once confronted with the fact that it will not stand up unless allowed time to take its final set before traffic is allowed to pass over it. This time should not be less than 10 days.

There are certain conditions of city operation which will not permit an uninterrupted time of 10 days for concrete substructure to set. This gives rise to the use of a material such as crushed stone for ballast, and, hence, a second standard of construction as far as the substructure is concerned. When conditions are such that we can absolutely close the street to all traffic for a period of 10 days after placing the ballast, I believe the rigid concrete ballast should be standard construction. If conditions will not permit this, rock ballast tamped without interrupting traffic may become our standard. The depth of the ballast depends on the amount of traffic and the character of the foundation. A depth of 6 in. below the bottom of the tie for concrete and 8 in. for stone ballast substructure is reasonable for standard substructure construction.

We have open to us two kinds of ties for our standard construction; namely, wood and steel, but the tendency of railroads is to eliminate the wood tie, due to the increasing cost and scarcity of timber. In line with a concrete substructure, the ties which form the other element of the substructure must be as long-lived as possible. The steel tie, therefore, goes hand in hand with concrete ballast. The weight of the tie depends on the engineer's judgment. Its requirements are bearing area, stiffness and accurate rolling.

While, to my mind, the concrete foundation and steel tie construction gives the highest type of standard substructure construction, one weakness arises from the difficulty of renewal. The present form of steel tie cannot be taken out without heavy labor cost and the possibility of destroying the concrete substructure. New rail cannot be laid on the old ties and put in surface except by shimming. If our concrete substructure is going to outlive the rail, joints and pavement we must find a way to renew the steel tie without heavy labor cost and the possibility of destroying the substructure. This will mean either the use in the first installation of a wood tie or of a steel tie of different shape than those now on the market. If, for instance, we used a wood tie in the concrete in the original construction these could be removed and a small steel tie inserted in the cavity when the rail renewal took place, thus giving twice the life to the substructure as to the superstructure. The same thing would be true of a differently shaped steel tie. I think this condition must be met before we can call our concrete steel tie type of construction really standard.

For our second or stone ballast type of standard substructure construction only one tie, the wood tie, can be used, as a steel tie in stone ballast requires constant maintenance for a year after installation. In paved streets we are compelled to close up the pavement as soon as possible and consequently could not undertake frequently to re-tamp for a year the steel ties in stone ballast.

THE SUPERSTRUCTURE

The third part of the track structure is the superstructure consisting of the rail, joints and pavement. In a way this is the least important part, as its life depends to a large extent on the foundation and substructure. Stability in our substructure produces stability in the rail and consequently a longer life to our pavement.

The choice of a rail for standard superstructure construction is a discouraging undertaking. The trade catalogues contain prints of a large number of sections, principally the side-bearing rail. Our requirements for rail are not hard to meet, as we have no great trouble in keeping our rail in surface. We do, however, have one controlling condition to meet in picking a standard rail, in that it is difficult to keep our rail in line. This is due to the fact that we operate single cars and do not have the steadying effect of a long train as on steam roads. The fact that our rails are difficult to keep in line at once fixes our standard rail as one whose physical properties tend to make it easy to keep its alignment. The first requirement in a rail to meet this condition is that it be center-bearing and under present designs this limits us to a T-rail. As far as I know, no center-bearing groove rail has yet been rolled.

Assuming then that our first rail standard is to be a T-rail we must decide on what weight to use. Theoretically, I think it can be shown that an 80-lb. rail will meet any service, including interurban service, which is met in city work. However, we must consider that the first cost of the rail represents only about 10 per cent of the net cost of a track. There is, therefore, no great object in picking light rails within reasonable limits. The character of pavement must decide our type of T-rail, whether standard or special. For cities whose specifications call for a 7-in. stone for stone block pavement, the special T-rail, as recommended by the American Street & Interurban Railway Association, meets the requirements. With brick pavement the standard A. S. C. E. T-rail can be successfully installed.

Another type of pavement, the wood block, is coming into general use and will always force us to have a standard superstructure to meet this condition. As it is not practical to cut a groove in the wood block and maintain it, our third standard for superstructure should call for a groove rail.

The second part of a superstructure is the joint. Types of joints and fastenings are nearly as numerous as types of rail. Two ideas present themselves in the joint problem. Are we going to construct a joint designed to be permanent and, therefore, not admit of maintenance, or are we going to construct a joint which permits maintenance? As the standards outlined above are designed to permit maintenance, our joint standard to be in conformity must be a joint which can be maintained. The riveted joint as recently developed fulfills the mechanical requirements of a joint and also permits maintenance. The only objection to this joint is the high cost of the riveting outfit, which makes it prohibitive to some roads. As a mechanical joint its results are more than was expected, and I should feel safe in accepting it as a standard.

To those of us who cannot afford this riveted joint, any of the base-supported joints give a joint susceptible of maintenance and form a fair standard for our construction. The bolts are hard to tighten, but if necessary this can be done. The surface of the rail can be kept true at the joints by the use of a special cutting flat file. The idea proposed by the Boston Elevated Railway in 1890 of installing a joint box adjacent to the joint to allow the tightening of the bolts was a good one. This idea has been experimented with recently, but no practical results have been developed.

The choice of rail as between Bessemer, open-hearth and

alloy cannot as yet be based on experience. No great superiority has been shown for open-hearth steel over Bessemer. The alloy rails, such as nickel, have shown about 20 per cent greater resistance to abrasion than the Bessemer, but are prohibitive on account of the high cost. Titanium rail has shown remarkable results on the New York Central & Hudson River Railroad. The application of the titanium does not greatly increase the cost of the rail and, therefore, an ordinary street railway can afford to experiment with it. Extensive experiments are being carried on in the comparison of the wearing qualities of Bessemer, open-hearth and alloy rail, but the method of rolling seems to have the greatest effect on the wearing quality of the rail.

For the portion of our rail superstructure consisting of frogs, switches and mates we have four types of construction to choose from, as follows: Solid manganese work; cast-steel construction with hard center plates; iron-bound construction with hard center plates, and ordinarily built-up work. These types of construction are standard, and it remains for the railway companies to standardize them as to location and as to radii of switch pieces to permit renewals without the expense of new patterns.

Drainage of the special work foundation is even of more importance than in standard track construction. Since steel ties are not practicable in connection with special work installations, we must use the wood tie. Here is a chance to standardize by making up special sets of ties to fit each turnout. In this way we have a direct result of standardization by saving a very considerable amount of board measure in the ties by not using the ordinary tie and overlapping the ends. The question of ballast for special work is a matter of choice with each engineer, but stone ballast probably meets the greatest number of requirements in connection with the special work substructures. It allows water to pass through it and does away with the allowance of 10 days for setting, as would be the case with a concrete substructure for special work. Crushed stone also permits surfacing when renewals are made.

The choice of the third part of our superstructure, the pavement, is not entirely in the hands of the railroad companies. Pavement is essentially a problem for the city engineer, and in the last analysis his judgment must stand. Our superstructure standards must be such as meet his requirements as to pavement. My experience has been that city engineers will not permit the use of brick on any except light-traffic streets, and the tendency is more and more toward the use of the stone block pavement. This is to our advantage as the block stone has a high salvage value, while other classes of pavement have little or none. After the choice of pavement has been made, the railroad company can have something to say as to the method of laying the pavement. Ordinary city specifications cover the requirements for pavement, except as to the character of cushion between the concrete foundations and the block. As the railway has to maintain the pavement these details are of interest to it.

One of the direct results of the experimental piece of track built in Rochester was a change in the pavement specifications abolishing the use of a sand cushion and substituting for it a dry-mortar cushion. The cushion consists of one-to-one dry mortar. When the grouting takes place the water from the grout sets the dry-mortar cushion so that the blocks are on a solid bed, instead of a sand bed easily washed by water. This is one requirement which I think should be added to ordinary paving specifications and made a standard form of paving construction.

General Standards.

Considering the track as consisting of foundation, substructure and superstructure, we have then the following general standards which may be applicable to cities of ordinary size:

Foundation.—The foundation should be well drained in any type of construction.

Substructure.—First: 6-in. concrete substructure laid where it is possible to keep all traffic off the street for a period of 10 days after the concrete is placed.

Second: 8-in. stone ballast to be used in all cases where it is not possible to keep all traffic off the street for a period of 10 days.

Superstructure.—First: special T-rail as recommended by the American Street & Interurban Railway Association where the pavement is to be stone block.

Second: standard A. S. C. E. T-rail where the pavement is to be brick.

Third: grooved rail where the pavement is to be wood block.

The choice of the three rail standards as above has left out one consideration important in some cities, which is width of street. In choosing standards one must use as a basis his own experiences. To those of us who have not had experience in cities having narrow streets, it can readily be seen that where all traffic is compelled to take the car tracks this fact might so far outweigh the advantages of T-rail as to make inadvisable its use as against a groove rail.

In addition to the possible standards of foundation, substructures and superstructures as outlined above, there are many details, such as tie treatment, fastenings, tie rods, tie plates, bolts, etc., which can be standardized. These, while important, are not the controlling factors in a track structure. The important requirement for these details is that we stick to one standard so as to make renewals easy and inexpensive. Local conditions have a very great effect on our type of standard construction and on our interpretation of what result standard construction should give, particularly as to its life. Chief among these conditions is the question of sewer systems. An ordinary sewer system in a city is designed to serve a certain number of people per acre. In the business section the number of people is much higher than it would be in a residential district. In American cities it often happens in the course of rapid growth that residential districts become business districts, so that the sewers originally built are inadequate and it is necessary to renew them. Whenever this is done the tracks must come out and be rebuilt. People will not consent to be taxed for sewers for the good of future generations, so that this condition of sewer construction in cities is bound to continue as long as cities grow. Another point tending to reduce the life of a track is the continual construction of laterals of all sorts beneath the track. Sewer laterals, fire-alarm conduits, electric light conduits, water mains, gas mains and various other forms of municipal utilities find occasion frequently to cross the street and consequently have to undermine the track. In each case where this is done the so-called permanent track is reduced to limited life track.

The standards outlined above are not given with the idea that they will produce permanent construction, although in the case of the concrete construction we should be able to produce a substructure which will outlive two superstructures placed upon it.

DATA SHEET ON TRAINING OF TRANSPORTATION EMPLOYEES

The American Street & Interurban Railway Transportation & Traffic Association sent out under date of June 24, through Secretary Donecker's office, data sheet No. 60 prepared by the training of transportation employees committee, the chairman of which is G. O. Nagle, general manager of the Wheeling (W. Va.) Traction Company. Among the questions which the members are asked to answer are those relating to the number of conductors and motormen employed and new ones engaged during the past 12 months; the average number of men who remain in the service one year or longer; the methods of instruction covering the practice relative to the use of instructor motormen and conductors, extra compensation for such instructors, average time required to qualify a new man for work, the payment of men during the breaking-in period and practice with regard to paying men on extra list; use of skeleton cars and model apparatus, and determination of the candidate's fitness for a position.

RECENT DEVELOPMENTS IN MULTIPLE-UNIT CONTROL AND OTHER ELECTRIC RAILWAY APPARATUS *

BY CLARENCE RENSHAW, WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY

The use of power-operated control apparatus affords many advantages. One of the most important of these is the ability to operate multiple-unit trains of two or more motor cars. This is of the greatest assistance in handling heavy traffic under any circumstances, particularly on high-speed roads.

Increased seating capacity during rush hours or on special occasions obtained on such roads by operating additional cars as "second sections," or by reducing the usual headway, is always attended by increased danger of collision or other accident. Similar capacity obtained by the use of multiple-unit trains, however, does not affect the usual train dispatching, and is, therefore, absolutely safe in this respect. In addition to this important advantage, multiple-unit trains can be operated more cheaply than the same number of motor cars can be operated singly, and more satisfactorily than the same number of cars can be operated by a combination of motor cars and trailers.

The ability to operate multiple-unit trains during rush hours or on special occasions also will frequently permit the size of cars and equipments to be based upon the average rather than the maximum load conditions, and thus allow smaller cars and lighter motors to be used. For instance, cars small enough to be operated by means of quadruple 50-hp. motors may be sufficient where equipments of 75-hp. motors would otherwise have been required, or quadruple 75-hp. motors may do where quadruple 100-hp. motors would otherwise have been necessary. If this can be done, large economies, both in investment and in operation, may be effected.

Even where train operation is not contemplated, the use of power-operated control apparatus is well worth while to secure the location of the main power circuits and circuit-breaking devices away from the platforms and below the car floor. When thus located they are out of sight of timid passengers, and a source of numerous damage claims is eliminated. Incidentally, with large equipments, a considerable saving in platform space is effected. The location of the controlling apparatus beneath the car, also, by reducing the amount of wiring, more readily permits the thorough protection of it, and this, together with the more powerful and substantial character of the apparatus, enables a car so equipped to render a maximum service with a minimum of delays and expense.

During the past year the Westinghouse Electric & Manufacturing Company has placed on the market a new line of power-operated multiple-unit control equipments, which have been remarkably successful. These equipments are much simpler than any previous types of multiple-unit control equipments and have been designed with especial reference to the needs of city and interurban roads. They are designated as Type HL unit-switch control equipments, and have been referred to as the hand-operated type to distinguish them from equipments arranged for automatic acceleration, which was formerly the only type made. The Type HL equipments are based upon the same fundamental principles as the well-known automatic types of unit switch control equipments and retain all of their essential features. Many important improvements have been made in constructional details, however, and the circuits have been so simplified that they are easier to follow and to comprehend than those of the usual platform types of controllers.

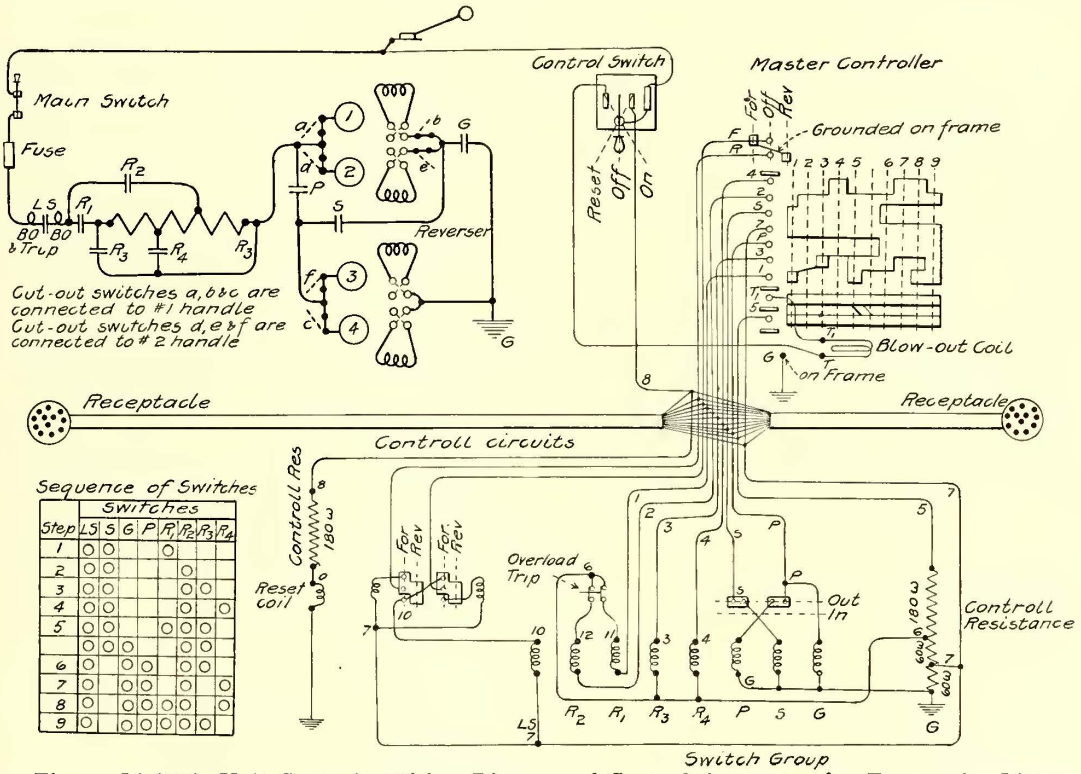


Fig. 1—Multiple-Unit Control—Wiring Diagram of Control Apparatus for Four 75-hp Motors

In the Type HL unit switch control equipments the various main circuit connections between trolley, resistance, and motors, which, in the usual car equipment, are ordinarily made by the overhead circuit-breaker and by the power drum and contact fingers of the controller, are made by six or eight (depending upon the size and number of the motors) unit switches, each provided with a strong magnetic blow-out and normally held open by a powerful spring. These switches are assembled in a common frame and designated as a "switch group." In the larger sizes of equipments the group is supplemented by two additional switches mounted in a second frame, and called a "line switch." Each switch is closed when desired by compressed air acting on a piston, which opposes the spring and forces the lower or movable switch jaw against the upper or stationary one.

The connections ordinarily made by the reverse drum of the platform controller are made up in these equipments by a re-

*Abstract of a paper read at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 29, 1910.

verse drum similar in general to that in the controller, but of more substantial construction, pneumatically operated and mounted in a separate case. The complete reverse drum with its operating mechanism is termed a "reverser."

The admission or release of compressed air to the cylinders, and hence the operation of the switches and reverser, is regulated by means of electrically operated magnet valves attached to the cylinders and governed by means of a master controller. The small amount of power which is required for operating the magnet valves is taken from the trolley through a resistance. The circuits from the master controller are carried to a 12-conductor control "train line," from which branch circuits are run to each piece of apparatus. This train line extends the entire length of each car, and terminates in one or more 12-conductor "train line receptacles" at each end.

By means of a 12-conductor "train line jumper" placed so as to connect adjoining receptacles on adjacent cars, the train line of any car may be connected to that of a second car at either end, and the control train line thus made continuous throughout a train of any number of cars. Operating the master controller on any car under these conditions will operate the respective pieces of apparatus on all cars simultaneously.

Air for operating the pneumatic parts is obtained from the air-brake system through strainers for removing the moisture and through a reducing valve set for 70-lb pressure.

The general arrangement of main and control circuit connections for quadruple equipments of 75-hp motors or less is shown by the diagram on page 35, from which the operation of the control may be readily understood.

It will be noted that the arrangement of the main circuit connections to the motors is the same as that used in the well-known "K" type of controller. With this arrangement is combined a particularly ingenious connection of the resistance, which gives a maximum number of resistance steps with a minimum number of switches. The entire combination of main circuit connections is such that an extremely simple arrangement is obtained, and an unusually small number of switches serves to effect the necessary combinations.

From the standpoint of safety, it is usually not desirable to attempt to operate large cars unless the air brakes are in good working order. If, for any reason, it should be desired to do this, however, an emergency reservoir may be added. This provides a reserve supply of air for operating the control apparatus in case of accident to the main source.

A particular feature of the control for quadruple equipments

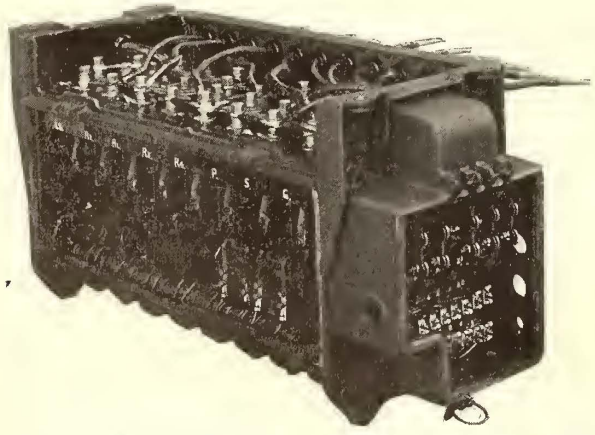


Fig. 2—Multiple-Unit Control—Unit Switch Group

is the arrangement of the cut-out switches for cutting out a damaged motor when necessary. These are so arranged that in case of motor trouble one motor of each pair is cut out, thus leaving the remaining two motors operated in series-parallel just the same as if they were the two motors of a double-motor equipment. With this arrangement a car with two motors temporarily cut out will operate just as smoothly as one with all four motors in service.

The magnet valves which control the switches and reverser are operated by means of current from the trolley through a resistance. A very small amount of current is required for operating these valves, and this has made it possible to arrange the valves so that they will operate with a wide variation of trolley voltage.

A main switch is provided in the circuit between the trolley and the motors, so that by opening this switch the control apparatus may be operated for test purposes without putting power on the motors.

Overload protection is provided by means of an overload trip mounted on one end of the switch group. In case of over-

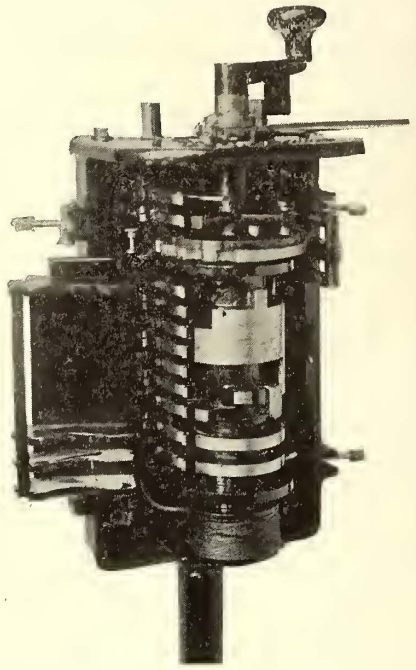


Fig. 3—Multiple-Unit Control—Master Controller

load or short-circuit, this will open the control circuit to certain of the switches in the group and thus cut off power. A copper ribbon magnetic blow-out type fuse is also provided, but there should be little or no occasion for this to blow.

In general, the switch group consists of a cast and malleable-iron skeleton frame, to which the various working parts are attached, which is completely enclosed by easily removable sheet-iron covers.

A blow-out coil is located at the side of each switch in such a way as to give a particularly short magnetic path, and thus to allow a very strong magnetic flux to be obtained with blow-out coils of reasonable size, and a moderate expenditure of energy. An exceptionally strong blow-out effect is thus obtained which enables the switches to open under heavy overloads without damage and secures long life for the contact tips.

Each switch and each blow-out coil is enclosed in an insulating box of vulcabeston, and the switch jaws are surrounded by an easily replaceable box of soapstone and asbestos lumber. All live parts are carefully insulated from each other and from the frame. Wherever possible, the connections between the various switches and blow-out coils are made of copper strap rigidly supported and giving the same substantial effect as the busbar connections on a power-house switchboard.

A particular feature of this group, and, in fact, an essential advantage of the unit-switch system of control, is the heavy pressure obtained at the switch jaws for opening and closing them. With the type of switch described a pressure due to the spring of nearly 100 lb. is obtained at the switch jaws for opening them, and a similar force due to the air pressure in the cylinder for closing them. This force is not applied merely as a steady pull or dead weight, but the means which are employed to obtain a wiping contact when closing the switch gives also a toggle-joint effect when the switch is opened. The heavy pressure for closing the switches insures good contact and excellent carrying capacity, while that for opening them is so great that failure to open is almost impossible.

The term "unit switch" which is applied to this system of control apparatus is derived from the fact that the design of the fundamental pieces of apparatus is laid out on the "unit" plan, so that any worn, broken or damaged part may be easily replaced.

The reverser consists of a number of copper fingers mounted on a stationary base and pressing on one or the other of two sets of movable contacts carried on a wooden drum. The drum is revolved to the forward or the reverse position by one or the other of two pneumatic cylinders, each controlled by a magnet valve similar to those in the switch group.

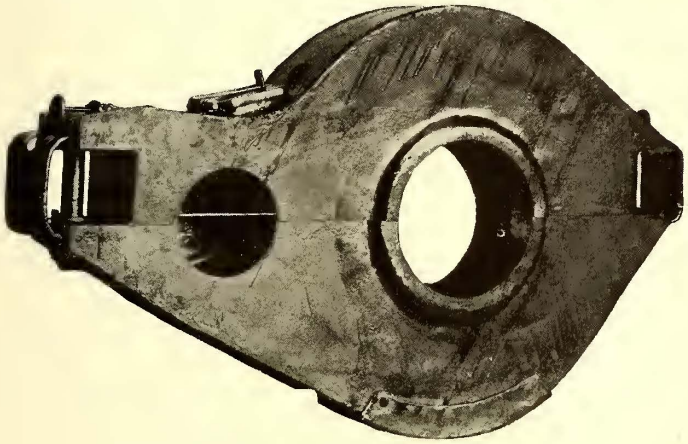


Fig. 4—Welded Sheet-Steel Gear Case

Powerful forces approximating those for operating the switches are used also for moving the reverser, so that heavy pressure may be used on the fingers and firm contact thus secured. This construction gives the reverser large overload capacity for taking care of heavy current rushes, and makes it almost impossible for the fingers to become stuck or welded, due to motor flashes, short-circuits or other similar troubles.

No springs are used in the reverser cylinders, and the drum when moved to one position by closing the circuit of one of the magnets remains in that position until the circuit of the other magnet is closed. Suitable small fingers mounted upon the reverser frame and pressing upon corresponding movable contact pieces on the reverser shaft establish the necessary interlocking connections.

The reverser parts are built upon a cast-iron frame, suitably protected by easily removable sheet-iron covers.

The master controller which is used with Type HL unit switch control equipments contains the usual power and reverse handles and these are mutually interlocked. It is arranged with five notches in series and four in parallel. The position of the notches is indicated on the cap plate of the master controller and also by a suitable star-wheel inside of the case. The main resistance, control resistance, train line receptacles, train line jumpers, and other equipment details have been carefully designed to perform their specific functions.

The Type HL unit switch control equipments offer a number of important advantages over drum-type controllers as well as over any other forms of multiple-unit control. The more important may be summarized as follows:

The apparatus is extremely simple in all of its parts.

Powerful forces are employed for opening and closing the switches and throwing the reverser. The control apparatus is capable of opening the circuit under all conditions and reliability of operation is thus insured.

The main power circuits are removed from the car platform and accidents from "controller blow-ups" are avoided.

Economy of platform space is secured.

Multiple-unit train operation is available and greatly increased passenger capacity can be had at any time without operating additional trains or overloading the motors. The dangers due to "second sections" are thus avoided.

Heavy pressures are used on the contacts and great momentary overload capacity thus secured.

An exceptionally effective magnetic blow-out is employed, and the circuit thus opened with little or no burning of the contacts.

The wiring and connections between the various switches and blow-out coils are arranged in a particularly substantial and workmanlike manner.

Automatic overload protection is secured in addition to the protection afforded by a fuse, by means of a device of such a nature that its calibration can be relied upon.

The apparatus is capable of operating satisfactorily with trolley voltages varying from a maximum of 600 volts or more to a minimum of approximately 200 volts, thus covering any range likely to be met with in service.

When operating with minimum trolley voltages the switches open and close with the same force as when operating with maximum trolley voltage.

The powerful forces used in operating the switches and their great momentary overload capacity, together with the strong magnetic blow-out which is obtained, and the substantial arrangement of connections, give an exceptional reliability of operation of the switches, and insure long life of the contact tips and other wearing parts. The use of reliable control apparatus means a minimum amount of motor trouble, since faulty operation of the control apparatus frequently causes damage to the motors. Economical maintenance should thus be effected by the use of unit switch control apparatus and at the same time reliable service secured.

WELDED STEEL GEAR CASES

The use of the acetylene welding process has recently enabled a very substantial sheet-steel gear case to be developed, and although not yet thoroughly tried out, this gear case gives good promise of success in eliminating some of the weight of car equipments. Such a gear case for a Westinghouse No. 303 motor, which has a rating of 100 hp at 550 volts, is made of ⅛-in. sheet steel and weighs 124 lb., as compared with a weight of 193 lb. for the malleable-iron gear case previously used on this motor. A saving of 59 lb. is thus effected. This is not a large saving, but it is sufficient to be well worth while where it can be conveniently secured.

The welded gear case has a reinforcing strip at the bottom, which is the part most likely to be damaged. The arrangement used on the Westinghouse motors of suspending

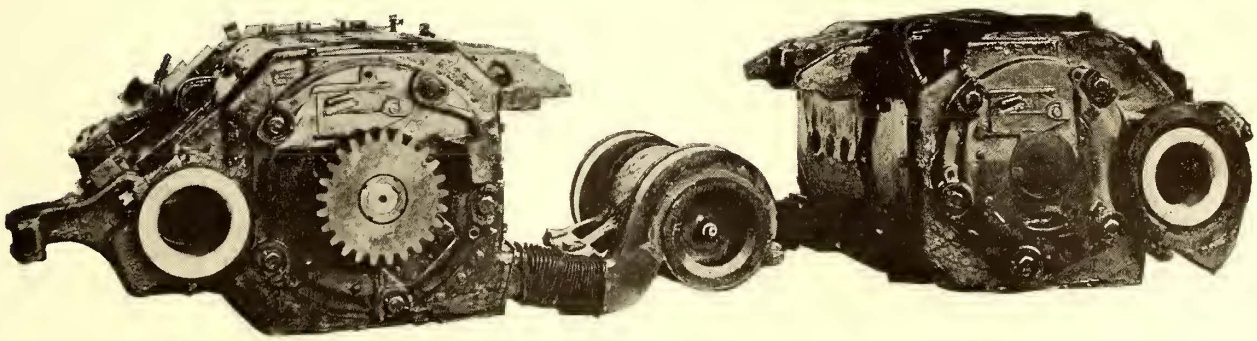


Fig. 5—Blower for Forced Ventilation of Motors on Long Island Railroad Motor Cars

the gear case from the two ends simplifies the problem of supporting such gear cases very greatly.

FORCED VENTILATION FOR RAILWAY MOTORS

An interesting development of the past year is the method used for securing increased motor capacity on the new electric motor cars purchased by the Pennsylvania Railroad interests for use on Long Island and in the new tunnels through Manhattan Island. Each car is equipped with two interpole motors, which are normally rated at 215 hp., but which by means of forced ventilation are enabled to do work which would otherwise require motors rated at about 250 hp. each.

The blower outfit consists of a 1½-hp., 2250-r.p.m. motor, to the shaft of which is attached, at each end, a blower fan, 9 in. in diameter and 3 in. wide. Each of these fans is capable of forcing between 400 cu. ft. and 500 cu. ft. of air per minute through the motor to which it is connected.

The truck on which these motors are mounted is so arranged that the blower outfit can be mounted below the bolster so that the general arrangement of motors and blowing outfit is shown.

This arrangement has been remarkably satisfactory, and 180 cars are being equipped in this way. The installation is of particular interest as being the first instance where forced ventilation has been used for car motors on such a large scale.

REVISION OF COMMUTATION RATES ON THE PENNSYLVANIA RAILROAD COMPANY

D. N. Bell, assistant general passenger agent of the Pennsylvania Railroad, recently made the following statement to a representative of this paper regarding the reasons which led that company to announce increases of its commutation rates to New York City.

"A thorough analysis was made of our commutation business, and we found that on the 50-trip tickets the average amount paid per passenger was 11.1 cents, the average distance traveled was 9.22 miles, and the average rate per mile was 1.202 cents. On the 60-trip ticket the average amount paid was 11.1 cents, the average distance traveled was 16.83 miles, and the average rate per mile was 0.666 cent. On the 180-trip and annual tickets the average amount paid was 12.3 cents, the average distance traveled was 26.45 miles, and the average rate per mile was 0.466 cent. The cost of terminal service at Jersey City and New York, including ferriage between the two points, is 10.5 cents, so that after deducting terminal and ferriage expenses we are carrying 50-trip passengers 8.22 miles for 6 mills; 60-trip passengers 14.83 miles for 6 mills, and 180-trip and annual passengers 24.45 miles for 1.8 cents.

"During the past 10 years there has been a marked increase in the cost of handling passenger traffic, due to a steady demand on the part of the traveling public for stations equipped with modern conveniences, trains composed of the best equipment and the taking of every possible precaution to insure against accident. To accomplish these results, we have invested millions of dollars in improving the roadbed, replacing block-signal system and the laying of heavier rails, thus permitting greater speed with absolute safety.

"In addition to the above, like all other roads, our cost of operation has been increased on account of greater expenditures in taxes, labor, etc. The increase in the cost of labor since 1899 has ranged from 32 per cent to 100 per cent. The increase in taxes in the State of New Jersey has amounted to 286 per cent during the same period.

"We have also, within the past year, entered into an arrangement with the Hudson & Manhattan Railroad Company by which our passengers are transported between Jersey City and Church and Cortlandt streets, New York, without additional charge, the expense of transportation being borne by this company.

"In view of the above we feel that the increased charges to commuters are not unfair, and can be justified before the public."

MEETING OF THE NEW YORK STATE ASSOCIATION

The twenty-eighth annual convention of the Street Railway Association of the State of New York was called to order by President E. F. Peck at the Hotel O-te-sa-ga, Cooperstown, N. Y., at 10:50 a. m. on June 28.

President Peck introduced Lynn J. Arnold, of Cooperstown, who made an address of welcome to the association.

John H. Pardee, the secretary, read a letter from the Hotel Clifton, Niagara Falls, Ont., inviting the association to hold its next annual meeting there.

Mr. Peck then read the president's annual address. An abstract follows:

ADDRESS OF PRESIDENT PECK.

"The evolution of transportation has been so rapid that it has been a severe task for the companies engaged in this business to keep pace with the times. A rival of the electric railways, and one which bids fair to grow rapidly in popularity, has arisen in the skies. I refer to the flying machine, recent experiments with which have set the whole nation in a quiver of excitement, and have upset many of our old-fashioned theories in regard to rapid transit. Whether this development will be of any serious import, or whether it will have any commercial value, is a problem which none of us, at the present time, is able to solve. Not many years ago we laughed at the adventures of Darius Green with his wonderful flying machine; but to-day who would dare ridicule the achievements of such venturesome men as the Wright brothers, Curtis and Hamilton? Who here is competent to predict as to the future in any matters pertaining to the development of transportation? As it is, we are not here to-day to prophesy as to the future, but rather to discuss the serious problems which daily confront us.

"The past year has been an eventful one to the electric railway interests, and the financial reports of our member companies for the fiscal year ending June 30 will, in most cases, show marked improvement over the previous year. The dark clouds of financial unrest that nearly overwhelmed us in 1908 seem to be gradually drifting away, and to-day I fully believe we have entered upon another period of prosperity.

"The paramount problem before us is that of the 5-cent fare. As this subject will be discussed later by one who has given it careful study, and is better able to present the facts than I, it is unnecessary to consider this most important matter at this time.

"Another question which has been the subject of considerable discussion during the past year has been that of the encouragement of friendly relations between the electric railway companies and the public. During the past six months this association has fathered a systematic publication of a series of educational articles on the following topics:

"'Cost of snow removal and maintenance of track pavement, showing the hazardous and expensive character of this burden which must be borne by the street railways, and which has been appreciated but slightly, if at all, by the general public.

"'Plans and methods of street railway companies, by perfecting safety devices, to prevent accidents to human beings; and the education of the public to greater care and prudence.

"'Division of the nickel as applied to the various operating and maintenance accounts, bringing out conspicuously the enormous percentage paid for labor, and the comparatively insignificant percentage which the street railway companies are able to retain as a profit from the business.

"'The remarkable and unappreciated expense, and the executive management, required to move people to and from their work in rush hours, showing the cost to the companies of meeting such extreme peak-load conditions.

"'The remarkable increase in population and prosperity in the rural districts, and the inadequately appreciated benefits resulting therefrom to farmers, small villages, and hamlets throughout the State from the extension of suburban and interurban railway systems.'

"The general object to be obtained by the publication of these

articles was to bring the public of New York State generally to a realization of the peculiar problems and expense incident to street railroading, to the end that a better and fairer treatment of these public-service corporations might result eventually.

"Indicative of the importance placed on this subject by the executive committee of the American Street & Interurban Railway Association, a joint meeting of representatives of the various State and sectional associations was held in New York City in January of the present year to discuss means to bring about a closer affiliation of State and sectional associations with the American Association, to the end that with their united action results more beneficial to our business might be obtained. After considering the various phases of the situation, it was generally concluded that the most effective method of procedure would be the appointment of the presidents of the State and sectional associations as members of the committee on public relations of the American Street & Interurban Railway Association. The suggestion of the joint committee was later adopted by the executive committee of the American Association.

"With the work performed by the association during the past year you are all more or less familiar. An innovation in our quarterly meetings was decided upon by your executive committee, a 'get-together' dinner on the evening previous to the business session. I feel that the good derived from our meetings has been greatly enhanced by these social gatherings.

"The work of an association of this character depends largely upon the personnel of the executive committee, and I wish to express my sincere thanks to the members of the executive committee for the hearty support given me in conducting the affairs of the association."

Mr. Pardee then presented his report as secretary, showing 20 member companies, 6 associate members and 75 allied members.

H. M. Beardsley, Elmira, the treasurer, made a report showing a balance at the close of the previous year of $6,101. Receipts during the year were $6,070 and disbursements $4,911, leaving a balance on hand of $7,260.

Edgar S. Fassett, Albany, chairman of the committee on city rules, reported that no questions requiring the attention of the committee had arisen during the year.

PROBLEM OF THE 5-CENT FARE

Henry W. Blake, editor of the ELECTRIC RAILWAY JOURNAL, then read a paper on "The Problem of the 5-Cent Fare." The paper is published in abstract elsewhere in this issue.

Mr. Fassett said that as a member of the committee on topics he had suggested that Mr. Blake be asked to prepare the paper and said that the title really should be, "What Shall We Do to Be Saved?" That was really the subject of the paper.

Something had to be done, Mr. Fassett said. A slight advance in commutation rates had put one company doing both an urban and an interurban business on its feet financially, but the average city road was not able to adjust its fares. With the 5-cent fare as the fixed unit of compensation the only solution was the receipt of some money for transfers. Mr. Fassett's initiation into the business took place in 1885 and at that time the street railways secured two or three 5-cent pieces for a length of ride for which but one fare was received now. A change in the law providing for a 5-cent fare should be made so as to enable companies to charge for transfers. Otherwise expansion was at an end. No increases in mileage were being constructed or would be until conditions were changed. The United Traction Company had franchises for $500,000 of new road, but could not construct the lines under existing conditions.

Mr. Fassett believed that with the publicity which the companies were receiving the people were beginning to see that the fault did not lie with the railways. However, some steps must be taken to enable the railways not only to exist but to expand so as to meet the increasing requirements of the communities.

On motion of W. H. Collins, Fonda, Johnstown & Gloversville Railroad, a vote of thanks was given to Mr. Blake for his paper.

At the suggestion of C. Loomis Allen, Utica & Mohawk Valley Railway, discussion was then postponed until a later session in order to give the delegates an opportunity to study Mr. Blake's paper.

INTERURBAN RULES

The discussion on the advisability of adopting the interurban rules approved by the American Street & Interurban Railway Association at the Denver convention in October, 1909, was opened by C. Loomis Allen.

Mr. Allen thought that a study of the interurban rules as adopted at Denver would be sufficient argument in favor of their acceptance, but he realized that an added moral support would be given to the American Association by a ratification of the rules by the New York Association. These rules represented the best thought and best practice up to the time of their adoption by the best men in the business. Where differences of opinion existed on any points they were talked over and reconciled and all points at issue were settled by deciding votes. In reading the resolutions adopted at the Denver Convention and moving their adoption Mr. Allen said that different methods of operation and the regulations of various States would cause modifications of the rules to accord with local conditions. He asked how many roads had adopted the rules approved at Denver.

Matthew C. Brush, general manager, Buffalo & Lake Erie Traction Company, said that he had the Denver code, except for very slight changes due to local conditions, in proof form and that the rules would be in force in 30 days.

W. B. Rockwell, general manager, Syracuse & Suburban Railroad, had adopted the Denver code with slight changes arising from local conditions.

T. C. Cherry, Utica & Mohawk Valley Railway, had adopted both the urban and the interurban rules with very slight exceptions. For interurban trainmen books containing both codes were provided.

Joseph K. Choate, general manager, Otsego & Herkimer Railroad, had adopted the rules effective as of July 1.

John E. Duffy, superintendent, Syracuse Rapid Transit Railway Company, was not able to attend the Denver convention, but was a member of the committee of the American Street & Interurban Railway Transportation & Traffic Association that compiled the rules. He was chairman of the committee that compiled the New York State code adopted at Kingston in 1907, which was entirely different from the Denver code. The New York code, as adopted then, was similar to that of the American Railway Association. The present committee on interurban rules of the Transportation & Traffic Association had held three meetings so far this year and it appeared to be the unanimous opinion of the members of the committee that the American Railway Association code should be adopted. The argument advanced in favor of this code was that it represented the best thought and effort of steam railroad managers.

Mr. Duffy did not see any reason why interurban electric and steam roads could not be operated under like rules. The rules should be numbered alike in both codes. The committee on interurban rules of the Transportation & Traffic Association had seen fit to change front. The sentiment in New York State was in favor of the American Railway Association code in 1907. Now the committee had practically finished its work and at the meeting to be held in Atlantic City in October of this year would present a code that would be a duplicate of that of the American Railway Association so far as it was applicable to interurban electric roads. Some of the high-speed, single-track interurban roads of the West had operated under this code with success. It would not be possible to operate under American Railway Association rules absolutely, but amendments could be made that would make them applicable to all local conditions arising in interurban electric operation.

Mr. Duffy admitted that the Denver code was good, but said that the American Railway Association code represented the thought and experience of officials of steam railroads through a period of many years.

Mr. Rockwell had been waiting for several years for some

action to be taken on the subject of interurban rules and conditions had so developed that some definite course was essential at Denver. He had never heard a more thorough discussion than that which took place over the Denver rules. Rules could be changed by amendment from year to year.

Mr. Duffy referred to the information on the data sheets sent out by the committee and said that the report to be made at the Atlantic City Convention would recommend what the committee thought was best for the roads. Continuing, Mr. Duffy said that C. D. Emmons, chairman of the committee, had taken up questions of difference with the transportation committee of the American Railway Association and would meet a member of the steam road committee and a representative of the Interstate Commerce Commission to discuss the subject. He asked that the committee be supported in the course which it had concluded to follow. Its work should not be nullified before its recommendations were presented to the Atlantic City convention. The report of the committee as presented at the Denver convention was a good work, but it was now proposed to try to reconcile the differences which developed at that time.

Mr. Allen said that the interurban code was taken up rule by rule at Denver. The final report as adopted was not coincident with that recommended by the committee. The majority determined each point. The changes that it was now proposed to recommend at Atlantic City were not so much changes of theory and practice as of other matters. The retention or rejection of rules was governed by the doctrine of survival of the fittest. The question was simply that of the adoption of the American Street & Interurban Railway Association code. Strong arguments would be presented on both sides at Atlantic City. If the code was changed then the New York association could change too. The industry was not standing still. He wanted the safest and best rules that could be secured for the industry.

Mr. Allen added that after the 1897 classification of accounts was adopted the association stood still and it was a shock when the Interstate Commerce Commission requested the adoption of a new system. The companies then were behind the times. It was better now to go on record for the rules adopted by the Transportation & Traffic Association and ratified by the parent association.

Mr. Duffy was right in his position, Mr. Allen said. He was working as a member of the committee of six. But that committee would have to convince the Transportation & Traffic Association of the correctness of its position.

John H. Cain, superintendent, Buffalo, Lockport & Rochester Railway, attended the meeting at Kingston at which the rules were adopted and put them into effect on the road with which he is connected. During the two years there had not been a failure of the rules. The New York State Association had adopted a code taken practically from that of the American Railway Association and he thought that at the Atlantic City convention substantially the same code would be adopted so far as it is applicable to electric interurban roads.

R. E. Danforth, general manager, Public Service Railway, Newark, N. J., doubted whether more than one-third of the men present knew the numbers of the rules. If a steam railroad man was hired by an electric railway he had to learn a good deal anyway about methods that were different from those to which he had been accustomed. So far as principles were concerned, the Denver code was taken almost bodily from that of the American Railway Association and it was a good safe system for operation. Perhaps each individual road would prefer some slight changes in details. He thought that Mr. Allen's resolution should be passed, although realizing that minor changes may be necessary to adapt the code for local practice.

W. H. Collins, Fonda, Johnstown & Gloversville Railroad, had a book of rules based on the Denver code about ready for adoption on that road. He believed it was the best code ever provided to meet the different conditions existing. His early experience had been with steam railroads but he realized that the American Railway Association code as used by steam railroads was not applicable to all electric interurban roads. As a matter of fact the adoption of the resolution would be in support of the work of the committee and would strengthen its position. If the committee did something better at Atlantic City the New York association should adopt that.

Mr. Duffy said that all he wanted to do was to retain the American Railway Association numbers of rules and companies could put in force the rules they desired. Some of the officials were bound to follow steam railroad practice and the committee was trying to adopt something which those officials and others also could adopt.

E. F. Campbell, Buffalo, Lockport & Rochester Railway, thought the rules all over the country should be the same. It was wrong to have different codes in different States. Some of the best men he had were trained on steam railroads. The same numbers should be applied to rules on both electric and steam properties. A few months would make very little difference. When the association acted it should take the right course.

Mr. Rockwell said that if the association waited year after year no rules would be adopted.

Mr. Cain said that the New York association had adopted practically the American Railway Association code. Each year the American Street & Interurban Railway Association had drawn nearer to the same code.

Mr. Allen said that if the report of the committee was accepted at Atlantic City he would be the first one to ask that the New York State Association rules be amended. He believed in investigating every practice and in striving to do everything that would advance the industry. He was proud of the fact that electric railways had taught steam railroads something concerning transportation. Was it a good position not to ratify the Denver code but to wait and see what else was done? If the Denver code was adopted it put the association on record as adopting rules that represented the best thought and practice up to that time.

The resolution offered by Mr. Allen was then adopted, as follows:

"Whereas, the committee appointed at the last meeting of this association has prepared and reported a certain code or set of rules governing the operation of electric interurban cars, which code is intended to include such general rules as represent the best and most modern practice in electric railway operation, and

"Whereas, this association has duly and carefully considered and amended the same in some particulars, and

"Whereas, it is for the interests of the members of this association that the association adopt, approve, promulgate and recommend a code of rules which shall be considered the standard code, except in so far as it may, in specific instances, be necessary to omit, add to or change rules in order to conform to State or municipal laws and regulation or to local conditions.

"Now therefore be it resolved, that the rules reported by the committee and as changed, omitted or amended at this meeting be the standard code of rules of this association for the operation of interurban cars, until such rules may be duly amended or changed at a meeting of this association, and

"That this association requests its members to adopt this standard code of rules for the operation of interurban cars on their respective railways except in so far as such rules may conflict with State or municipal laws or regulations or be unwise or inapplicable on account of local conditions, and

"That the committee on interurban rules be continued to report at the next meeting of the association such proposed changes or amendments as may seem wise or necessary."

Adjournment until the afternoon session followed.

TUESDAY AFTERNOON SESSION

The session of Tuesday afternoon opened with the presentation of the paper on the "Latest Development of Car-wheels For Electric Railways," by V. S. Yarnell, expert, Carnegie Steel Company. This paper is published elsewhere in this issue. Mr.

Yarnell illustrated his paper with about 20 stereopticon slides which were thrown on a screen, the room being darkened for the purpose. There was no discussion. President Peck then asked Martin Schreiber, engineer maintenance of way, Public Service Railway, New Jersey, to read the paper on "Standardization of Track Construction in Paved Streets" prepared by B. E. Tilton, engineer maintenance of way, New York State Railways. This paper is found elsewhere in this issue.

Mr. Schreiber at the conclusion of the paper discussed the subject of track construction on the Public Service Railway. He said that steel ties should be used only with a concrete substructure because with stone ballast the spacing of the ties would have to be so short that the cost of steel ties would be prohibitive. With a concrete substructure, the cost of construction with steel ties was about equal the cost of construction with wood ties. It was generally conceded that all wood ties should be treated. Practically the only wood that did not require treatment was oak, whose use for ties was prohibitive on account of cost. Mr. Schreiber then described the open tank and the closed tank methods of treatment and exhibited half sections of ties treated by each of these methods. His company has treated between 50,000 and 60,000 long leaf yellow pine ties by the open tank treatment, using the same method employed by roads in Denver, Salt Lake City, and Berlin, Germany. With the pressure system a cheaper preservative material could be used, that is, natural creosote could be employed, but the cost of treatment of the tie was higher than with the open treatment. Mr. Schreiber also showed a sample section of one of 25,000 short leaf yellow pine ties, which his company had had creosoted in Jacksonville. Complete penetration was shown. The specifications employed were the same as those of the American Engineering & Maintenance of Way Association. When both were creosoted he did not think that there was much difference in the wearing qualities of short leaf and long leaf pine. He referred to a common method of distinguishing between these two kinds of timber by the number of rings; less than from five to eight rings per inch indicated short leaf pine. In Europe good results had been obtained for ties of cheaper woods such as birch, when thoroughly impregnated. Most engineers consider the pressure system more reliable than the superficial system, but the latter seemed to be giving good results. Still another material used for tie preservation is zinc chloride or a combination of zinc chloride and creosote. This method has been used extensively in the West and is now being employed on the Chicago properties. Mr. Schreiber thought that roughly the cost of superficial treatment was from 25 to 26 cents a tie and the full treatment was approximately 40 cents per tie. The use of softer woods was less objectionable in electric railway service than in steam railway service, because there was less rail wear as the rail was supported between ties.

The Chicago roads, according to Mr. .Schreiber, were using tie-plates on every tie. They were also using screw spikes, hoping that the ties would outlast two rails. With the screw spike the hole can be filled up and a new rail installed or the old rail realigned. In tests conducted by the Board of Supervising Engineers of Chicago screw spikes have shown practically double the holding power of ordinary spikes. Roughly, it required 5400 lb. to draw one out instead of 2700 lb. with the ordinary spike. He considered tie plates much more desirable than tie rods, especially with a low rail. He agreed with Mr. Tilton on the advisability of using a dry mortar cushion under the paving. His company had done this for some time, but he did not see why a T-rail could not be laid with wooden block paving. The situation in regard to rail sections was now fairly satisfactory. In streets where groove rail was used, the standard of the American Association in which the head was set slightly off from the gage line was desirable and made a good wearing rail. Many companies have adopted this section with slight modifications in the shape of the groove. He considered granite made the best paving, especially when used as in Chicago and by the Public Service Railway Company with very narrow joints. It made as smooth a paving as brick and had a much longer life.

C. Gordon Reel, consulting engineer, Kingston, spoke in favor of T-rail construction and said that it was not used in New York State as much as it otherwise would because of Sec. 109 of the Railroad Law which prohibited the use of "center-bearing" rails. This law was passed 20 years ago and had no reference to T-rails but was intended to apply to a rail with a special head, having a narrow tram on each side, at that time used in New York. This old type of rail was not desirable but the former Railroad Commission had ruled that the T-rail was also a "center-bearing" rail. He did not think that the Public Service Commission had ruled on the same subject but objection was sometimes raised to T-rail by local authorities based on this erroneous construction of Sec. 109. He made a motion that the President should appoint a committee of three to take the matter up with the Public Service Commission and obtain a ruling on the meaning of the word "center-bearing." The motion was carried.

M. V. French, engineer maintenance of way, Utica & Mohawk Valley Railway, disagreed with the other speakers as to the advisability of using dry mortar under paving. He said that if the stone paving or brick was properly grouted a sand cushion was all that was necessary. If good mortar was used, the paving blocks could not be used over again. The mortar cushion has never been used in Utica, but no trouble had ever been experienced there with the pavement heaving except in one place where it was not properly laid. He recommended a depth of ½ in. to ¾ in. as a sand cushion for brick and 1½ in. to 2 in. for block paving. He strongly recommended that on a track laid on stone ballast cars should be run over the track before the paving was laid. In Utica he had found a settlement of from ½ in. to ¾ in. in track on 8-in. ballast, thought to have a very solid foundation. He had heard of the rule in regard to eight rings to the inch to distinguish short leaf and long leaf pine, but tie contractors had declined to bid on specifications containing this provision. He also laid great stress upon the use solely of ties cut from living timber. Other ties were apt to have a fungus growth, acquired while the timber was stacked.

W. Boardman Reed, president Otsego & Herkimer Railway, described the real center-bearing rail which was condemned by the law. He did not think it was so bad a rail for railway purposes. It had been used on the 125th Street crosstown line when that line was built for cable traction, and also had been used on various horse car lines in New York City.

In answer to a question F. A. Bagg, Fonda, Johnstown & Gloversville Railway, said that he had laid strips of cement pavement 12 in. to 16 in. wide next to the rail at a point on his road where the brick next to the rail had been removed. This paving had been in some years and had given good results.

On account of the absence of a number of accounting officers, President Peck announced that the discussion on the subject of the system of accounts prescribed for street railroad corporations by the Public Service Commission, Second District, would be postponed.

A letter was read from the Public Service Commission, Second District, on the subject of passenger traffic, suggesting that the commission would be glad to confer with representatives of the electric railways on this topic. A motion was made that a standing committee be appointed to consider questions relating to tariffs and traffic to meet the representatives of the Public Service Commission.

Supplementing the letter from the commission, Walter E. Griggs, chief of the division of tariffs of the commission, said that he would be glad to have the committee appointed. He spoke of the importance of tariff construction and the advantage of committee work on this subject.

J. M. Campbell, Buffalo, Lockport & Rochester Railway, urged the appointment of a committee as suggested and said that it would perform an important work in effecting uniformity of tariffs. Mr. Campbell spoke of the discrepancies in existing tariffs on various roads and described his experience with the conditions governing the sale of tickets for children or their transportation free.

The motion for the adoption of the standing committee was then carried. President Peck appointed as members of this committee E. E. Campbell, Buffalo, Lockport & Rochester Railway; R. W. Colt, general passenger agent, Fonda, Johnstown & Gloversville Railroad; C. R. Gowan, general passenger agent, Utica & Mohawk Valley Railway; Charles H. Armatage, general traffic manager, United Traction Company of Albany, and H. C. Allen, Buffalo & Lake Erie Traction Company; B. E. Wilson, general passenger and express agent, New York State Railways; I. W. Nugent, general freight and passenger agent, Otsego & Herkimer Railroad.

The nominating committee was then appointed by Mr. Peck. This committee was as follows: C. Loomis Allen, Edgar S. Fassett, R. E. Danforth and J. N. Shannahan.

Adjournment was then taken until Wednesday, June 29.

WEDNESDAY MORNING SESSION

The Wednesday morning session was opened at 10:30 a. m. with President Peck in the chair. After Secretary Pardee announced the accession of several manufacturing and supply companies to the membership list, the chair appointed the following gentlemen to act as a committee of three to place the subject of center-bearing rails before the Public Service Commission, Second District: W. H. Collins, general manager, Fonda, Johnstown & Gloversville Railroad; M. J. French, engineer maintenance of way, Utica & Mohawk Valley Railway Company, and B. E. Tilton, chief engineer of tracks, New York State Railways.

The next order of business was the reading of a paper entitled "Railway Motor Gears and Pinions," by T. W. Williams, of the General Electric Company. An abstract of this paper is published elsewhere in this issue.

In response to a query from C. Loomis Allen, general manager of the Utica & Mohawk Valley Railway, as to what lubricants he would advise for gearing, Mr. Williams said that unquestionably the heavy, clinging grease lubricants were much better than thin ones. One of the ingredients of the heavy lubricants seemed to be pitch. The value of the material was not so much its lubricating quality, but its ability to form a cushion which prevents direct metal-to-metal contact.

Clark H. Prather, superintendent of motive power, Rochester, Buffalo & Lockport Railway, asked why there should be such variations in the life of chrome-nickel, heat-treated pinions from the same maker as given in the paper. Mr. Williams replied that it was impossible to account for a great many breakages. One pinion may have received a better heat treatment than the others. The slightest carelessness in quenching was likely to leave one portion much harder and less ductile than the rest of the piece, thus causing dangerous shrinkage strains.

The next paper was on "Recent Developments in Multiple-Unit Control," prepared by Clarence Renshaw, of the Westinghouse Electric & Manufacturing Company. An abstract of this paper is published elsewhere in this number. In response to a question, Mr. Renshaw said that no additional compressor capacity was required if care was taken to avoid leakage losses.

The next order of business was to have been a discussion on H. W. Blake's paper on "The Problem of the 5-Cent Fare," read at the Tuesday session. Upon motion by J. C. Calisch, vice-president, Buffalo & Lake Erie Traction Company, it was decided to postpone this discussion until the next quarterly meeting, when it will be made the first order of business. By that time the members of the association will have had ample opportunity to analyze the paper.

C. Loomis Allen, as chairman of the nominating committee, presented the following ticket, which was unanimously elected: President, James H. Pardee, operating manager J. G. White & Company, New York; first vice-president, E. J. Cook, general manager, New York State Railways, Rochester; second vice-president, J. W. Hinkley, Jr., president, Poughkeepsie City & Wappingers Falls Electric Railway; secretary, C. Gordon Reel, Kingston; treasurer, H. M. Beardsley, assistant general manager, Elmira Water, Light & Railroad Company; executive committee, J. K. Choate, W. H. Collins, J. C. Calisch and J. E. Duffy.

Upon motion by W. H. Collins, resolutions of thanks were tendered to J. K. Choate and to the hotel management for the splendid convention arrangements. The convention adjourned after R. E. Danforth, a former president of the association and now general manager of the Public Service Railway, Newark, N. J., had been elected an honorary member of the association upon motion of C. Loomis Allen. A farewell luncheon was held at Five-Mile Point, on Lake Otsego.

THE BANQUET

The annual banquet was held on Tuesday evening and was a most successful affair. The only disappointment was the absence of Vice-President Sherman, who was unable to appear as one of the speakers, owing to the serious illness of Mrs. Sherman in Baltimore. The toastmaster of the evening was Hon. John D. Kernan, Utica, who had a felicitous introduction for every one of the orators of the evening. The latter were James F. Hooker, Schenectady, who spoke on the "Benefits of Electric Railways"; Rev. Ralph Birdsall, Cooperstown, who gave sketches of the historical features of the convention meeting-place under the title of "The Glimmerglass"; Walter B. Reed, Schenectady, who presented a sheaf of wittily told stories under the caption of "The Flying Machine," and Hon. John N. Carlisle, Watertown, member of the Public Service Commission, Second District, who spoke on the need for and the functions of the Public Service Commissions in New York. Mr. Carlisle pointed out that such commissions offered the only method of stopping socialism through the power conferred on them to check corporation abuses. His idea of the functions of a public service commission was to help the corporations in the solution of their problems as well as to help the public.

He said that the commission of which he was a member was being used too much for complaints against corporations and too little for their assistance. The latter condition was the fault of the companies themselves. In several instances the commission had gladly helped the railway companies to secure reasonable franchises from the local municipalities, and in one case it had refused its sanction to a franchise because it felt that the railway could not do business under the rigorous local restrictions placed in its franchise. The Street Railway Association ought to ask the State Legislature to pass a uniform franchise law just as there is now a uniform fire insurance policy throughout New York. There was no reason why the electric interurban railway in particular should not be able to go through a district as easily as a steam railroad. The latter gets its privileges from the State Supreme Court without haggling with a score of petty municipalities, each of which has some special and frequently impracticable condition to impose relative to construction, speed, fares, etc. The present system led to perfectly absurd conditions. Congestion in cities presented another serious problem, and he hoped that the association members would also take up with the important manufacturers in their towns the question of having different opening and closing hours for their different departments so as to avoid peak loading.

Further, Mr. Carlisle said the corporations had a wrong idea as to the commission's attitude toward capitalization. The commission realized that the present managers were not responsible for the over-capitalization of the past. If money was needed for a new project, the commission was perfectly willing to make a reasonable allowance for the inevitable promotion and organization expenses over the actual construction cost. The financial condition of the public service corporations of the State was a most serious one. Thus, of the 310 gas, electric and street railway companies in the commission's jurisdiction, 237, or 80 per cent, were not paying dividends on any kind of common or preferred stock. The capitalization of the non-dividend companies totaled $142,330,000, or 66 per cent of all the common and capital stock issued by these corporations. Either there was too much stock or an insufficient return was being secured on it. The commission was anxious to see that the corporations got enough money to run their busi-

ness properly. It had no intention whatever of keeping them down to a 6 per cent basis or any other definite profit. It wished that they could make 25 per cent on their common stock so that the companies could do more for the public. He realized that every railway man in the State would be glad to improve his line and service, but to attain this end there must be a stop to loading up the corporations with stock.

SOCIAL SIDE OF THE CONVENTION

The social side of the convention was very enjoyable, including as it did automobile and boat trips for the ladies and the annual baseball game between the railroad men and the supply men. The line up on each side consisted of:

Railroad men: Joel, pitcher; Brown, catcher; Barnes, first base; Gower, second base; Wilson, shortstop; Weidman, third base; Hamilton, left field; French, center field; Kadl, right field.

Supply men: Ransom, pitcher; Hegerman, catcher; Smiley, first base; Ellicott, second base; Campbell, shortstop; Farmer, third base; Berry, left field; Slimp, center field; Chapin, right field.

A novel feature of the convention was the fact that many of the delegates from the western part of the State went to the convention in two special cars. These cars came from the Buffalo, Lockport & Rochester Railway, via Syracuse and Utica, then to Cooperstown over the tracks of the Otsego & Herkimer Railways.

REINFORCED CONCRETE FOUNDATIONS FOR TRACK

The Grosse Berliner Strassenbahn, Berlin, Germany, now has about 240 km (192 miles) of track on plain concrete foundations in asphalted streets, as illustrated in the section Fig. 1. It also has six different types of construction in stone-paved streets, comprising a total of 460 km (285 miles) and 8 km (5 miles) of track with wooden blocks. The standard weight of rail is 51 kg per meter (about 102 lb. per yard). In addition to the foregoing types, the company has installed during the past four years 7 km (4.3 miles) of track on foundations of reinforced concrete plates in asphalted streets. This last construction is shown in plan and section in Fig. 2 and by half-tone in Fig. 3. The reinforced concrete has been found considerably stronger than the ordinary concrete design shown in Fig. 1, and, besides, costs about $5,000 less per km (0.62 miles), as less concrete is used.

It was the belief of the Berlin company that ordinary track concrete does not contain enough cement to give it the strength necessary to carry heavy traffic. Further than this, the concrete is rarely given the opportunity to set properly, and once

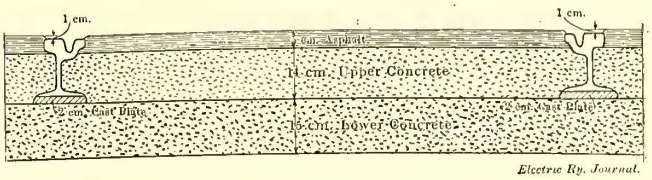


Fig. 1—Berlin Concrete Track—Ordinary Concrete Construction in Asphalt-Paved Streets

in service it is subjected to the deleterious influence of water and the continuous pounding of vehicle traffic. Consequently, it was determined to try a reinforced concrete construction in which the concrete itself would be relieved from severe strain.

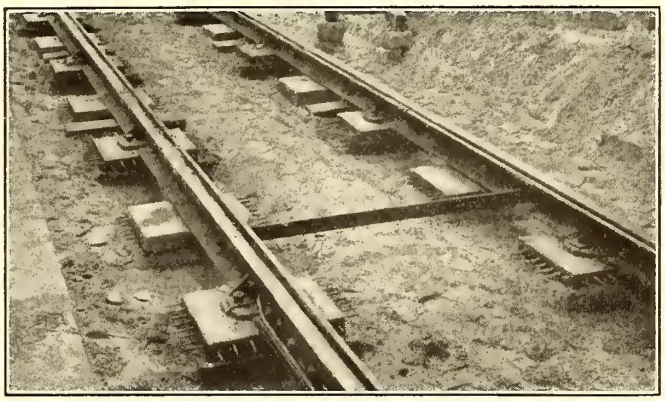


Fig. 3—Berlin Concrete Track—Blocks in Place

As shown in the illustrations the construction adopted consists principally in the use of a ready-made reinforced concrete tie or plate which is 10 cm (4 in.) thick, 40 cm (15.6 in.) wide and 50 cm (19½ in.) long. These plates are set at 1.44 m (4.4 ft.) from center to center, except at joints, where one plate is laid under the end of each abutting rail. Tie rods are installed every 2.16 m (6.6 ft.). The construction described was designed by Arthur Busse, chief engineer of way and structure of the Grosse Berliner Strassenbahn.

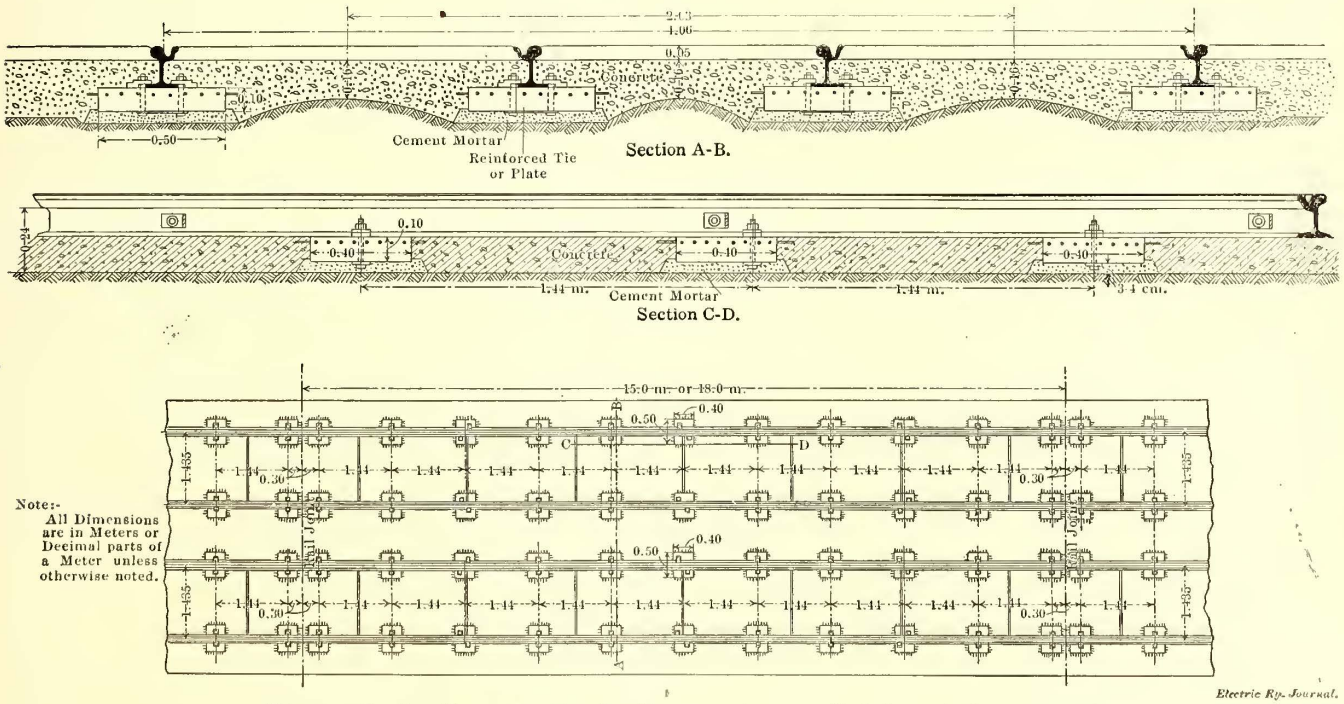


Fig. 2—Berlin Concrete Track—Construction on Reinforced Concrete Ties

NOTES ON DURHAM, N. C.

The Durham Traction Company, Durham, N. C., is an interesting example of an efficient public utilities corporation in a small town. The population of Durham does not exceed 10,000 and it has therefore proved most satisfactory to have the power, railway, lighting and even the ice manufacturing business in the hands of a single company. The following paragraphs will describe the various features of the company's work except the lighting.

TRACK AND LINE

The trackage of the Durham company is 7 miles, composed of standard gage 60-lb. T-rail on the highways and 70-lb.

Durham Traction Company—The Casino

girder rail in the paved streets, all laid on white oak or chestnut ties spaced 2 ft. The routes are single track except for a 600-ft. siding on the main street of Durham. The lines run from the center of the town about 2 miles in each direction, east and west, and the longest possible ride for one fare is about 4½ miles. The overhead construction is of the span type within the city limits but brackets are used elsewhere. The trolley wire is No. 00 throughout and the feeders are of No. 0000 cable. The feeders run from the power station in the city for about 1 mile in each direction and the longest transmission with the trolley alone is 1½ miles, which is the distance from the end of the eastern feeder to the new baseball grounds. Cars are operated on a 12 minute headway. The company sells no tickets at reduced rates except that $5 lots may be purchased at the main office for $4.50. Free transportation is given only to the city police, the chief of the fire department, the street commissioner, the county sheriff and the sheriff's deputies. The company does not give transportation to newspapers, but has an annual contract with the latter whereby car tickets are exchanged for advertising bills.

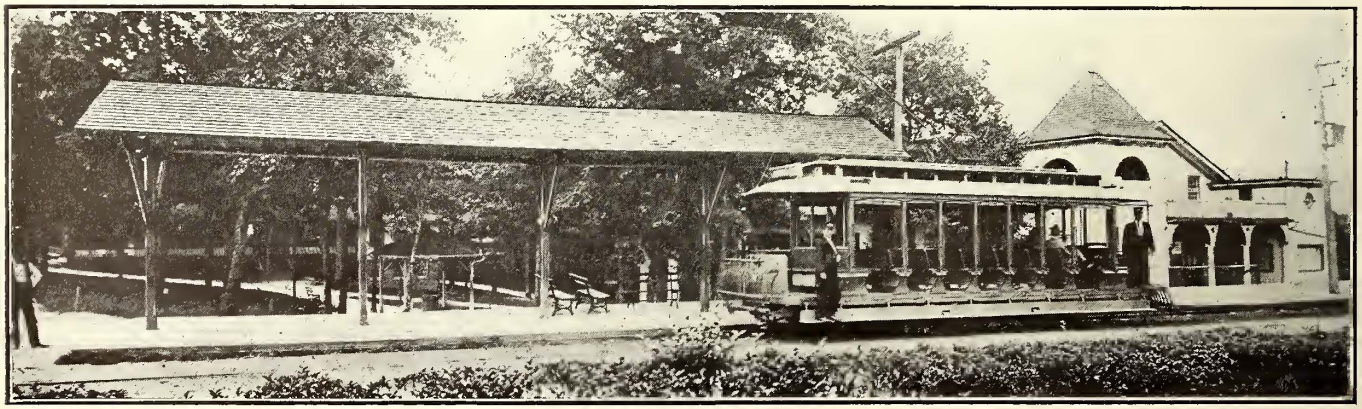
ROLLING STOCK

The company now operates 10 closed single truck cars, eight of which were built by the American Car & Foundry Company and have Lord Baltimore trucks carrying two GE-54 motors; the other two were built by the Southern Car Company and are mounted on Dupont single trucks carrying two GE-67 motors. The remaining rolling stock comprises four 10-bench Brill single truck cars with 7 ft. wheel base and four 12-bench St. Louis cars, two of which have Dupont single trucks and two were equipped last season with Brill maximum traction trucks. The company expects to equip the other cars with the maximum traction trucks some time this summer.

At present the company is doing very little repairing at its own car house, most of the work being done at a nearby machine shop which, however, is not supplied with a wheel press. The company is planning to purchase a lathe, wheel press and boring mill and other tools necessary for car repairs and power house maintenance. Woodworking tools will not be installed as there are plenty of facilities in Durham for the small amount of work of this kind which the company has. The necessity for a wheel press may be appreciated from the fact that it now costs $2.50 per wheel set each way merely for the freight.

POWER HOUSE

The power station of the company is used both for d. c. railway work and a. c. lighting. The original d. c. installation consisted of a 200-kw General Electric railway generator connected to a Ball simple engine. This machine is now used principally on Sundays when the other apparatus is shut down. Another reserve unit is the 200-kw General Electric 2300-volt alternator which is run by a high-speed Ball engine operated either condensing or non-condensing. The principal unit for carrying the load, however, is a 500-kw, 2300-volt, three-phase, 60-cycle Parsons turbine which is run at 3600 r.p.m. This machine was installed in the fall of 1906 and has been giving very satisfactory service. The voltage delivered by the turbo-generator is divided between the lighting transformers and three 75-kw oil-cooled transformers which feed a 200-kw General Electric rotary. This rotary is sometimes run inverted to take direct-current from the railway generator and to deliver alternating current to the lighting system. The boiler equipment which is operated at 160 lb. pressure now comprises three 125-hp. Aultman & Taylor and two 250-hp Stirling boilers. The power house is to be lengthened, however, about 36 ft. for its entire width of 100 ft. to take new equipment as follows: Two 250-hp boilers, one Hamilton-Corliss cross-compound condensing engine to be direct-connected to a General Electric 2300-volt, 600-kva generator. The new condensing equipment to be installed will consist of 2000 sq. ft. capacity apparatus from the C. H. Wheeler Engineering Company of Philadelphia, Pa. This will embrace a pair of natural draft cooling towers with combined capacity of 2600 gal. of which 1000 gal. will be used for the present turbine because the old cooling tower will be displaced. In connection with this apparatus, there are also to be furnished by the same contractor a Mullins wet vacuum pump and a volute pump driven by a 40-hp induction motor which will have a capacity of 1600 gal. of water per minute. The old steam auxiliaries now in this plant comprise a 1000-hp Cochrane feed water heater and a Worthington 1800 sq. ft. surface condenser. This power station also contains the refrigerating machines which are operated by steam from the boilers previously mentioned.

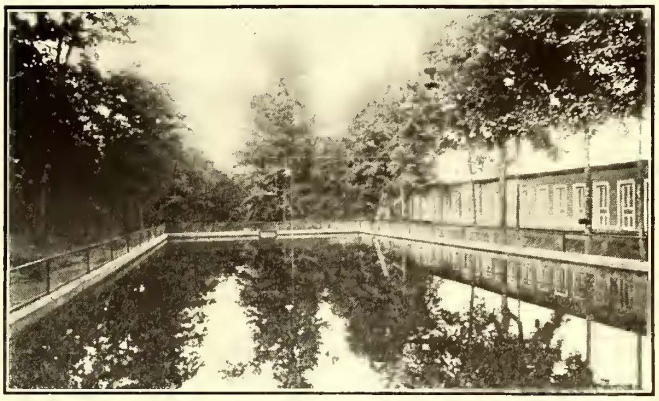


Durham Traction Company—Entrance to Lakewood Park

LAKEWOOD PARK

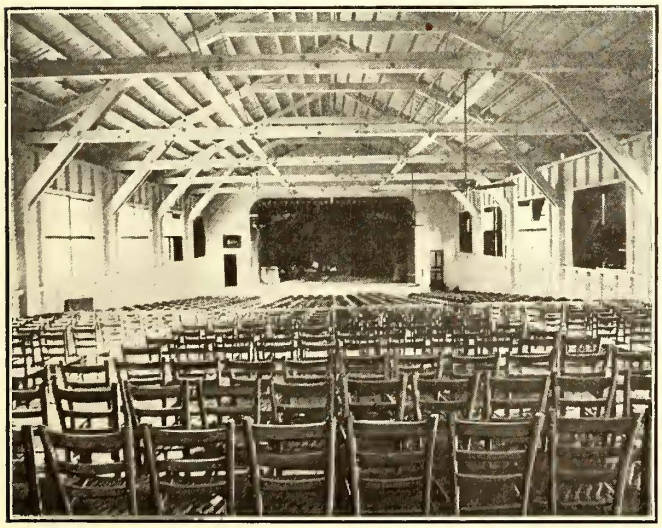
An excellent traffic producer for the company is a 30-acre grove located about 1½ miles from the center of Durham and known as Lakewood Park. The grounds are in the midst of fine rolling country but at present do not contain a lake suitable for boating. It is planned, however, to dam the brook which runs through the park and thereby enlarge the present pond in one of the hollows to such an extent that it will be possible to build a rustic path 900 ft. along the shores. If this work is undertaken, the company will embellish the vicinity of the lake with bridges, benches, etc. As Durham is an inland city far from large bodies of water, an improvement of this kind should greatly increase the revenues of the park.

Durham Traction Company—A Scene in Lakewood Park Near the Dance Pavilion

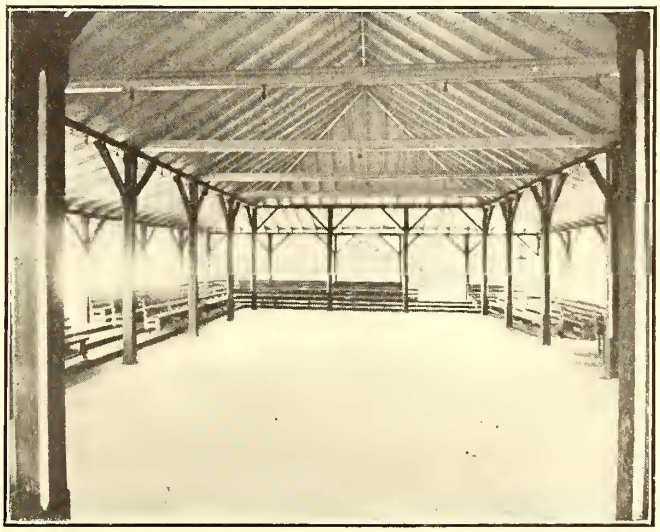


Durham Traction Company—The Swimming Pool in Lakewood Park

The accompanying views will give a fairly good idea of the arrangement and attractions in Lakewood Park. Cars are run in on a stub track through the park gates to a covered platform, the passengers being unloaded next to the Casino, which is the principal building in the park. The Casino is provided with a ticket office in the front and eight dressing rooms in the rear. Its stage is 32 ft. wide and has five sets of scenery. The seating capacity is 1000. Admission to the entertainments last season was free to all seats except 400 orchestra chairs for which 10 cents each was charged. More money was taken in by this plan last summer than when the admission charges were 10, 15 and 25 cents. The change of policy, however, was induced primarily by a rapid development of moving picture shows in Durham which threatened to cut seriously into the park business. In 1908, vaudeville and moving pictures were given for a general admission of 10 cents and a free house for ladies and children every Wednesday afternoon.



Durham Traction Company—Interior of Theater at Lakewood Park



Durham Traction Company—In the Dance Pavilion at Lakewood Park

Last season the railway secured a repertoire stock company with moving pictures and vaudeville between the acts. There were two changes of bill weekly and the 10-cent charge was made only for the 400 orchestra seats. As a result, the traffic to the park was largely increased and at the same time the theatrical people received as good returns as under the old conditions. The Casino is leased for a nominal figure. The company has nothing further to do with it except to furnish the lighting and whatever policing is required. The stage people even paid for their own transportation. In order to limit the patrons of the theater to passengers, the company printed a triplicate ticket of the type reproduced on page 46. This was sold for 10 cens in the city. The first coupon was given for the ride to the park, the second was for admission to the Casino and the third for the ride to Durham.

All the park concessions except the merry-go-round and the swimming pool are rented. These concessions include a roller skating rink, bowling and box-ball alleys, pool room, shooting gallery, ball rack, photograph studio, lunch privileges, and refreshment stands. The concrete swimming pool operated by the company is very popular especially with onlookers for whom benches are provided on the hillside. The pool is large enough for 100 people and is graded in depth to suit all ages. Forty dressing rooms are provided. A charge of 25 cents is made for the use of room and suit.

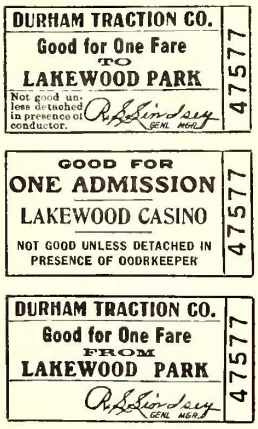
Free orchestral music and dancing are provided at the pavilion every night except Wednesday and Sundays. Four to six firework displays are also given throughout the season. A rather novel feature of the park management is that iced city water is furnished free from two artistic fountains, a 300-lb.

block being placed over each fountain coil every day of the park season.

ICE BUSINESS

For the last four years the Durham Traction Company has been making ice from distilled water from the condensation of its Westinghouse power station turbine. The daily capacity of the ice plant, which is located in the power station, is 50 tons, but this is a great deal more than the amount sold as there is only local trade to cater to, such as stores, residences, the hospital, etc. Durham is not on the main line of any railroad and has no important garden truck shipments so that there is no ice market for refrigerator cars. The ice-making equipment includes two refrigerating machines and tanks, with a special forced-draft cooling tower. The latter is kept separate from the cooling tower of the power station proper and is more liberally designed so that the water in summer never reaches as high a temperature as that in the other cooling tower. An extra multi-stage pump is installed for handling the cooling water to the refrigerating machines.

Practically no money is spent for soliciting ice business. The ice machine loads help to keep the boilers busy in the summer time when the lighting business is low. The ice compressors use steam from the regular boilers of 100-lb. pressure, this being cut down from the regular pressure of 160 lb. by a reducing valve. In the power station accounting, an arbitrary portion of the cost for steam generation is charged off against the ice department, as is also the cost of water and engineering service. The chief engineer of the power station also takes care of the refrigerating machinery.



Park Ticket

The prices of ice are as follows: 10 lb. tickets, 45 cents per 100 lb.; 25 lb. tickets and upward, 40 cents per 100 lb.; cash ice for the wagon, 50 cents per 100 lb.; block ice, 35 cents per 100 lb. when delivered and 33½ cents per 100 lb. when taken by the user at the company's platform. The summer trade is handled by 11 regular wagons and one occasional dray. Most of the horses are sold at the end of the season, as not more than two wagons are required for the winter service. Very little feed has to be bought because most of it is raised by the company on its park grounds and elsewhere.

GENERAL CONCLUSIONS.

The gross earnings of the Durham Traction Company are divided into different departments approximately as follows: Railway, 41.4 per cent; power and lighting, 39.6 per cent; ice, 19 per cent. Since 1905, the company has doubled its business and decreased its operating expenses by 15 per cent. In connection with the lighting business, it might be interesting to note that this company was one of the first to exploit tungsten lamps in the south, both for house and street sign lighting. The power business amounts to 600 hp in induction motors, all scattered among very small units because the large factories in Durham have their own power plants.

The Durham property is largely owned by R. H. Wright and J. S. Carr, local capitalists. The manager is R. L. Lindsey, who has been with this company since its organization in 1901 when he became auditor. Previous to this, he was secretary and treasurer of the parent corporation, the Durham Electric Light Company, whose service he entered in 1898. He was appointed general manager of the present company in 1905 in addition to his previous work as auditor.

The traffic on the electric street railways of Bohemia in 1909 was as follows: Passengers, 55,679,248; receipts, $1,565,078, of which the Prague lines alone had 42,634,681 passengers and $1,181,312 receipts, leaving for all others, 13,044,567 passengers, and $383,766 receipts.

AIR PURIFYING SYSTEM FOR COMPRESSORS AND OTHER MOTORS

The Spencer Air Purifying Company, New York, has placed on the market two interesting devices especially designed for securing clean air and consequent economy in air brake power consumption and maintenance. The company's air purifier is applicable to all modern compressors, while the equalizer and purifier system combined is intended for compressors where both the pump and motor are mounted in one case.

The object of the air purifier is to insure the passage of clean air to the compressor without the use of screens which soon

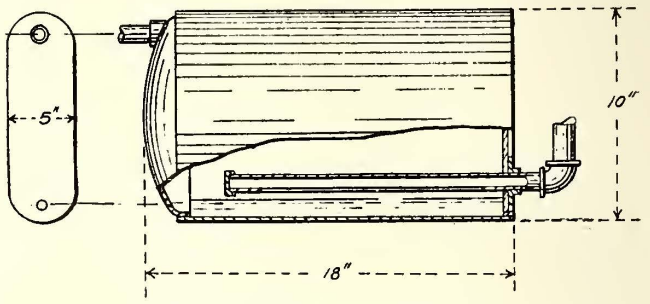


Fig. 1—Simple Air Purifier

clog up if not given constant attention. As shown in the accompanying drawing, Fig. 1, this contrivance comprises a small, light, sheet metal tank which may be placed anywhere in the line of the air-piping system as, for instance, under the seats. The air inlet is through the pipe shown at the right hand end of the drawing. The underside of this pipe is slotted so that when air comes in it is deflected toward the bottom of the tank against a layer of oil which extends almost to the height of the slot and which traps every particle of dirt before the purified air reaches the pump intake at the upper left-hand end of the tank. The bottom of the tank contains a plug to permit the removal of the dirt-filled oil from time to time. From experience with the installations already made on electric railways it has been found that the tank requires cleaning not oftener than once a year. The same principle of air purification can be applied to the natural air cooling of railway or other motors. Some figures of the power economy possible with the Spencer method were published on page 624 of the

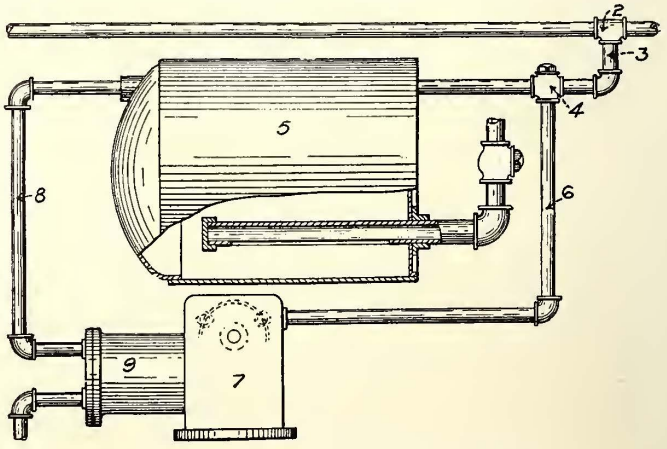


Fig. 2—Equalizer and Purifier Combined

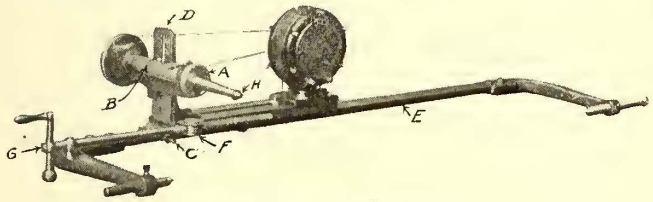
Electric Railway Journal, Oct. 2, 1909, in a description of its use on the New York & Queens County Railway. The fact that clean air is always obtainable makes possible the use of a smaller compressor and eliminates the danger of compressor burn-outs due to no-load operation.

The equalizing and air-purifying system combined is especially adapted for old style compressors. It traps the exhausts from the brake cylinders at the release of the brake and utilizes it to air cool both the pump and the motor. The principle of operation will be understood from the following paragraph and by reference to Fig. 2.

When the brakes are released the exhaust is conducted through the top pipe 1, branch pipe 3 and automatic valve 4 into the tank 5. When the exhaust and tank are equalized the automatic valve 4 closes against the volume in the tank, thus trapping it. At the same time the automatic valve opens the bypass 6, leading into the motor case 7 and the brake cylinder air is blown against the motor, thus keeping the latter clean and cool. The volume of air in tank 5 is under some pressure and due to its expansion is very cold. This air is blown on the pump 9 through the pipe 8 and cools the pump and motor and also supplies the pump with a large volume of clean air, in this way increasing the power efficiency. After the volume of air in tank 5 is pumped out, atmospheric pressure is admitted through the valve and tube shown at the lower right end of the tank and, as in the case of the simple purifier, the air is deflected and cleaned before it reaches the pump intake.

A COMPACT COMMUTATOR SLOTTER

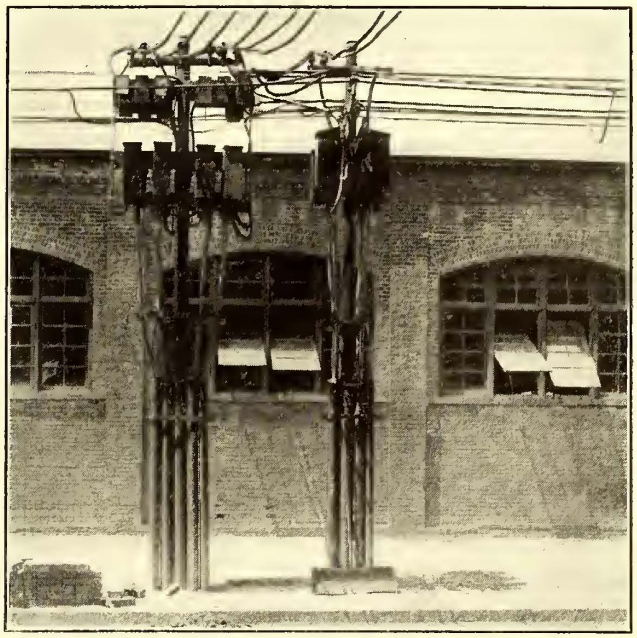
J. A. Place, Geneva, N. Y., has placed upon the market a light and compact commutator slotting machine which was first designed and installed by him for the Asheville (N. C.) Electric Company when he was in its employ. The machine is



Commutator Slotter

designed for independent drive and is adapted to any size of commutator. It is capable of slotting GE-80 and GE-67 commutators in about 1½ hours each. The machine illustrated is operated by a 1/15-hp, 60-cycle, 110-volt motor run at 1800 r.p.m.

It is so constructed that the saw arbor is run in eccentric bearings. When the cut is completed the saw is raised from the slot by turning the hand wheel "A" and is ready to be carried back to starting position. The eccentric bearings are set with the armature shaft. The slotted vertical piece "D" is 8 in. high, thereby giving an adjustment for commutators up to 16-in. in diameter. The clamp "E" is 51 in. long and will take on any armature shaft. "F" is a movable nut, which allows

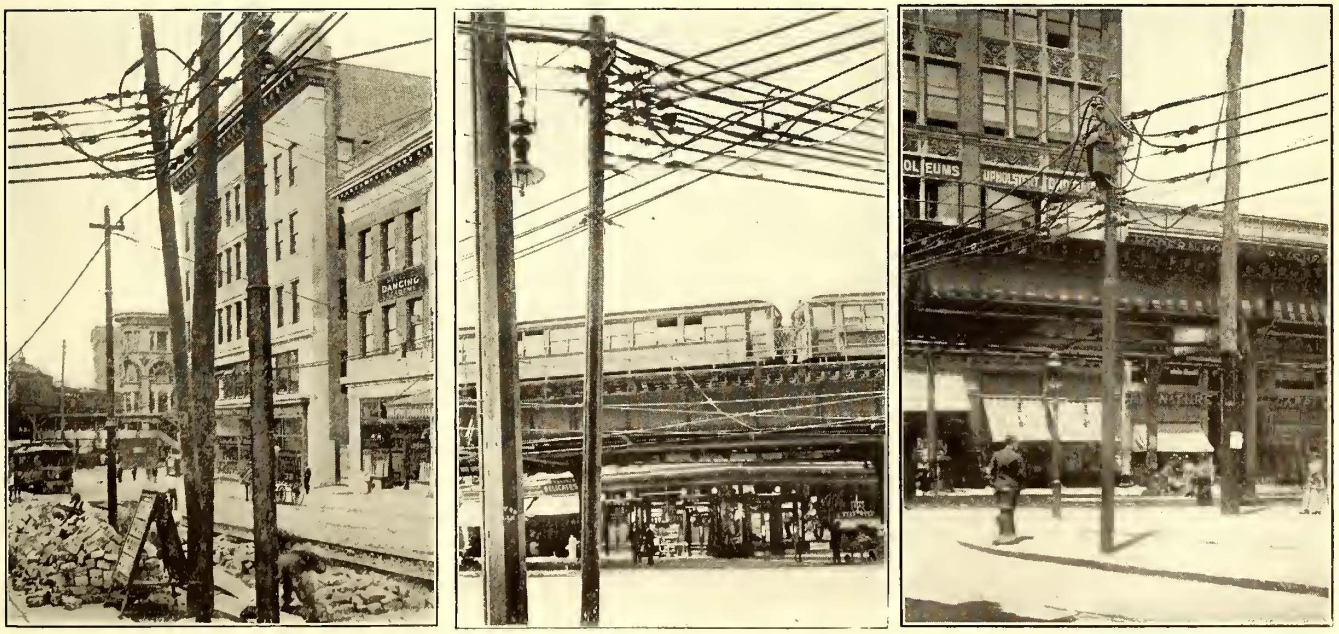


Cable Clamps in Front of West Farms Car House

free motion to the feed screw when the carriage is moved sideways for segments out of true. Three turns of the handle "G" will move the carriage 1 in.

INSTALLATION ON IMPROVED CABLE CLAMPS IN NEW YORK

The accompanying views show four installations made by the Union Railway Company, New York, with Matthews cable clamps. One illustration shows them applied to a strain pole



Cable Clamps at 150th Street and Melrose Avenue; Southern Boulevard and Westchester Avenue, and 150th Street and Third Avenue, New York

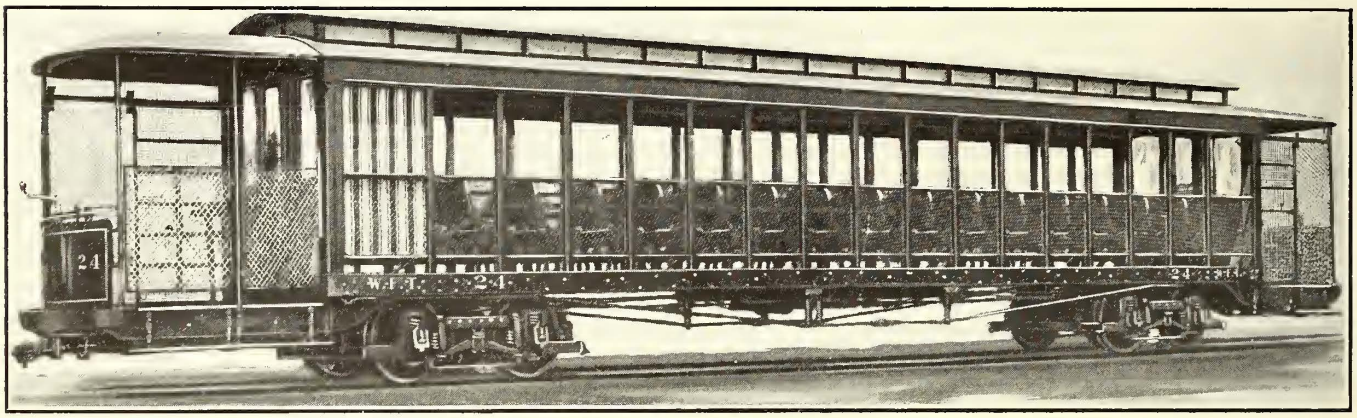
in a solid length of brass tubing "B" which constitutes an oil receptacle sufficient to lubricate the saw arbor for months. The nut "C" is for the side adjustment of the carriage, to make possible the slotting of an armature which might be out of line at 150th Street and Third Avenue; another to a corner pole at 150th Street and Melrose Avenue where the giving away of the first pole made it necessary to transfer the cables to a second pole without interfering with the service; a third illustration

shows the application of the clamps at a corner pole at Southern Boulevard and Westchester Avenue; and a fourth illustration shows them in use between two poles in front of the West Farms car-house where the cables are brought from below to the aerial lines past lightning arresters, switch-boxes, etc. These clamps have given such satisfactory service that the Union Railway Company has made them its standard for all corner work, dead-ending, etc. The first clamps were installed about three years ago and the same type was adopted for all later installations.

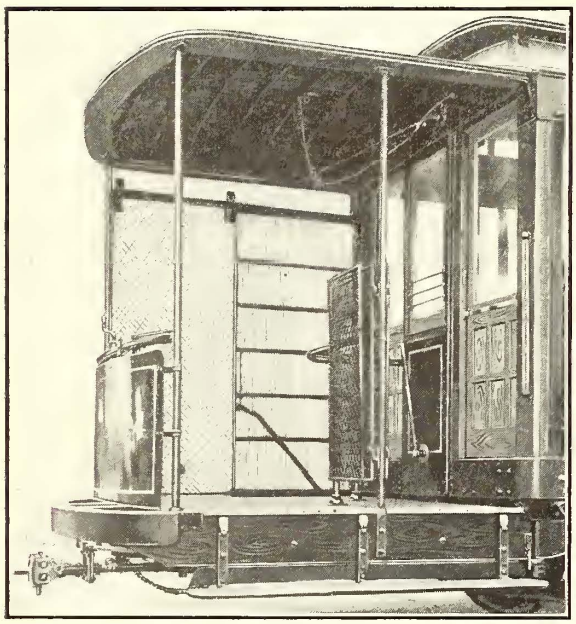
The old method was to make a wrap splice, cut the wire, dead-end on a pole and put a jumper across. In the hurry to cut in a cable, it often happened that the soldering was forgotten. The clamps have eliminated all difficulties of this kind and furthermore they avoid all waste of material and loss of current on account of bad connections. It takes less time to make a splice than before and the job looks better when it is finished. The clamps are applied after the cable insulation has been cut away for the necessary distance. No trouble has been experienced from sliding. In the case of the installation at 150th Street and Melrose Avenue already mentioned, it has been a simple matter to change from pole to pole without interference of any kind as the clamp made it possible to take the cables and loop them over one at a time on the pole arms without breaking the connections. All the clamps were installed under the supervision of J. D. Kent, chief and electrical engineer of the Union Railway Company. This company operates the greater part of the overhead trolley electric railway mileage in the Borough of the Bronx, New York.

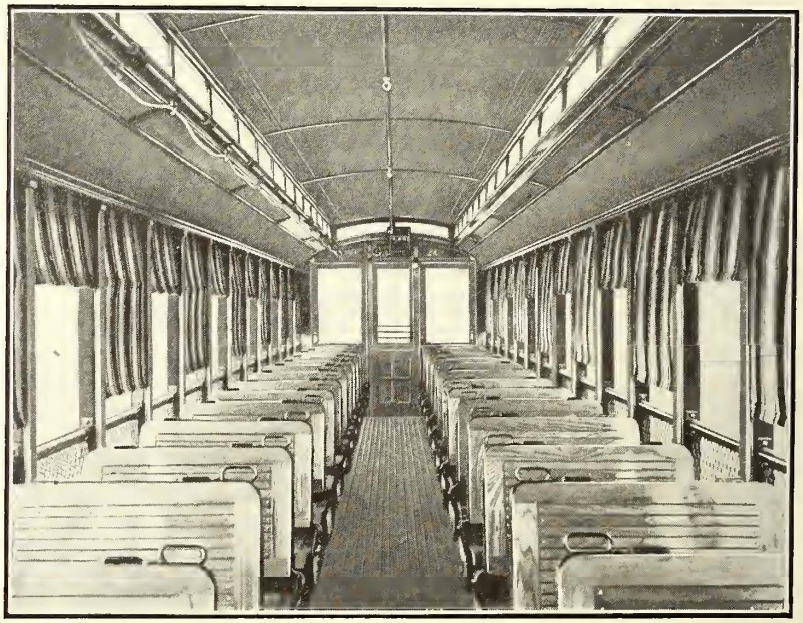
PAY-AS-YOU-ENTER TRAILERS FOR WICHITA FALLS

The Wichita Falls (Tex.) Traction Company lately has received from the Danville Car Company four 16-bench pay-as-you-enter trailer cars of the novel design shown in the accompanying illustrations. It will be observed that the cars are of open construction with side screens. The body ends are furnished with bulkheads arranged for a sliding entrance door controlled by the conductor and a sliding exit door. These doors are used in connection with a two-leaf swinging entrance gate and a single swinging exit gate, both under the control of the conductor. On the opposite side of each platform there is a single sliding gate which is locked when on the inner side of the track; otherwise it serves as a sliding front exit controlled by the motorman. At the entrance-exit side of each platform there is a folding step which is latched when not in use. The step on the other side is of the folding type and is operated in conjunction with the sliding exit gate.



Pay-As-You-Enter Trailers for the Wichita Falls Traction Company





Platform and Interior View of the Wichita Falls Pay-As-You-Enter Cars

The general construction of this rolling stock is such that it can be converted into motor cars later on. The car body dimensions are: Length over the crown pieces, 59 ft 9⅜ in.; width over the sills, 8 ft.; length of platform center, from center of end posts, 7 ft. The side sills of the car are plated with ⅝-in. by 8-in. steel. The roof is one of the monitor deck type the full length of the car body and is provided with ventilator sash glazed with white Florentine glass. The inside finish of the car is of ash and the ceiling finish of bird's-eye maple. The cars have Westinghouse trailer car brake equipment, type S.T., and are mounted on Brill No. 27 G-2 trucks.

LONDON LETTER

(From Our Regular Correspondent)

The fifteenth annual convention of the Incorporated Municipal Electrical Association was opened on June 14, 1910, at the Institute of Engineers and Shipbuilders, Glasgow, by A. McInnes Shaw, Lord Provost of Glasgow, after which W. W. Lackie, chief electrical engineer of the Glasgow Corporation Electricity Department and president of the association, read his presidential address. Thereafter a paper on "Commercial Progress," by A. C. Cramb, Croydon, and H. Collings Bishop, Newport, was presented for discussion. Luncheon at the City Chambers was then tendered to the members and delegates by the tramways and electricity committees of the Glasgow Corporation. In the afternoon the various power houses and substations of the electricity and tramways departments were visited, and in the evening there was a reception and conversazione at the City Chambers. At the meeting of the association held on June 15 at Edinburgh the Lord Provost of Edinburgh welcomed the delegates. The papers presented at this session were "Exhaust Steam Turbines and Condensing Plant," by F. A. Newington, Edinburgh, and "Mixed Pressure Turbines," by Ashton Bremner, Burslem. Luncheon was tendered to the members and delegates by the Corporation of Edinburgh. In the afternoon the works of the Electricity Department were visited. The association met again in Glasgow on June 16, when the following subjects were discussed: "Advantages of Continuous Records of Costs and of Steam Consumption," by George Wilkinson, Harrogate, and C. E. C. Shawfield, Wolverhampton, and "Cheapening of the Cost of Mains and Services," by S. E. Fedden, Sheffield, and S. J. Watson, Bury. Various other electric stations were visited in the afternoon, and the ladies were carried in a special car to Rouken Glen. The fourth day of the convention was devoted to the business meeting and the election of officers and council for the ensuing year.

The Tramways & Light Railways Association held its annual congress this year at the Imperial Hotel, Dublin. William Murphy, chairman of the Dublin United Tramways, opened the congress. R. S. Tresilian, of the Dublin United Tramways, then read a paper descriptive of the system of that company; J. R. Salter read a paper, "Tramway Economics." Harry England submitted a paper, "Railless Traction," and Fred. Coutts a paper, "Should the 1870 Act Be Revised?". In the evening a banquet was tendered to the delegates by the Dublin United Tramways. The second day was devoted to a visit to the power station and to various excursions. The Dublin United Tramways entertained those in attendance at the conference at luncheon at the Marine Hotel, Kingstown, and at tea at the Claremont Hotel, Howth.

The first electric tramway in Edinburgh was inaugurated in June, 1910, when a car conveying a number of officials was run from Ardmillan Terrace to the new Cattle Markets at Gorgie. As is well known, Edinburgh is equipped with a most successful system of cable tramways, so that this new extension will be carefully watched.

The London County Council has a bill before a select committee of the House of Commons for extensions to its system. Mr. Macassey, who appeared for the London County Council, explained that the bill was an omnibus one, and sought to obtain powers for a variety of things. The bill contemplates a total expenditure of £931,335 for the construction of new tramways, the reconstruction of horse tramways and the widening and making of new streets. In the County of London there are 144 miles of tramways, of which 136 are owned by the London County Council, 113 miles being worked by electricity, and most of the remainder being still worked by horses. Mr. Macassey pointed out that in 1904-05 the total number of passengers carried was 164,000,000, while last year the number of passengers carried increased to 451,000,000. It has also been reported by the highways committee of the London County Council that the Council has had under consideration the question of making arrangements whereby passengers on the tramways could book direct to any station on the several underground electric railways in London, and vice versa. It has therefore been suggested that authority for this purpose should be sought at the next session of Parliament. The London County Council is also considering the subject of issuing return tickets at reduced rates between the hours of 10 a. m. and 5 p. m. with a view to increasing traffic on its system during the hours when ordinarily the traffic is light.

In the London Letter in the ELECTRIC RAILWAY JOURNAL of June 4, 1910, page 1001, it was stated that Sir George Gibb, who has resigned as managing director of the Metropolitan District Railway, had been appointed chairman of the board. It should have been stated that Sir George Gibb had been appointed chairman of the Road Board, a new body constituted under the provisions of the Development and Roads Improvement Funds Act of 1909, and formed to give proper arteries through London and provide proper egress and ingress to and from the metropolis and the outlying districts.

An interesting job in electric rail welding is being carried out on the Birmingham Corporation Tramways system by the Tudor Accumulator Company, the British representative of a German invention. If the work now being done is satisfactory after it has been in service some time it is more than likely that an agreement will be entered into between the company and the Council whereby all lines on which the return circuit is not particularly good will be welded by the Tudor process.

The Board of Trade of Torquay has intimated that it will not renew the certificate for the use of the Dolter system on the tramway after Oct. 30, 1910, unless service improves. The Torquay tramways are equipped with the Dolter surface contact system, and while on the whole the system has worked satisfactorily, there has been considerable trouble from live studs. The Board of Trade has never issued a license to the company which operates the system for a longer period than six months, and has on several occasions called attention to the number of live studs reported to it each month by the company. Doubtless the surface contact system will be abandoned and the tramways equipped with the overhead system, which, it is estimated, can be done for about £8,000.

The Maidstone Corporation has before it a proposal to extend the electric tramways of the borough to the neighboring town of Chatham, a distance of nearly 7 miles. It is estimated that the scheme would involve an expenditure of £60,000.

A receiver has been appointed for the Sunderland District Electric Tramways, Ltd. The company was formed to construct a tramway from Houghtonle-Spring to Sunderland. There are £160,000 of first mortgage debentures outstanding and £20,000 of second mortgage debentures. The company has been carrying on business for eight years at a loss. No interest has been paid on the preferred shares, of which there are £90,000, or on the £74,000 ordinary shares. Though no interest on the debentures is in arrears, it is admitted that there would not be sufficient funds to pay the interest which becomes due on July 1, 1910.

The Paisley District Tramway is building a new line 4 miles long, to connect Barrhead and Rouken Glen, and cost about £40,000. The extension will mean that passengers from Paisley to Rouken Glen will have a choice of returning by the Corporation cars or via Barrhead to Paisley, and thence by the Paisley Road to the city, or travel to Renfrew and return to the city from Renfrew or Yoker. The company has agreed to build a double-track line and Spiers Bridge has been extended at a cost of nearly £3,000, and rails laid across it. The Clyde Valley Company will supply the electric power. The terminus of the Paisley District Tramway at Rouken Glen is close to the terminus of the Glasgow lines.

The annual meeting of the Anglo-Argentine Tramways, Ltd., was held recently in London. During 1909 223,823,792 passengers were carried. The total receipts were £1,938,887, and the expenditures, including £50,000 carried to the depreciation renewals funds, totalled £1,207,222, leaving a net profit of £731,665. After providing for all fixed charges, dividends on both classes of preference shares, nine months' rent of the Metropolitan Tramways and the share capital sinking fund, the surplus is £140,972, from which has to be deducted the interim dividend paid on the ordinary shares and the extra dividend which has been recommended upon them, together £130,625, leaving a balance of £10,347 to be carried forward. A. C. S.

News of Electric Railways

Transit Affairs in New York

The Public Service Commission has rejected the terms offered by the Brooklyn Rapid Transit Company for the use of the Center Street subway loop in Manhattan. The letter from the commission to the company was signed by Commissioner McCarroll, who is acting chairman. Mr. McCarroll points out that traffic can be increased over the Williamsburgh Bridge 15 per cent or 20 per cent and that the connecting loop is a trunk line of vast importance. He also says that it is unfair for the company to desire to withhold 40 per cent of the rental until the Williamsburgh Bridge can carry 10-car trains as the stations on the Broadway elevated are not equipped to receive 10-car trains. During the rush hours 62 trains are run across the Brooklyn Bridge while only 20 trains are operated across the Williamsburgh Bridge. Mr. McCarroll suggested that President Winter, of the company, and Vice-President Calderwood should confer with the members of the commission in regard to the matter. This they have done, but no agreement has been reached. The Board of Estimate and Apportionment has also rejected the offer of the company to operate across the Manhattan Bridge.

On June 24, 1910, E. W. Winter, president of the Brooklyn Rapid Transit Company, sent a letter to the Public Service Commission containing a further statement of the position of the company in regard to the operation of the bridge loop subway. The letter in substance reaffirms the offer, with additional details and a concession in one particular, giving the city the option of changing at its will from a flat rental to payment from the company on a car mileage basis. The company offered originally to pay, in case a flat rental basis was determined upon, $40,000 the first year, $60,000 the second year, $80,000 the third year, $100,000 the fourth year, and $120,000 the fifth year. Thereafter the rate was to be $200,000 a year, with a reduction proportional to the capacity of the bridge loop subway under a limit of a 10-car train. The commission was of the opinion that these sums were much too small, and that payment for the first year should be at least $75,000 and increase annually in the proportion named in the company's proposal, making the payment for the fifth year $225,000 and thereafter, if 10-car trains were permitted to operate, $375,000 a year. Mr. Winter, in his letter, said, in part:

"In addition to payments to the city, I ask you to consider the fact that approximately $2,000,000, rather more than under, will have to be expended for a substation in Manhattan, additional electrical and other equipment made necessary by this extension of service, and a conservative estimate of increase in operating expenses of $100,000 per year will have to be borne by the operating company, constituting in all a fixed charge on the basis of our proposal ranging approximately from $240,000 for the first year to $320,000 for the fifth year, and, if the city makes it possible for the operation of 10-car trains, $400,000 per year thereafter.

"In short, the company proposes to incur an expense ranging from $240,000 to $400,000 per annum for the privilege of performing an important service for the public without additional charge, its only possible pecuniary return being such enhancement of its general business as may in time be expected because of increased accommodation to its passengers.

"I call your attention to Clause B in the proposal of May 27, in which an alternative offer is made on a car mileage basis, the rate suggested being practically the same as that applying to the Interborough Rapid Transit Company's rental reduced to car mile basis. The immediate returns to the city under this arrangement can be estimated by applying the rate of 4½ cents per mile to the closely approximated car mileage named in that communication. Under this plan the city would share in whatever increase of business might come from time to time in the line in question."

The Public Service Commission has sent a letter to the Board of Estimate and Apportionment asking the board to appropriate $490,000 to provide for additional entrances and exits for the subway. The work of lengthening the platforms in the subway is now well under way and it is estimated that this improvement will increase the capacity of the subway 25 per cent. In order to avoid extensive congestion around the entrances, however, and to make full use of the lengthened platforms it is believed by the commission's engineers that it will be necessary to have more entrances and exits. The more important stations will then be arranged more or less like the present station at Fulton Street, which has entrances and ticket booth at John Street and Dey Street, on Broadway, as well as at Fulton Street.

Cleveland Traction Situation.

The Cleveland Railway has refused to accept the Hitchens amendment to the Tayler franchise, which provided that a greater portion of the cost of renewal work shall be charged to capital account. The officers of the company concluded that the capital valuation would probably be increased too rapidly through the working of the amendment, and that trouble might possibly result in the future from it.

J. J. Stanley, president of the company, has asked the City Council to confer with him on the question of an additional allowance for renewal charges. If the company is granted an addition above that provided in the Tayler franchise, the improvements may proceed, but if this is not done the account will have to be overdrawn for a time, at least, as some of the track is still badly in need of repair. Under the present grant all the renewal cost that may be charged to capital account is the difference between the cost of the new property and the original cost of the property which is replaced.

An allowance will have to be made for operation, it is believed, if the increase in the wages of motormen and conductors is to stand. This will also be referred to the City Council for consideration. Mr. Stanley believes that the board of arbitration took an extreme view of the conditions affecting the men who have been in the employ of the company more than one year, and that an increase of 2 cents an hour would have covered the case satisfactorily.

During May, 1910, 3,403,578 more passengers were carried than in May, 1907. The increase in car mileage for May, 1910, over May, 1907, was 23,330 miles. During March and April, 1910, there was a decrease in car mileage, but an increase of about 2,000,000 in the number of passengers carried. During the rush hours all available cars are in service, and about 50 per cent. of the business is done during those periods. Mr. Stanley states that no additional cars can be operated during the rush hours, but that the service can be bettered by not taking so many cars out of service during the non-rush hours. Street Railway Commissioner Dahl has objected to this because it would increase the operating expenses.

Yonkers Strikers Return to Work Pending Settlement

On June 23, 1910, the motormen and conductors of the Yonkers (N. Y.) Railroad who were on strike returned to work, temporarily, pending the decision of Supreme Court Justice Keogh, in the matter of an increase of wages.

On the same day there was a hearing before Justice Keogh, at which Thomas F. Curran represented the city of Yonkers, John J. Crennan appeared for the strikers, and Leverett S. Crumb represented Leslie Sutherland, the receiver of the company. Mr. Curran told the court about the inconvenience to which persons were being put by the strike, and the suffering that it entailed, and urged the court to come to a decision that would speedily end the existing situation. Mr. Crumb said that the men on strike wanted an increase in wages to 30 cents an hour. Prior to the strike they had been paid on a sliding scale, the aver-

age pay being about 23 cents an hour. By the sliding scale system, which had been fixed by Justice Morschauser about a year ago, and to which the men had agreed, the men longest in the service of the company received the highest pay. According to Mr. Crumb the company's bonds are held by the Central Trust Company, New York, N. Y., as a depository. He said that Frederick W. Whitridge, receiver for the Third Avenue Railroad, represented the bondholders of the Yonkers Railroad, and was also receiver of the Union Railway. The Yonkers Railroad, the Westchester Electric Railroad and the Tarrytown, White Plains & Mamaroneck Railroad were all in the hands of receivers and all were controlled by Mr. Whitridge, as representative of the bondholders. Mr. Crumb argued that if the increase demanded by the strikers of the Yonkers Railroad were granted it would mean an increase in the wages of the men of the Westchester Electric Railroad and the Tarrytown, White Plains & Mamaroneck Railroad, which would amount to about $295,000 a year.

Justice Keogh, after being assured that the receiver of the Yonkers Railroad would submit to him a full statement as to the financial status of that road, said he would take the matter of the strike under consideration, and, in the meantime, desired that the strikers return to work pending his decision.

The strike was declared on June 15, 1910. Leslie Sutherland, who is operating the property as receiver, requested the men to return to work pending an adjustment of the wage question. This the men declined to do, and Mr. Sutherland stated that the cars would be permitted to remain in the car house until the men did return to work. Finally, the case came before the court for review as a result of an action by the City of Yonkers to compel the company to operate cars.

Plans for Opening Franchise Negotiations at Toledo

Brand Whitlock, Mayor of Toledo; B. Merrell, chairman of the railways and telegraph committee of the City Council of Toledo, and Carl Nau, of Nau, Tanner & Rusk, who are examining the books of the Toledo Railways & Light Company, Toledo, Ohio, for the city, have been named as a sub-committee of the general committee of the whole of the City Council to frame a reply to the suggestion of the company that the franchise matter should be referred to a commission of engineers. Mayor Whitlock has prepared two letters on the matter and whichever is adopted by the sub-committee will be referred to the Council before it is transmitted to the company.

Mayor Whitlock has formally accepted the invitation to make an inventory of the physical property of the company, but has declined to entertain the suggestion of President Lang, of the company, that the matter be referred to a board of engineers for settlement. The Mayor says that, in referring the matter to a board of engineers, the city officials and Council would be delegating to others duties with which they were charged when elected. He says that engineers will be employed to secure and furnish information, but that he does not believe such a board could properly arrange a settlement of the question. Mayor Whitlock states that Nau, Tanner & Rusk will proceed to make up the inventory, and suggests that they be allowed to inspect a copy of the inventory which was prepared for the committee representing the bondholders of the company some months ago.

Ohio State Board of Arbitration Acts in Threatened Strike at Columbus

On June 23, 1910, the State Board of Arbitration of Ohio ordered the officers of the Columbus Railway & Light Company, and the representatives of the organized employees of the company, to appear before the board on June 24, 1910, and present evidence under oath regarding the differences between them. The board can not enforce compliance with its decision, but it can make its findings public.

Previous to this call the employees of the company who are organized had authorized the executive committee of the body of which they are a part to call a strike. The representatives of the employees claimed that several men were discharged without cause, in violation of the agreement of May 5, 1910, between the company and the men.

On June 23, 1910, the officers of the company issued a written explanation. They claimed that there had been no discharges except for cause. In taking action in a case they had not inquired whether the employee was a member of the organization or not. Mr. Stewart, general manager of the company, subsequently asserted that he would protect all his men, whether they belonged to an outside organization or not, and that men who were uncivil to other employees could not remain in the service of the company.

At the hearing before the State Board of Arbitration, each side was represented by attorneys. Chairman Theodore I. Reese turned the chair over to Judge Noah Swayne. On motion of the attorney for the men the hearing was continued until July 1, 1910, in order that another attorney might have an opportunity to be present as a co-representative of the men. The attorneys were instructed to formulate a code of procedure and to specify to the board by June 28, 1910, the charges against the company, so as to give an idea of the extent of the hearing. The question of wages does not enter into the controversy at this time.

Association Meetings

Central Electric Traffic Association.—September.

Central Electric Accounting Conference.—Chicago, Ill., September.

Colorado Electric Light, Power & Railway Association.—Glenwood Springs, Col., Sept. 21, 22 and 23.

Oklahoma Public Utilities Association.—Oklahoma City, Okla., Sept. 30 and Oct. 1.

American Street & Interurban Railway Association.—Atlantic City, N. J., Oct. 10, 11, 12, 13 and 14.

New Jersey Line Opened.—The North Jersey Rapid Transit Company, Paterson, N. J., which is building an electric railway to connect Paterson, Glen Rock, Ridgewood, Hohokus, Allendale and Suffern, placed the line in operation between Paterson and Hohokus on June 22, 1910.

Sentence Passed on Men Who Held Up Seattle Car.—The four young men who held up a car of the Seattle (Wash.) Electric Company, at First Avenue South and Spokane Avenue, Seattle, at 1 a. m., on April 8, 1910, and robbed the passengers of $1500 in money and jewels, entered pleas of guilty when arraigned recently in the criminal court, and were sentenced to serve from five to 20 years each in the State penitentiary. The robbers were apprehended in Portland, and were promptly identified in Seattle.

Equipment Trust Certificates Subject to Approval of Commission.—The Court of Appeals has affirmed a decision of the Appellate Division of the Third Department in the controversy submitted without action upon an agreed statement of facts between the Public Service Commission of the Second District of New York and the New York Central & Hudson River Railroad. The companies, known collectively as the New York Central Lines, issued $30,000,000 of equipment trust certificates for the purchase of engines, cars and equipment in November and December, 1907, without application to the commission. The commission held that under section 55 of the Public Service Commissions Law the consent of the commission was necessary, and the court upholds the contention of the company.

Meeting of the Stone & Webster Club.—About 50 representatives of Stone & Webster, Boston, Mass., in the Pacific Northwest, who are members of the Stone & Webster Club of Washington, met at the Tacoma Hotel, Tacoma, Wash., on June 15. A. L. Kempster, superintendent of transportation of the Seattle Electric Company, who is president of the club, presided as toastmaster at a dinner which preceded the business session of the club. J. W. Wilmot, of the Seattle Electric Company, read a paper entitled "Prevention of Accident Claims"; A. H. McKay, traffic manager of the Puget Sound Electric Company, presented a paper entitled "Freight Transportation," and W. Osborn, of the Washington Water Power Company, Spokane, Wash., who was in attendance at the meeting of the National Electric Light Association, held recently in St.

Louis, read excerpts from a number of papers presented before that association, devoting particular attention to the paper by Arthur S. Huey, of H. M. Byllesby & Company, Chicago, Ill., which dealt largely with the relations between public service corporations and the public.

Plans for Boston Elevated Station Approved.—The Massachusetts Railroad Commission has approved the plans of the Boston Elevated Railway to establish an elevated station in Causeway Street, Boston, in connection with the East Cambridge elevated extension over the Charles River Dam. The station will be connected by passageways with the North Union Station of the Boston & Maine Railroad and the North Station of the Boston elevated system. A platform about 410 ft. long will be provided for East Cambridge cars, and a spur track will be installed for the use of elevated trains running between the North and South Stations. The entrances and exits will be located on the property of the Boston & Maine Railroad, with a covered connection with the North Station. Provision will be made in Commercial Street for double-track service in connection with the inter-terminal train operation. The East Cambridge elevated service will be handled by surface cars, which will be diverted into the Tremont Street subway at the head of the Canal Street incline. The new station will materially reduce the volume of traffic, which at present has to be handled in a somewhat limited platform area at the North elevated station.

Grand Central Terminal Improvements.—The work of demolishing the Grand Central Station of the New York Central & Hudson River Railroad, in New York, has been begun preparatory to erecting the new terminal on the site now partially occupied by the company. There will be two great waiting rooms in the new station, one for the suburban traffic, and the other for the through passengers. Each will be on the level of the tracks that it serves, and will be quite distinct from the other. The ticket offices, the entrances and exits, and everything else are distinct and separate. There will be two concourses, also, for suburban and through passengers. Each will have its own ticket offices, information bureaus, baggage checking places, parcel rooms, and all the facilities for travel. The concourse for the inbound trains will accommodate 8,000 people, and the outbound 15,000. The waiting rooms will be large enough to accommodate about 5,000 more. Seventy thousand outbound passengers an hour will be the capacity of the new terminal. Among the features which have been decided on is one by which trains when coming in will discharge passengers and continue on around a loop instead of backing out, as they do at present. The total area of the old terminal was 23 acres; that of the new will be 76 acres. The old terminal had a capacity of 366 cars; the capacity of the new will be 1,149 cars. The station building proper will be 600 ft. on the street level, 300 ft. wide, and 105 ft. high. Below the street level it will be 745 ft. long, 480 ft. wide, and 45 ft. deep.

LEGISLATION AFFECTING ELECTRIC RAILWAYS

Massachusetts.—The Legislature adjourned on June 15. Near the close of the session the bills were passed to authorize the purchase of the Berkshire Street Railway by the New York, New Haven & Hartford Railroad, and to permit the Boston & Eastern Electric Railroad to build a tunnel under Boston Harbor. The proposed acquisition of the securities of other street railways by the Boston Elevated Railway was embodied in a resolution which provides for an investigation and report upon the subject by the Boston Transit Commission and the Massachusetts Railroad Commission as a joint board. Other constructive legislation included the passage of a resolve to require the Boston Transit Commission to investigate the engineering details of a subway from Park Street to the South Station, Boston; the extension of liability to cover passengers riding on car platforms and the granting of half-fare privileges to pupils of industrial schools. A resolution was also passed to require the standard-gage steam railroads at Boston to report upon electrification within the Boston metropolitan district, the report to be passed upon in a supplementary report to the Legislature of 1911 by the joint commission on metropolitan improvements created by the acts of 1909.

Financial and Corporate

New York Stock and Money Market

June 28, 1910.

With no outside buying and with professional traders timid, there is little chance to hold a market the tone of which is radically weak. Beginning yesterday morning, after a week of exceptional dullness, a selling movement was started, and before it was checked near the close to-day prices had declined from 2 to 5 points. There was no assignable cause for the break. Tractions suffered along with the other issues.

The money market, on the other hand, continues to be entirely in favor of the buyer. Rates to-day were: Call, 2½ to 3 per cent; 90 days, 3¾ per cent.

Other Markets

The Philadelphia market has been weak, in sympathy with Wall Street, and trading has been light. Prices have receded, but to no considerable extent. Rapid Transit sold down to 18¾ and Union Traction to 46, but very little stock changed hands.

The main interest in tractions in Chicago has been in Elevated railway shares. Metropolitan has been more active than the others, and both the preferred and common now approximate the figures of the merger agreement.

Tractions in Boston have been less active during the past week. While there has still been some trading in Massachusetts Electric and Boston Elevated, there have been no material changes in prices.

There has been practically no trading in tractions in Baltimore during the week except in the bonds of the United Railways Company. Prices for these are unchanged.

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

	June 21.	June 28.
American Railway Company	a44¾	a44
Aurora, Elgin & Chicago Railroad (common)	*60	a60
Aurora, Elgin & Chicago Railroad (preferred)	*93	a91
Boston Elevated Railway	a126	a126
Boston & Suburban Electric Companies	a14	a14
Boston & Suburban Electric Companies (preferred)	a74	a74
Boston & Worcester Electric Companies (common)	a10½	a10½
Boston & Worcester Electric Companies (preferred)	a41	a40
Brooklyn Rapid Transit Company	79	76¾
Brooklyn Rap. Transit Company, 1st pref. conv. 4s	83⅞	83¼
Capital Traction Company, Washington	a129½	a129½
Chicago City Railway	a195	a195
Chicago & Oak Park Elevated Railroad (common)	*3¼	*3¼
Chicago & Oak Park Elevated Railroad (preferred)	*7½	*7¼
Chicago Railways, ptcptg., ctf. 1	a75	a75
Chicago Railways, ptcptg., ctf. 2	a19	a17
Chicago Railways, ptcptg., ctf. 3	a11	a11
Chicago Railways, ptcptg., ctf. 4s	a6½	a6½
Cleveland Railways	*91½	*91½
Consolidated Traction of New Jersey	a76	a76
Consolidated Traction of N. J. 5 per cent bonds	a103	a103
Detroit United Railway	*50½	*50½
General Electric Company	147	143
Georgia Railway & Electric Company (common)	a108½	a108
Georgia Railway & Electric Company (preferred)	a87	a87
Interborough-Metropolitan Company (common)	19¼	18
Interborough-Metropolitan Company (preferred)	51⅞	49½
Interborough-Metropolitan Company (4½s)	79¾	80
Kansas City Railway & Light Company (common)	a25	a25
Kansas City Railway & Light Company (preferred)	a72	a73
Manhattan Railway	130⅜	130
Massachusetts Electric Companies (common)	a16	a15⅞
Massachusetts Electric Companies (preferred)	a81	a80
Metropolitan West Side, Chicago (common)	*24½	a23¾
Metropolitan West Side, Chicago (preferred)	a71	a70
Metropolitan Street Railway	*15	*15
Milwaukee Electric Railway & Light (preferred)	*110	*110
North American Company	69	68
Northwestern Elevated Railroad (common)	a22	a22
Northwestern Elevated Railroad (preferred)	66	a65
Philadelphia Company, Pittsburg (common)	a48½	a48
Philadelphia Company, Pittsburg (preferred)	a43½	a43¾
Philadelphia Rapid Transit Company	a20	a19⅛
Philadelphia Traction Company	a84½	a84½
Public Service Corporation, 5 per cent col. notes	*96	a96
Public Service Corporation, ctfs	a101	a101
Seattle Electric Company (common)	*110½	a110
Seattle Electric Company (preferred)	*101	a100
South Side Elevated Railroad (Chicago)	a72	a72¾
Third Avenue Railroad, New York	7⅛	a7⅜
Toledo Railways & Light Company	9¼	8
Twin City Rapid Transit, Minneapolis (common)	110½	109½
Union Traction Company, Philadelphia	a46⅞	a46
United Rys. & Electric Company, Baltimore	a13¾	a14¼
United Rys. Inv. Co. (common)	32	30
United Rys. Inv. Co. (preferred)	*65	55
Washington Ry. & Electric Company (common)	a35	a33½
Washington Ry. & Electric Company (preferred)	a89	a88
West End Street Railway, Boston (common)	a88	a88
West End Street Railway, Boston (preferred)	a101	a100
Westinghouse Elec. & Mfg. Company	65¼	62
Westinghouse Elec. & Mfg. Company (1st pref.)	*125	*125

a Asked. * Last Sale.

Reorganization of International Traction Company

The committee consisting of Robert L. Fryer, Thomas De Witt Cuyler, Lewis Cass Ledyard, Thomas E. Mitten and Charles Steele, which has been appointed to protect holders of the $30,000,000 of 50-year 4 per cent collateral trust bonds of the International Traction Company, has issued a statement in part as follows:

"The International Traction Company owns all of the stock of the International Railway, which is deposited under the collateral trust indenture and constitutes the main security for the 50-year 4 per cent collateral trust gold bonds. The International Railway owns and operates the properties known as the International Traction System, all of which are located in Buffalo and vicinity.

"The International Traction Company has issued all of the bonds under the collateral trust indenture reserved for extensions and betterments of the property. There remain unissued $11,665,000 of bonds reserved exclusively for the acquisition or retirement of underlying bonds secured by liens on the property of the International Railway.

"For the payment of such underlying International Railway bonds, the collateral trust indenture contemplated the issue and sale of an equal amount of the 50-year 4 per cent collateral trust gold bonds of the International Traction Company reserved for such purpose. As the collateral trust bonds have a limited market and are selling much below par, they cannot provide sufficient funds to meet such underlying obligations, of which many will mature in the near future.

"In view of this situation and of the fact that under the collateral trust indenture no more bonds can be issued for extensions or betterments, there is urgent need for a reorganization of the finances and the legal status of the International Traction System. The urgency of this need is indicated by the foreshadowed inability of the International Railway to pay the dividend on its stock necessary to enable the International Traction Company to make its interest payments due next July on the 50-year 4 per cent collateral trust gold bonds.

"This condition has resulted, not from lack of earning power, but from the rapid growth of its business, and the consequent necessity of devoting to improvements and extensions publicly demanded a large part of its earnings which have been the only resource of the International Traction Company for such capital requirements since the exhaustion of collateral trust bonds reserved for such purposes.

"The agreement recognizes that foreclosure proceedings may ensue, and that the interests of the bondholders will require protection through the committee, empowered to acquire the pledged stocks of the International Railway at the foreclosure sale, and to cause to be organized under the laws of New York a new railroad which, by merger, shall acquire first the stock and then the physical properties of the International Railway (subject to its prior mortgages). Under this agreement such new company is to execute a refunding mortgage to secure 5 per cent bonds to mature not earlier than July 1, 1949, which shall constitute a first lien upon portions of the property of the International Railway, and a lien upon the other properties owned or controlled by the International Railway, as embraced in the reorganization, subject to bonds secured by direct liens.

"In exchange for their deposited bonds, the depositing collateral trust bondholders, at their option, shall receive either (a) 5 per cent refunding bonds of the new company to the amount of 80 per cent of the par value of such deposited bonds, and accrued interest in full in cash on the deposited bonds from the date of the last interest payment thereon to the date from which the new bonds shall draw interest, or (b) cash to the amount of 70 per cent of the par value of such deposited bonds, and also accrued interest in full on the deposited bonds from the date of the last interest payment thereon to the date fixed by the committee for such cash payment. Should the holders of the bonds prefer not to accept the new bonds, they can sell them at 70 cents on the dollar, a sum in excess of the present market price.

"It will be observed that the agreement authorizes the committee in its discretion to make provision for the stockholders of the International Traction Company in the stock of the new railroad.

"Arrangements have been effected whereby J. P. Morgan & Company, New York, N. Y., will act as depositary for the committee, and on behalf of the committee will issue transferable receipts for all deposited bonds.

"In view of past experience and the present condition of the property, the normal capital requirements of this growing system must now be estimated to be $1,000,000 per annum. The larger amount, $2,750,000, as indicated by the proposed capital expenditures for 1910 and 1911, is due to the fact that, because of the exhaustion of the 4 per cent collateral trust bonds provided for such purposes, the capital expenditures for the two preceding years, 1908 and 1909, were abnormally and harmfully low.

"On the basis of the reorganization of the property, as now proposed, net earnings as at present would indicate a satisfactory margin over the amount necessary to pay the fixed charges of the reorganized company. The normal increase in net earnings should be more than sufficient to meet the additional fixed charges for future capital requirements."

Consolidation of Chicago Elevated Railways.

The proposed consolidation of the elevated railways in Chicago seems likely to be effected. A few weeks ago an option was secured on the stock of the South Side Elevated Railroad by Henry A. Blair, on behalf of a syndicate headed by the First National Bank, New York, N. Y. Subsequently the trustees of the Northwestern Elevated Railroad stock accepted terms proposed by Mr. Blair. The Chicago & Oak Park Elevated Railroad has for some time been controlled by the Blair interests, and will, of course, enter the merger. On June 22, 1910, the directors of the Metropolitan West Side Elevated Railway voted to accept the offer of Mr. Blair for the purchase of the stock of that company, subject to the ratification of the stockholders. It is stated that the consolidated company will probably be known as the Union Consolidated Elevated Railways.

Chicago Railways Readjustment

Andrew Cooke, Charles G. Dawes and John Barton Payne, acting as a committee of the security holders of the Chicago Railways and the Chicago Consolidated Traction Company, submitted to Judge Peter S. Grosscup on June 22, 1910, a plan of readjustment which they have worked out for these companies. In effect the Chicago Railways will purchase the property of the Chicago Consolidated Traction Company and execute a rehabilitating mortgage to provide the necessary funds, including the cost of retiring the receivers' certificates outstanding. The Chicago Railways will use its existing rehabilitation mortgage for the purpose of acquiring the property of the Chicago Consolidated Traction Company if the City of Chicago approves the plan. A mortgage to secure what shall be known as purchase money bonds, bearing interest at the rate of 4 per cent for five years, and 5 per cent thereafter, will also be approved, as will a mortgage to secure what shall be known as funding mortgage bonds, to bear interest at a rate of 4 per cent a year, if earned, and such interest to be non-cumulative. It is agreed that the mortgage shall cover all the properties of the Chicago Consolidated Traction Company acquired by the purchase within city limits. The allotment of the proposed new bonds to the holders of the present securities was shown in a table. No agreement has yet been reached as to how the $2,000,000 of bonds of the Cicero & Proviso Street Railway will be taken care of. The Chicago Railways and the reorganization committee are willing to submit this question for decision to some arbitrator to be agreed upon by the parties at interest, or a referee to be appointed by the court. As to the securities held by the Yerkes estate, the plan is subject to the approval of the probate court.

On June 23, 1910, Louis S. Owsley, executor for the Charles T. Yerkes estate, asked the Probate Court to approve his acceptance of the reorganization plan of the Chicago Railways.

An ordinance authorizing the merger of the Chicago Consolidated Traction Company with the Chicago Railways is being prepared by the transportation committee of Chicago City Council, acting under instructions from the whole body issued in response to letters from Judge Grosscup, John M. Roach, president of the Chicago Railways, and Andrew Cooke, chairman of the reorganization committee. The letters were transmitted to the Council by Mayor Busse. It was agreed in the Council that in case the ordinances cannot be prepared in time for presentation before the summer recess, which will probably begin on July 11, 1910, a special meeting will be called by Mayor Busse.

Report of Westinghouse Electric & Manufacturing Company

The annual report of the Westinghouse Electric & Manufacturing Company for the year ended March 31, 1910, has been issued in printed form, for presentation at the annual meeting of the stockholders on July 27, 1910.

The gross earnings for the year ended March 31, 1910, were $29,248,682; the net manufacturing profits were $3,552,978; other income aggregated $1,616,561, making a total income of $5,169,539, or an increase of $3,203,280 over the preceding year. After making deductions the net income for the year was $3,060,664, an increase of $3,979,346 over the preceding year. The value of unfilled orders on March 31, 1910, was, in round numbers, $11,256,000, which is the largest in the history of the company with the exception of the year ended March 31, 1907. During April and May of the present year additional orders were taken aggregating in value $7,083,000, and unfilled orders on May 31 aggregated over $13,000,000.

Robert Mather, chairman of the board of directors, states that the satisfactory results reflected in the report are largely due to the policy adopted by the board of liberal expenditures for increasing the effectiveness of the selling organization and for development and improvement in design and in manufacturing methods. While this plan has added considerably to the expenses for the year, the increase is stated to have been amply justified both in the increased volume of business and in the decreased cost of production.

The consolidated balance sheet shows total assets of $83,588,000. Of this sum $14,974,000 is represented by property and factory plant; $13,893,000 in working and trading assets, including raw material and supplies, finished parts and machines, work in progress, goods on consignment and apparatus with customers; $27,206,000 by investments in stocks, bonds, debentures and collateral trust notes, including those of affiliated European and Canadian Westinghouse companies; $20,479,000 by current assets, including $7,040,000 in cash, $3,766,000 in notes receivable and $9,169,000 in accounts receivable. Charters, franchises, patents, insurance, taxes paid in advance, etc., enter in the assets for the sum of $6,083,000.

The main charges under liabilities are capital stock, $40,719,000; funded debt, $22,326,000; collateral notes, $8,720,000; readjustment notes, $1,387,000; current liabilities, $3,302,000; reserve, $1,280,000; surplus, $5,668,000.

Boston & Worcester Electric Companies, Boston, Mass.—The trustees of the Boston & Worcester Electric Companies have voted to defer the July, or semi-annual, dividend on the preferred stock of the company. The last dividend paid was $1, on Jan. 1, 1910. In 1909 $2 was paid, and in 1908 $4. W. M. Butler, president of the Boston & Worcester Electric Companies, has issued a statement in regard to the passing of the dividend, in which he says, in part: "By a recent act of the Legislature the fiscal year of all street railways in Massachusetts has been changed from Sept. 30 in each year to June 30, the change to take effect June 30, 1910. This change in the fiscal year means that the report of the company to the Railroad Commission will have to be made up for the nine months beginning Sept. 30, 1909, and ended June 30, 1910. By this change in the fiscal year, July, August and September, the three best months, during which practically the whole year's dividend is earned, are eliminated from the report. If the regular July dividend were declared at this time, it would mean the declaration of a dividend on the first day of the new fiscal year and before sufficient earnings had been made from which to pay the same, and the company has not at the present time a surplus adequate for this purpose. The trustees, therefore, have decided to defer the payment of a dividend on July 1."

Carbon Transit Company, Mauch Chunk, Pa.—The Carbon Transit Company has filed a mortgage to the Mauch Chunk Trust Company, Mauch Chunk, Pa., as trustee, to secure an issue of $100,000 of second mortgage 30-year 5 per cent gold bonds, of which only a part, it is stated, will be sold at present to provide for floating debt and necessary working capital.

Chicago City & Connecting Railways, Chicago, Ill.—The governing committee of the Chicago City & Connecting Railways has declared a dividend of $2.25 a share on the preferred participation shares of the company and $1 a share on the common participation shares, payable to shareholders of record on June 21, 1910.

Denver & Inter-Mountain Railroad, Denver, Col.—Interests identified with the Denver City Tramway have secured control of the Denver & Inter-Mountain Railroad, and new officers have been elected as follows: W. G. Smith, as president to succeed Charles F. Propst; J. H. Brown as secretary, to succeed J. F. Gaule; Fred Moffatt as treasurer, to succeed Wm. F. McDermott. Frank L. Butler was re-elected vice-president and general manager.

Elizabeth & Trenton Railroad, Trenton, N. J.—The Elizabeth & Trenton Railroad has been incorporated to take over the Trenton & New Brunswick Railroad and the New Jersey Short Line Railway. It is said that the Elizabeth & Trenton Railroad will later be leased to the Public Service Corporation of New Jersey, and that the New Jersey Short Line Railroad will then be pushed to completion.

El Paso (Tex.) Electric Railway.—The El Paso Electric Railway has applied to the State for permission to increase its capital stock from $1,500,000 to $2,500,000.

Forty-second Street, Manhattanville & St. Nicholas Avenue Railway, New York, N. Y.—Final order for the sale under foreclosure of the property of the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway has been entered by Judge Lacombe, of the United States Circuit Court, in the suit of the Union Trust Company. In accordance with a decree of the court Edward H. Childs, special master, is to sell all the property, franchises and securities on Sept. 1, 1910. The company is directed by the court to pay within 20 days $1,679,933, which is the amount due for principal and interest on a mortgage held by the Union Trust Company. The special master is also directed that 75 pay-as-you-enter cars, purchased since the mortgage was given to the Union Trust Company, must be sold with the rest of the property, but that the purchaser must pay in cash $350,365 to reimburse the receiver in the amount expended for these cars. All bidders for the property as a whole shall be required to deposit $100,000 with the special master prior to the acceptance of any bid. The decree does not fix any upset price, but the court reserves the right to reject or accept any bid.

Gary & Interurban Railway, Gary, Ind.—The Gary & Interurban Railway has authorized an issue of $10,000,000 of refunding and first mortgage 5 per cent gold bonds to provide for extensions, etc. Of the total issue, $470,000 will be reserved to retire a like amount of first mortgage 5 per cent bonds dated 1909. It is stated that $1,500,000 of the new bonds have been sold. The company has declared an initial dividend of 1 per cent, payable July 10, 1910, to holders of record on June 30, 1910.

Illinois Valley Gas & Electric Company, Streator, Ill.—Russell, Brewster & Comapny, Chicago, Ill., and New York, N. Y., offer for subscription at $85 a share, with a bonus of 25 per cent of common stock, the 6 per cent cumulative preferred stock of the Illinois Valley Gas & Electric Company, which controls the Illinois Light & Traction Company, Streator, Ill., and other companies.

Lehigh Valley Transit Company, Allentown, Pa.—The Lehigh Valley Transit Company's mortgage for $15,000,000 to the Lehigh Valley Trust & Safe Deposit Company, Allentown, Pa., as trustee, has been filed for record.

Nashville Railway & Light Company, Nashville, Tenn.—The Nashville Railway & Light Company has declared a

quarterly dividend of ¾ of 1 per cent on the $4,000,000 of common stock of the company, payable on June 22, 1910, which compares with ½ of 1 per cent in April and semi-annual distributions of 1 per cent in January, 1910, and July, 1909. This increases the annual rate from 2 per cent to 3 per cent.

Ocean Shore Railway, San Francisco, Cal.—F. S. Stratton, receiver of Ocean Shore Railway, has filed a petition in the United States Circuit Court asking that the master in chancery examine the claims of the various creditors of the company to determine the priority of the claims as between the bondholders and the other creditors. An itemized list of the debts of the company, exclusive of the bond issue, was filed with the petition, showing the amount to be $2,321,-743.50. In the list the receiver segregated the debts contracted six months or more prior to his appointment and those contracted afterwards up to May 5.

Owosso & Corunna Electric Company, Owosso, Mich.—The property of the Owosso & Corunna Electric Company has been sold under foreclosure for $80,000 to W. M. Eaton, who is said to represent the Commonwealth Power Company, Jackson, Mich.

Philadelphia Company, Pittsburgh, Pa.—An extra dividend of 1 per cent has been declared on the common stock of the Philadelphia Company, payable one-half of 1 per cent on Aug. 2, 1910, to stock of record on July 1, 1910, and one-half of 1 per cent on Nov. 1, 1910, to stock of record on Oct. 1, 1910.

Southwestern Street Railway, Philadelphia, Pa.—The sale of the property of the Southwestern Street Railway, which was to have been held on June 23, 1910, has been postponed indefinitely.

United Light & Railways Company, Grand Rapids, Mich.—The United Light & Railways Company has been organized under the laws of Maine in the interest of Child, Hulswit & Company, Grand Rapids, Mich., to take over the Fort Dodge (Ia.) Light Company, Muscatine Light & Traction Company, Muscatine, Ia.; Cadillac (Mich.) Gas Light Company, La Porte (Ind.) Gas Light Company, Mattoon (Ill.) Gas Light Company, Chattanooga (Tenn.) Gas Company, Cedar Rapids (Ia.) Gas Light Company, and the La Porte (Ind.) Electric Company. The United Light & Railways Company has an authorized capital stock of $30,000,-000, of which $12,500,000 is first preferred 6 per cent cumulative stock, $5,000,000 second preferred 3 per cent cumulative stock, and $12,500,000 common stock.

On June 23, 1910, Chairman Knapp, of the Interstate Commerce Commission, sent the following telegram to the presidents of the Delaware, Lackawanna & Western Railroad, the Erie Railroad, the Pennsylvania Railroad, the Central of New Jersey Railroad, the Lehigh Valley Railroad, the New York Central & Hudson River Railroad and the Philadelphia & Reading Railway:

"Several complaints have been filed against advances in commutation rates between New Jersey points and New York City, and the commission is urged to suspend the same. The new law has not been carefully examined and some of my associates are absent. Under the circumstances, and to afford opportunity for proper consideration both as regards our power and the propriety of its exercise, the commission requests your company to postpone until August 1 the effective date of tariffs announcing these advances. Your compliance with this request will be highly gratifying and permission to postpone will be granted on application."

The complaints filed included that of the New Jersey Railroad Commission and several other complaints received from various municipalities of New Jersey, all directed against proposed advances of rates by the same railroads. At the informal hearing on the subject the New Jersey complainants' delegation, headed by Attorney General Wilson, was informed that it was questionable whether the commission would accept the complaints, as the commission was doubtful of its jurisdiction over the matter of commutation rates. Mr. Wilson urged upon Chairman Knapp and Commissioners Cockrell and Harlan action by the commission to suspend the advanced rates, under the new law, as nearly all of the traffic involved was interstate commerce.

Traffic and Transportation

Fare Complaint Dismissed in Pennsylvania.

On June 24, 1910, the Railroad Commission of Pennsylvania dismissed the complaint of the West Chester Improvement Association against the Philadelphia & West Chester Traction Company, Philadelphia, Pa., which, in October, 1909, established six 5-cent fare zones between Sixty-third Street and Market Street, Philadelphia, and West Chester, instead of five. The circular of the company to the public announcing the increase was published in the ELECTRIC RAILWAY JOURNAL of Oct. 16, 1909, page 888, and a summary of the testimony presented in behalf of the company at the hearing before the commission in Harrisburg, on April 14, 1910, was published in the ELECTRIC RAILWAY JOURNAL, of April 30, 1910, page 787. The decision of the commission is substantially as follows:

"The operation of the respondent's road began in January, 1899, and from that date until September, 1909, the through fare from Sixty-third Street, Philadelphia, to West Chester, a distance of approximately 20 miles, was 25 cents, the fare zones in that distance being five, and the second one of that number—counting from Philadelphia—ended at Newtown Square, where nearly all the complainants in this case reside.

"In September, 1909, the company felt compelled to increase those fare zones to six, making the through fare from Philadelphia to West Chester 30 cents; and in this readjustment of those zones, Newtown Square fell practically in the centre of the third zone, instead of being the terminus of the second, as theretofore. This change is the occasion of this complaint.

"We have not been given the distances of the original zones, but the distances of the present zones on the main line, counting from Philadelphia, are as follows: First zone, 20,900 feet; second zone, 16,130 feet; third zone, 16,-320 feet; fourth zone, 17,475 feet; fifth zone, 16,355 feet; sixth zone, 17,060 feet.

"All of these zones, it will be noted, except the first, cover practically the same distances. On the first zone, however, are two branch connections, one running off therefrom at Upper Darby Junction, 5,070 feet from Sixty-third Street, to Collingsdale, 25,761 feet from said Junction, making a total distance from Sixty-third Street to Collingdale of 29,831 feet; and another running off at Llanerch, 14,259 feet from Sixty-third Street, thence to Ardmore, a distance of 17,270 feet, making the total distance from Sixty-third Street to Ardmore, 31,529 feet.

"The fare from Sixty-third Street to both Collingdale and Ardmore is 5 cents, and it is in comparison with the fare on these branch lines that the complainants find their principal ground of objection to the present arrangement of the zones throughout the main line.

"On all such interurban lines the most equitable arrangement of the fare zones is that which makes them practically equal in distance, for it is for his transportation for such distances that the patron pays; but in practice it is almost impossible to make these fare zone distances absolutely equal, and in this case, with the exception of the first zone and the branch lines leading therefrom as aforesaid, the distances are as nearly equal as it is ordinarily possible to make them.

"To account for the greater length of the first fare zone and for the length of the lines to Collingdale and Ardmore, it must be remembered that this zone and these branch lines are those located at the Philadelphia end of respondent's road, in the most thickly populated section of its territory, and reach points which are competitive by reason of their close proximity to the city. Because of these facts, roads of this character have found it necessary to make such fare zones, as a rule, longer than those which extend a greater distance beyond the limits of the centers of population. Moreover, in the statements which have been furnished us by the respondent it appears that these operations of its road are those which bring it the greatest proportionate return for the services rendered. Trolley rates are largely determined by the density of travel in each particular section, so that the probability is that, if the travel beyond the first zone were at all commensurate

with that within that zone, the other zones would be so arranged as to make each include substantially the same distance as the first.

"The complainants find no fault with the through rate from Philadelphia to West Chester, but because of what they conceive to be due to them from the company—largely, perhaps, in consequence of the location of the original fare zone termini—they would have the second zone extended, as it originally was, to Newtown Square, making it cover a distance of 23,600 feet, and then propose, in order to maintain for the respondent the same through fare to West Chester, to make the zones between Newtown Square and West Chester considerably shorter than they now are, or have ever been; that is, they would make the third zone but 15,000 feet, the fourth zone 14,280 feet, the fifth zone 13,420 feet, and the sixth—the last—17,060 feet, as it is at present.

"It is natural to suppose that if any such rearrangement of the zones were made to suit the convenience and desires of complainants, it would occasion more or less dissatisfaction and complaint on the part of residents all along the line between that place and West Chester, the result of which would be that the dissatisfaction would probably be greater than it is at present.

"When the whole situation is thus considered, it does not appear that the commission would be justified in recommending the readjustment of these fare zones which the complainants desire."

Recommendations Regarding Service in Pittsburgh

The Railroad Commission of Pennsylvania on June 23, 1910, issued the following recommendations regarding street railway service in Pittsburgh, based on the report on traction matters in that city made for the commission by Emil Swensson, the letters to the commission by both Mayor Magee and President Callery of the Pittsburgh Railways and the report made about a year ago on the local street railway situation in Pittsburgh by Stone & Webster, Boston, Mass.:

"1. That 50 additional closed motor cars of 56-seat capacity be ordered at once for delivery as speedily as possible.

"2. That all cars be distributed over practicable routes according to the amount of travel, and during rush hours be scheduled to meet, so far as possible, the demands thereof; and that, outside of the morning and evening rush hours, a sufficient number of cars be run on all routes to accommodate the travel comfortably.

"3. That hereafter there be annual additions to the rolling stock amply sufficient to provide for any increase in travel and to supply the loss from wear and tear.

"4. That so far as the character of the various routes permits and the travel thereon requires, and as the wear and tear of the rolling stock demand its renewal, the old 28-seat cars should be replaced by the 56-seat or other equally good, large type of cars.

"5. That routing and re-routing and the operation of short runs should be carefully studied, and, from time to time, experimented with, as the city, the other municipalities concerned, and the company may find advisable and practicable, until the best arrangement thereof is determined, and that thereupon publication be made of the several routes and the service thereon for the convenient information and guidance of the patrons, and that wherever now practicable, or hereafter rendered so, the terminal loops be shortened, the number of stops thereon decreased and the crossings of loops by each other avoided.

"6. That all cars be regularly and thoroughly cleaned, both inside and outside, each day, with such additional cleaning during the day as the circumstances demand and permit, and that ample provision be made for prompt and full repairs as they may be required.

"7. That the roadbed be maintained in first-class condition, and that the power plants be made sufficient for every demand.

"8. That persistent endeavor be made to keep the cars on schedule time. This is regarded as very important.

"9. That the company promptly determine the additional franchise privileges it regards as necessary for the most satisfactory and efficient service, and then make application to the respective municipal authorities for the grant thereof, and persist in efforts to obtain the same until a definite conclusion is reached.

"10. That the endeavor to eliminate grade crossings of steam railroads be prosecuted vigorously.

"11. That proper and adequate provision be made for the storage of cars near the terminal district, so that the cars can be readily run in for short trips and for the rush hour service."

Freight Petition Granted in Massachusetts.—The Railroad Commission of Connecticut has granted the petition of the Connecticut Valley Street Railway, Greenfield, Mass., to act as a common carrier in Hadley.

Car License Suit in Milwaukee.—Emil Seidel, Mayor of Milwaukee, has begun action against the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., to recover $77,000 in car license fees which he claims is due the city.

Special Seeing Buffalo Service.—The International Traction Company, Buffalo, N. Y., operated a special seeing Buffalo service during the recent conclave of the Knights Templars in that city, arranged especially to suit the convenience of those in attendance at the conclave.

Freight Over the Rochester, Syracuse & Eastern Railroad.—The Rochester, Syracuse & Eastern Railroad, Syracuse, N. Y., has filed tariffs with the Public Service Commission of the Second District of New York to provide for the transportation of freight locally over its lines hereafter.

Interurban Poultry Car.—The Evansville & Southern Indiana Traction Company, Evansville, Ind., proposes to run a poultry car over its Rockport line every Saturday, leaving Rockport at 7 a. m., and arriving in Evansville at 11 a. m., stopping at all the intermediate points to receive consignments of eggs, chickens, etc.

Report on Elevated Loop Congestion in Chicago.—It is expected that Bion J. Arnold and the commission appointed to consider the reduction of congestion on the Union Elevated Railroad, operating the loop in Chicago, will report very soon. It is predicted that through routes and liberal transfers will be recommended.

Proposed Abandonment of Part of New York State Line.—In connection with the petition of the Waverly, Sayre & Athens Traction Company, Waverly, N. Y., under section 103 of the Railroad Law for an approval of a declaration of abandonment of a portion of its constructed route, the Public Service Commission of the Second District of New York has directed the company to present to the commission a record of its passenger business arising exclusively from that part of its system which is involved in the matter.

Pittsburgh Fare Ordinance Signed.—The Mayor of Pittsburgh has signed the city ordinance which provides for transfers on all lines operating within the city which cross, intersect or run within a radius of 250 feet. Transfers are to be issued upon transfers, the intention of the law being that, for a single fare, any passenger shall be entitled to a single continuous ride over the lines of the railway system within the limits of the city. J. D. Callery, president of the Pittsburgh Railways, says that the legality of the ordinance will be tested on the ground that it is illegal and unjust, and that Councils have no right to order or regulate the issuing of transfers.

Arbitration in Albany.—Two of the three arbitrators have been chosen who will consider the question of the wages of the employees of the United Traction Company and the length of the new agreement between the company and its employees in regard to terms of service. C. Gordon Reel, formerly second vice-president and general manager of the Kingston (N. Y.) Consolidated Railroad, has been selected to represent the company, and Joseph McLoughlin, president of the Troy division of the organization representing the employees of the company, has been selected to represent the men.

Increase in Wages on Toledo & Chicago Interurban Railway.—On June 1, 1910, the following wage scale for motormen and conductors became effective on the Toledo & Chicago Interurban Railway, Kendallville, Ind.: First six months, 18 cents per hour; second six months, 19 cents per hour; third six months, 20 cents per hour; fourth six months,

21 cents per hour. Motormen and conductors on freight runs receive 2 cents per hour, in addition to the above. The old wage scale was: First six months, 17 cents per hour; second six months, 18 cents per hour; third six months, 19 cents per hour; fourth six months, 20 cents per hour. No extra amount was received by motormen and conductors on freight cars under the old scale.

Wage Agreement in Brooklyn.—The agreement between the Coney Island & Brooklyn Railroad, Brooklyn, N. Y., and its employees regarding wages and terms of service expires on July 1, 1910. The man have been receiving 23 cents per hour for swing runs, no swing run to pay less than $1.75, and a flat rate of $2.30 per day for straight runs of 10 hours completed inside of 11 hours. Some of the straight runs fell short of 10 hours and others extended over 10 hours. The men asked for an increase in pay to 25 cents an hour, no swing run to pay less than $2, and straight runs to be paid for all time in excess of 10 hours. The company declined to increase the rate of wages or to guarantee $2 per day for swing runs so long as two-thirds of the runs on the table were straight runs, but agreed to pay 23 cents an hour for all time made by straight runs in excess of 10 hours. On this basis an agreement has been signed for another year.

Decision in Oregon Fare Case.—The Supreme Court of Oregon in an opinion written by Justice Slater on June 1, 1910, denied the application of the Portland Railway, Light & Power Company, Portland, Ore., for a rehearing of the case of the company against the State Railroad Commission of Oregon in the matter of the fare over the Milwaukee line of the company. The company contended that the act of the Railroad Commission and the decision of the court are confiscatory. The court states that it finds itself unable to assent to the conclusions of the company's attorneys, and concludes with an answer to the contention that the State has no power to regulate fares in Portland. The opinion concludes: "Assuming that these claims are well founded, still we do not see that the order of the commission attempts to regulate fares within Portland, for the decision operates only upon traffic reaching or extending beyond the boundaries of the corporate limits."

New Transfers in Portland, Ore.—B. S. Josselyn, president of the Portland Railway, Light & Power Company, Portland, Ore., has announced that the company will adopt a new style of transfer. In connection with the proposed change, Mr. Josselyn issued a statement in which he said: "The new transfers will have the date printed in red across the face and in large, bold type, so that there can be no mistake about it. At present the conductor punches the date, and no doubt mistakes sometimes creep in. On the other hand, there are passengers who will present transfers that they know have outlived their usefulness, but it is difficult for the conductor to refuse to accept them because the conductor who issued them might have made a mistake. The new transfers will also be better equipped for giving the time of transfer. Along one side of the slip will be printed the even hours, while on another will be the figures 15, 30, 45. This will make it easy for the conductor to punch the exact time. The transfers cannot be used for any other date but that indicated in red."

More Brooklyn Rapid Transit Advertisements.—The Brooklyn (N. Y.) Rapid Transit Company has recently published in the Brooklyn newspapers a number of advertisements setting forth features of the company's work. As typical of these advertisements there were two, one on the power system of the company, and one on the employees' training school, which indicate their scope and purpose. Each contained less than 100 words, and both were illustrated, the one about the power station with an exterior view of the company's Kent Avenue plant. and the one about the employees' school with a view of the motormen's instruction room. The advertisement about the company's training school for employees follows: "Brooklyn Rapid Transit was one of the first systems in the country to develop the training of its motormen. In its fully equipped schoolroom, at Second Avenue and Fifty-eighth Street, and in the actual operation of school cars all prospective motormen are first trained, and then required to pass strict efficiency tests before being permitted to break in on cars in regular service."

Personal Mention

Mr. William G. Smith has been elected president of the Denver & Inter-Mountain Railroad, Denver, Col., to succeed Mr. C. F. Propst.

Mr. Fred Moffat has been elected treasurer of the Denver & Inter-Mountain Railroad, Denver, Col., to succeed Mr. William F. McDermott.

Mr. James H. Brown has been elected secretary of the Denver & Inter-Mountain Railroad, Denver, Col., to succeed Mr. James F. Gaule.

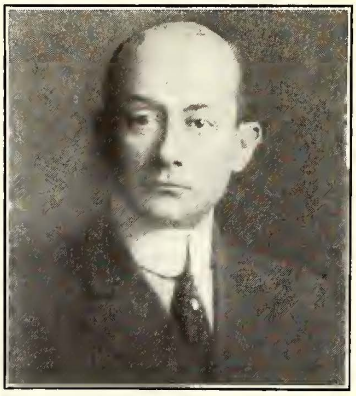
Mr. A. Katterheinrich has been appointed assistant auditor of the Chicago, Lake Shore & South Bend Railway, Michigan City, Ind. Mr. Katterheinrich was formerly general passenger and freight agent and auditor of the Fort Wayne & Springfield Railway, Decatur, Ind. Mr. Katterheinrich entered electric railway service in 1906 as a stenographer with the Fort Wayne & Springfield Railway, and was appointed chief clerk of the company on Sept. 1, 1908, and on Jan. 1, 1909, was appointed general passenger and freight agent and auditor of the company. He subsequently relinquished the duties of general passenger and freight agent of the company to Mr. J. R. Fink, but upon the retirement of Mr. Fink from the company he resumed the duties of this position. In the meantime he acted as auditor.

Mr. E. P. Clark, until recently president of the Los Angeles-Pacific Railrway, Los Angeles, Cal., has acquired traction interests in and near Portland, Ore., and has identified himself with the Mt. Hood Railway & Power Company, in the management of which he proposes to take an active part, although he does not intend to give up his residence in Los Angeles. Mr. Clark and his associates, some of whom are Southern California capitalists, have invested several million dollars in the vicinity of Portland. An electric railway is now in process of construction to Mt. Hood. Gen. M. H. Sherman, who is a brother-in-law of Mr. Clark, although still vice-president of the Los Angeles-Pacific Company, is also interested in the Mt. Hood Railway & Power Company. Mr. Clark still retains a financial interest in the Los Angeles-Pacific Company.

Mr. William Walker has been appointed assistant superintendent of the Milford, Attleboro & Woonsocket Railway, Milford, Mass., and the Interstate Consolidated Street Railway, North Attleboro, Mass., which are controlled by the New England Investment & Security Company. Mr. Walker's first electric railway experience was with the Schenectady (N. Y.) Railway as conductor and then as motorman. He was later made an inspector of the company, which he served in all about 10 years. Mr. Walker next became connected with the Berkshire Street Railway, Pittsfield, Mass., as motorman, but soon after entering the employ of the company he was made train dispatcher. Subsequently he was transferred to Westfield as inspector of transportation, and later was transferred from Westfield to Springfield, where he was located about two years. Finally he was again transferred to Westfield.

Mr. K. K. Garrick has been appointed general traffic agent of the Seattle-Everett Traction Company, Everett, Wash. In September, 1902, Mr. Garrick entered the service of the Everett Improvement Company as assistant bookkeeper. At that time the Everett Improvement Company controlled and operated the Everett Railway & Electric Company, the Everett Water Company, the Everett Theatre Company, the Everett Dock & Warehouse Company and was interested in the townsite of Everett. About June, 1903, Mr. Garrick was made assistant cashier of the company and in January, 1904, he was appointed bookkeeper. In July, 1904, Mr. Garrick was made chief clerk of the company, and about January, 1906, the duties of purchasing agent were added to the office of chief clerk. In August, 1907, the Puget Sound International Railway & Power Company, managed by Stone & Webster, Boston, Mass., leased the properties of the Everett Railway, Light & Water Company, and Mr. Garrick continued with the lessee company as chief clerk and purchasing agent until recently, when he was placed in charge of the freight and passenger traffic of the Seattle-Everett Traction Company, which is being managed at the same offices in Everett as the Puget Sound International Railway & Power Company.

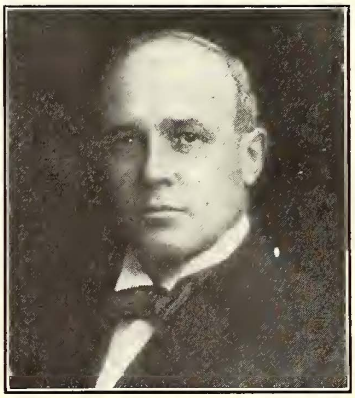
Mr. C. Gordon Reel, who retired early in the year as first vice-president and general manager of the Kingston (N. Y.) Consolidated Railroad, after holding that position since 1902, when the Colonial City Traction Company and the Kingston City Railroad were consolidated, was elected secretary of the Street Railway Association of the State of New York at the meeting which was held at Cooperstown on June 28 and 29, to succeed Mr. J. H. Pardee, who has been elected president of the association. Mr. Reel has been appointed as arbitrator to represent the United Traction Company, Albany, N. Y., in settlement of a schedule of wages for three years, to be determined by a representative of the company, of the men and by a third person to be chosen by the two other arbitrators. Mr. Reel is also one of the commissioners of appraisal in the land condemnation proceedings in connection with the Ashokan dam, which is being built to hold the water supply of New York City. He is making his headquarters in Kingston as a consulting engineer. Mr. Reel was formerly first vice-president of the Street Railway Association of the State of New York.



C. G. Reel

Mr. J. E. Gibson has been appointed assistant to Mr. J. M. Egan, president of the Metropolitan Street Railway, Kansas City, Mo. Mr. Gibson was born in Kansas City, Mo., on Aug. 20, 1881, and was educated in the public schools of Kansas City and at the Missouri State University at Columbia, Mo., from which he was graduated in 1902. From 1902 to 1904 Mr. Gibson served as private secretary to Mr. W. S. Cowherd, Congressman from the Fifth Missouri District, in Washington. In 1904 he entered the service of the Metropolitan Street Railway as a clerk in the office of the auditor. On Jan. 1, 1905, Mr. Gibson was appointed secretary to Mr. Bernard Corrigan, who was then president of the company, and he continued in this capacity until March 1, 1909, when he entered the service of the operating department of the company as a division superintendent.

Mr. J. H. Pardee, who has been secretary of the Street Railway Association of the State of New York since November, 1906, was elected president of the association to succeed Mr. E. F. Peck, at the meeting of the association which was held at Cooperstown on June 28 and 29, 1910. Mr. Pardee has been connected with J. G. White & Company, Inc., New York, N. Y., since January, 1907, as operating manager of the public utility companies which are controlled by that company. Mr. Pardee was born at Lysander, N. Y., in 1867, and in 1889 was graduated from Hamilton College. In 1891 he was admitted to the bar of New York and began to practice as a member of Petrie, Zimerman & Pardee, with whom he continued until 1898. Meanwhile Mr. Pardee perfected the reorganization of the railway, lighting and gas company at Canandaigua, N. Y., and was appointed general manager of the Ontario Light & Traction Company and the Canandaigua Gas Light Company. In 1898 he was appointed general manager of the Rochester & Eastern Rapid Railway, and continued in this position until he became connected with J. G. White & Company, Inc. Mr. Pardee has been connected with the Street Railway Association of the State of New York as an officer since 1903.



J. H. Pardee

Construction News

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

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

RECENT INCORPORATIONS

***Butte & Plumas Railway, Oroville, Cal.**—Application for a charter has been made in California by this company to build a 30-mile railway to connect Oroville and Stanwood. Surveys are now being made. Capital stock, $500,000. Incorporators: O. C. Hasslett, E. S. Dunbar and J. L. Smith.

***Forest City & Mason City Railway, Forest City, Ia.**—Incorporated in South Dakota to build a 30-mile railway, to be operated either by steam or electricity, from Forest City, via Fertile to Mason City. Capital stock, $400,000. Headquarters, Watertown, S. D., and at Forest City. Incorporators: P. O. Koto, C. N. Christopherson, C. S. Isaacs, Forest City; A. M. Sheimo, Baldwin, Wis.; A. L. Sherin and M. J. Hawley, Watertown, S. D.

***Niobrara Investment Company, Omaha, Neb.**—Application for a charter has been made in Nebraska by this company for the purpose of constructing an interurban railway between the Niobrara River and Sioux City. A power plant will be built on the Niobrara River. Capital stock, $1,200,000. F. Jaeggi is interested.

***Riverside Traction Company, Trenton, N. J.**—Incorporated in New Jersey to succeed the Camden & Trenton Railway. Capital stock, $1,500,000. Common, $20,000; preferred, $8,000. Officers: Thomas Haydock, Philadelphia, president; Dietrich Debuys, Camden, secretary, and Robert Long, Philadelphia, treasurer.

***Washington-Virginia Railway, Vienna, Va.**—Incorporated in Virginia to build a 50-mile electric railway from Vienna, Fairfax County, to Bluemont, Loudoun County. Maximum capital stock, $1,000,000. Officers: M. E. Church, president; G. B. Fadsley, vice-president; F. B. Parker, secretary; L. L. Northrop, treasurer, all of Falls Church, Va.

Ontario & Northern Railway, Ontario, Wis.—Chartered in Wisconsin to build an 8-mile electric railway from Ontario to Wilton. Capital stock, $75,000. Directors: V. A. Stoddard, C. W. Lord, A. T. Saunders, L. R. Abbott, F. G. Bredlow and Levi Wallace, all of Ontario. [E. R. J., June 4, '10]

FRANCHISES

Point Grey, B. C.—The British Columbia Electric Railway, Ltd., Vancouver, has applied for a 40-year franchise to build a street railway in Point Grey.

Berkeley, Cal.—The Oakland Traction Company has been granted a franchise by the Council for the extension of its Euclid Avenue line.

Martinez, Cal.—A. W. Maltby, representing the Antioch & Oakland Electric Railway, has asked the Board of Supervisors for a franchise to build a railway over the county roads between Martinez and Pachoco.

Carbondale, Ill.—The Murphysboro Electric Railway, Light, Heat & Power Company, Murphysboro, has applied to the Council for a franchise to build a street railway over certain streets in Carbondale.

Hammond, Ind.—The Indiana Northwestern Traction Company, Monticello, has been granted a 50-year franchise by the City Council to build a railway in Hammond. This proposed line will connect Cedar Lake, Hammond, Crown Point and Chicago. Eugene Purtelle, 222 La Salle Street, Chicago, president. [E. R. J., Dec. 25, '09.]

Grand Ledge, Mich.—J. W. Ewing, J. S. Mudge and associates have been granted a franchise by the Council to build an electric railway between Lansing and Grand Ledge. R. E. Olds is said to be financing the proposition. [E. R. J., June 18, '10.]

Billings, Mont.—At a special election held in Billings on June 30, the Eastern Montana Electric Railway was voted a 50-year franchise to build a railway over certain streets in Billings. This is part of a plan to build an electric railway to connect Laurel, Bearcreek, Billings, Red Lodge, Rockvale, Belfry and Fromberg. F. A. Kesselhuth, chief engineer. [E. R. J., June 4, '10.]

Lincoln, Neb.—The Lincoln (Neb.) Traction Company has asked the Council for a franchise to extend several of its lines in Lincoln.

Cairo, N. Y.—The Catskill (N. Y.) Electric Railway has been granted a franchise by the Town Board to extend its railway from Leeds to Cairo.

Columbus, Ohio.—The Fifth Avenue Railway & Light Company has asked the Council for a franchise to build a street railway on Fifth Avenue, Columbus. A. C. Wolfe is interested. [E. R. J., June 25, '10.]

Morristown, Pa.—The Philadelphia & Western Railway, Philadelphia, has been granted a franchise by the City Councils to build a railway in Morristown. This completes the preliminary work for connection with the Lehigh Valley Transit Company.

Cleburne, Tex.—Daniel Hewett and associates have been granted a franchise to build a street railway in Cleburne. [E. R. J., June 18, '10.]

Barnstown, W. Va.—The Fairmont & Northern Traction Company, Fairmont, has been granted a franchise by the Council to build a railway over certain streets in Barnstown.

TRACK AND ROADWAY

Birmingham Railway, Light & Power Company, Birmingham, Ala.—This company has recently completed and placed in operation the extension of its railway to Corey.

British Columbia Electric Railway, Ltd., Vancouver, B. C.—This company has awarded the contract to Christian & Hartney, Vancouver, for building the Richards Street extension in Vancouver.

Los Angeles-Pacific Company, Los Angeles, Cal.—This company will proceed at once with the proposed four-tracking of its line between Venice and Redondo. The borings for the company's new subway have also been begun. By next winter the latter improvement will be under full headway, and will likely be completed by the end of 1912.

***Modesto, Cal.**—J. C. Mehling, G. S. Schuler, J. H. Wallace and L. Eddinger, are said to be interested in promoting an interurban railway project to connect Modesto and Stockton, via Escalon.

***Monterey, Cal.**—A. G. Metz and H. M. Bergine, Monterey, are said to be interested in a plan to build an electric railway to connect Fresno and Monterey, via Coalinga.

St. John's Light & Power Company, St. Augustine, Fla.—This company has prepared plans for the construction of several extensions to its street railway in St. Augustine.

Burley, Idaho.—Isaac N. Powell, Chicago, advises that he is not interested in the proposed electric railway to connect Albion and Burley. [E. R. J., June 11, '10.]

Kankakee & Urbana Traction Company, Kankakee, Ill.—This company is securing right of way in Urbana for its proposed 125-mile railway to connect Kankakee, Urbana, Villa George, Camargo and Charleston. It is expected that construction will be started at an early date. W. J. Brock, Kankakee, president. [E. R. J., Nov. 27, '08.]

Peoria Railway Terminal Company, Peoria, Ill.—This company states that it is now building 2.3 miles of double track within the city limits, making a total of 4.6 miles, which will be complete and in operation in about 90 days.

Evansville, Mount Carmel & Olney Electric Railway, Evansville, Ind.—This company is said to have nearly completed the preliminary arrangements and construction will soon be started by the Burns Construction Company, Chicago, on its proposed 65-mile interurban railway to connect Mount Carmel, Highland, Darmstadt, Cynthiana, Owensville, Friendsville, Lancaster, Berryville and Olney. J. J. Burns and M. A. Peoples are interested. [E. R. J., June 4, '10.]

Evansville (Ind.) Railway.—In connection with the absorption of the Owensboro (Ky.) City Railroad and the Henderson (Ky.) Traction Company by interests identified with the Evansville Railway, it is planned to build a bridge across the Ohio River between Evansville, Ind., and Henderson, Ky., and to connect Evansville, Henderson and Owensboro. Other lines are planned from Henderson to Uniontown and Morganfield, Ky., and from Owensboro to Calhoun into the Green River territory. This company has recently awarded a contract to the Tennis Company for the construction of 6½ miles of track between Rockport and Grandview.

***South Bend, Ind.**—M. H. Lane, president of the Chicago & Kalamazoo Terminal Railroad; H. Bennett, president of the Chicago, Kalamazoo & Eastern Railroad; Edward G. Folsom, M. P. Reed and R. W. Reynolds are said to be interested in the construction of a proposed line from South Bend, Ind., to Kalamazoo, Mich.

Central Kentucky Traction Company, Frankfort, Ky.—This company is said to be considering plans for building an extension from Frankfort to Owenton.

***Henderson, Ky.**—J. P. Porter is said to be promoting a plan to build an electric railway to connect Uniontown, Smith Mills, Dixon, Corydon, Morganfield and Henderson, Ky.

Grosse Isle Railway, Detroit, Mich.—This company has completed surveys of Grosse Isle, and is now securing right of way around it. It is expected that construction will be started within a few weeks. Frank Whitehall and P. N. Jacobsen are interested. [E. R. J., May 28, '10.]

Menominee & Marinette Light & Traction Company, Menominee, Mich.—This company has completed preliminary arrangements and construction will soon be begun on its 1½-miles extension to Henes Park.

***Winona, Minn.**—John E. Hanson, St. Paul, is said to be promoting an electric railway to connect Rushford, Chatfield and Spring Valley.

Kansas City, Lawrence & Topeka Electric Railway, Kansas City, Mo.—This company is building a 5-mile extension to its railway.

United Railways, St. Louis, Mo.—This company plans to rebuild 4 miles of its McPherson line, using white oak ties and new 120-lb. rails. This line will be extended to the western city limits. It will also build an extension of its De Givernville Avenue line to the city limits.

Jersey Central Traction Company, Keyport, N. J.—This company has placed a contract with the Standard Bitulithic Paving Company, New York, for paving Perth Amboy.

Elmira, Corning & Waverly Railroad, Elmira, N. Y.—This company has secured rights of way through Chemung County, and as soon as the Steuben County negotiations have been closed it will begin construction of the extension between Elmira and Corning. The line will connect Waverly, Elmira and Corning.

Hudson Valley Railway, Glens Falls, N. Y.—This company has applied to the Public Service Commission of the Second District for permission to construct an extension of its lines in Saratoga Springs, through East Avenue and crossing Union Avenue. Saratoga Springs has granted a franchise for the proposed extension.

Union Railway, New York, N. Y.—This company has applied to the Public Service Commission of the First District for permission to extend its lines from Fordham Road and Sedgwick Avenue, across the University Heights Bridge at 207th Street, to Amsterdam Avenue, and through Emerson Street to Broadway. This extension will connect the Union Railway and the Third Avenue Railroad.

Alliance-Akron Railroad, Alliance, Ohio.—It is reported that this company has awarded a contract to the B. & M. Engineering & Construction Company, Cleveland, to build the proposed 26-mile railway between Alliance and Akron. L. C. Marble, Schofield Building, Cleveland, engineer in charge. [E. R. J., June 11, '10.]

Wheeling, Cadiz & Tuscarawas Traction Company, Cadiz, Ohio.—This company is reported to have succeeded in financing the first section of its projected railway from Cadiz to New Athens, a distance of 8 miles. This proposed 60-mile railway will connect Wheeling, Cadiz, Uhrichsville and Cleveland. A. E. Townsend, Cadiz, president. [E. R. J., June 18, '10.]

Fifth Avenue Railway & Light Company, Columbus, Ohio.—This company announces that construction will start on its proposed 7-mile railway from East Columbus to Marble Cliff, Columbus, as soon as the company can obtain a franchise. A. C. Wolfe is interested. [E. R. J., June 22, '10.]

*Enid, Okla.—J. M. Spaulding is said to be interested in a plan to build a four-mile electric railway between Enid and North Enid. Press reports state that work has been begun on the line.

Monaca & Ambridge Street Railway, Monaca, Pa.—This company has nearly completed the surveys for its proposed railway to extend through Monaca, Moon and Hopewell Townships. [E. R. J., Dec. 11, '19.]

Pittsburgh (Pa.) Railways.—This company has awarded the contract to Wm. Pickett & Company for building an extension of its railway from East Maiden Street to Washington Park.

Galveston-Houston Railway, Houston, Tex.—The Stone-Webster Engineering Corporation, Boston, Mass., which is building this 50-mile railway between Galveston and Houston, has ordered 5700 tons of 80-lb steel rails from the Pennsylvania Steel Company.

Milwaukee Western Electric Railway, Milwaukee, Wis.—This company reports it expects to commence building from Milwaukee to Beaver Dam this year, a distance of 70 miles.

SHOPS AND BUILDINGS

Athens (Ga.) Electric Railway.—This company reports it has started construction of its new reinforced concrete car house and repair shop, to cost approximately $20,000. Work is being done by the Foy-Proctor Company, Nashville. [E. R. J., June 4, '10.]

Aurora, Elgin & Chicago Railway, Chicago, Ill.—This company will build a 3-story brick railway station and offices, 40 ft x 120 ft.

Grafton (W. Va.) Traction Company.—This company reports that during the summer it will build a new brick car house in Grafton. [E. R. J., Apr. 30, '10.]

POWER HOUSES AND SUBSTATIONS

St. John's Light & Power Company, St. Augustine, Fla.—It is stated that this company will install a new engine at its power plant in St. Augustine, which will increase the capacity of the station by 1,200 hp. Additional generators, motors and other machinery will also be installed.

Chicago, Aurora & De Kalb Railroad, Aurora, Ill.—This company is building a new substation at Cortland.

Peoria (Ill.) Railway Terminal Company.—This company has under construction a new power house, 72 ft. x 200 ft. The building will also contain a machine and blacksmith shop. The company is preparing plans for increasing its power generating capacity, which will cost nearly $60,000.

Evansville (Ind.) Railway.—This company has awarded a contract to the General Electric Company for apparatus for two 300-kw substations and 21 miles of high-tension lines. [E. R. J., June 18, '10.]

Indianapolis Traction & Terminal Company, Indianapolis, Ind.—This company has awarded the contract to the Bedford Stone & Construction Company to build its new power house in West Tenth Street, west of White River, in Indianapolis. The Brown-Ketcham Iron Works have the contract for steel construction. Work has been started. The stack at the new power plant will be 995 ft. high and will be 45 ft. square at the base.

Kansas City, Laurence & Topeka Electric Railway, Kansas City, Mo.—This company is now installing a 150-kw generator and a 250-hp gas engine in its power house at Endora.

Metropolitan Street Railway, Kansas City, Mo.—This company is constructing a five-story steel and brick addition to its present building on Fifteenth Street and Grand Avenue in Kansas City. The structure will be 115 ft. x 90 ft. The addition will cost, it is estimated, $75,000.

Wheeling, Cadiz & Tuscarawas Traction Company, Cadiz, Ohio.—It is reported that this company will soon build a power house at Cadiz. A. Evans Townsend, president.

Corpus Christi & Interurban Railway, Corpus Christi, Tex.—This company, which at present rents power from the local electric light plant, expects to soon erect its own power plant.

Milwaukee Western Electric Railway, Milwaukee, Wis.—This company will build a power house at Hustisford having a capacity of nearly 20,000 hp. J. W. Barber, secretary.

Manufactures & Supplies

ROLLING STOCK

Selma Street & Interurban Railway, Selma, Ala., is in the market for three new cars.

Milwaukee Western Electric Railway, Milwaukee, Wis., expects to purchase several new cars and trucks.

Mason City & Clear Lake Railway, Mason City, Ia., expects to purchase two 60 or 70-ton electric freight locomotives.

Worcester (Mass.) Consolidated Street Railway expects to purchase 12 28-ft. closed cars complete with motors, trucks, etc.

Interurban Construction Company, Wichita, Kan., is in the market for several standard interurban passenger cars for August delivery.

Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis., expects to purchase one double-truck closed car, either new or second-hand.

Charleston Consolidated Railway, Gas & Electric Company, Charleston, S. C., is said to be considering the purchase of eight semi-convertible cars for 1911 delivery.

J. H. Clark, Boise, Idaho, is asking prices on combination passenger and baggage cars and passenger cars for a 25-mile line in Idaho. The cars are to be equipped with four motors each.

New York & Queens County Railway, Long Island City, N. Y., which was noted in the Electric Railway Journal of June 11, 1910, as contemplating the purchase of 25 60-hp, double-motor equipments, including air brakes, has placed the order for this equipment with the General Electric Company.

Springfield (Ill.) Consolidated Railway has placed an order with the G. C. Kuhlman Car Company for five 22-ft. closed car bodies with 5-ft. 9-in. platforms at each end so arranged as to be easily converted for prepayment operation. These car bodies will be mounted on Brill No. 21-E single trucks and equipped with two GE-54 motors.

Metropolitan Street Railway, Kansas City, Mo., which was noted in the Electric Railway Journal of May 14, 1910, as having issued specifications for 25 cars, has placed an order with the Cincinnati Car Company for 25 cars of the prepayment type, with an option of increasing the order to 50 cars. The company is rebuilding at its shops in Kansas City 25 trail cars. These cars are now being fitted with motors and will also be of the prepayment type.

Portland Railway, Light & Power Company, Portland, Ore., mentioned in the Electric Railway Journal of March 26, 1910, as having purchased 40 pay-as-you-enter cars from the American Car Company, has specified the following details for 10 of these cars, which are to be narrow-gage and of the closed type:

Length of body....28 ft. 8 in.	Destination signs....Hunter
Over bumpers.....45 ft.	Gongs.....Brill Dedenda
Width over sills.....7 ft. 4 in.	Hand brakes.....Brill
Over posts at belt.....8 ft.	Headlights ....Crouse-Hinds
Sill to trolley base .....12 ft. 2⅝ in.	Journal boxes.....Brill
	Motors, type.....GE
Height from top of rail to sills.. 2 ft. 7½ in.	Push button.....Brill
	Roofs .....monitor
Body .....wood	Sanders.....De Witt
Interior trim.....bronze	Seats .....Brill
Axles .....Brill	Seating material.....rattan
Brakeshoes .....Brill	Side bearings.....Brill
Bumpers .....Brill	Springs .....Brill
Car trimmings.....Brill	Step treads.....Universal
Couplers, Brill, with Van Dorn head	Trucks, type.....Brill 22
	Varnish .....Murphy
Curtain fixt...Curt. Sup. Co.	Ventilators .....Brill
Curtain material...Pantasote	Wheels .....Griffin

TRADE NOTES

Rail Joint Company, New York, N. Y., has moved its office in London, England, to the Egypt House, 36-38 New Broad Street.

Pennsylvania Steel Company, Philadelphia, Pa., has moved its offices to the Morris Building, 1421 Chestnut Street, Philadelphia.

Northern Engineering Works, Detroit, Mich., have recently installed two 25-ton, 40-ft. span cranes and one 10-ton Northern traveling crane in the power stations of the Pennsylvania Tunnel & Terminal Railroad, New York, N. Y.

Crocker-Wheeler Company, Ampere, N. J., announces the election of the following officers, who will serve during the ensuing year: Schuyler Staats Wheeler, president; Gano Dunn, first vice-president and chief engineer; Arthur L. Doremus, third vice-president; Rodman Gilder, secretary, and W. L. Brownell, treasurer.

J. B. McClary, formerly general manager of the Sheffield Company, Sheffield, Ala., has been elected vice-president and general manager of the Yolande Coal & Coke Company and the New Connellsville Coal & Coke Company, and president of the Abernant Coal Company, with headquarters in the Brown-Marx Building, Birmingham, Ala.

C. W. Hunt Company, New York, N. Y., builder of coal handling, conveying and hoisting machinery, has opened offices at the State Bank Building, Richmond, Va., and at 607 Rhodes Building, Atlanta, Ga., with W. F. Lee, for several years preliminary engineer to the company, in charge. The C. W. Hunt Company also announces the appointment of C. T. Anderson as manager of its Chicago office, at 1616 Fisher Building.

Kean, Taylor & Company, New York, N. Y., has been formed by Hamilton F. Kean and Moses Taylor to continue from July 1. 1910, the business of Kean, Van Cortlandt & Company, which expired by limitation on that date. Joseph R. Swan, formerly treasurer of the Union Trust Company, Albany, N. Y., has been admitted to partnership in the new firm. The business of Kean, Taylor & Company will be carried on at the same address, 30 Pine Street, New York.

Parmenter Fender & Wheel Guard Company, Boston, Mass., has received a second order from the Metropolitan Street Railway, New York, N. Y., for 550 wheel guards; also from the Rhode Island Company, Providence, R. I., for 160 wheel guards, and the Washington Railway & Electric Company, Washington, D. C., for 100 wheel guards and 50 fenders. In addition the company has an order from the Brooklyn Rapid Transit Company for 500 wheel guards.

Penberthy Injector Company, Detroit, Mich., on March 29, 1910, numbered its 600,000th Penberthy automatic injector. The combined capacity of these injectors is so great that the Penberthy Injector Company has compared this capacity to the water going over Niagara Falls, as estimated in the "Encyclopedia Americana," and finds that 600,000 of its size GG injectors would handle about one-third of the supply of water, or approximately 2,520,000,000 gals. per hour.

Peter Smith Heater Company, Detroit, Mich., on July 1 will move its Eastern sales office in New York from 30 Church Street to Room 2065, 50 Church Street. The company announces the appointment of Walter E. Hinmon, who will have charge of the central and Western territory. Mr. Hinmon was formerly connected with the Cooper Heater Company. The Peter Smith Heater Company reports that the contract which it secured from the Cleveland (Ohio) Railway was for 250 Peter Smith forced circulation hot air equipments instead of hot water equipments, as noted in a recent issue.

Columbia Machine Works and Malleable Iron Company, Brooklyn, N. Y., entertained about 120 electric railway officers and supply men on Saturday afternoon, June 25, 1910, on the occasion of the completion of an extensive addition to its works in East New York. The guests were transported in automobiles from the Flatbush Avenue terminal of the subway in Brooklyn to the works, and at 2 o'clock a beefsteak luncheon was served in the new building, which was elaborately decorated. Among the railway officers who occupied seats at the head of the long tables with J. C. Buehler, president of the company, were W. O. Wood, president and general manager, New York & Queens County Railway; Edward A. Maher, manager, Third Avenue Railroad; J. S. Doyle, superintendent car equipment, Interborough Rapid Transit Company; H. H. Adams, superintendent of rolling stock and shops, Metropolitan Street Railway; W. T. Dougan, engineer maintenance of way, Metropolitan Street Railway; J. S. McWhirter, superintendent car equipment, Third Avenue Railroad; F. T. Wood, assistant to general manager, Metropolitan Street Railway, and L. H. Palmer, superintendent of transportation, Metropolitan Street Railway. After luncheon the guests were conducted through the shops and shown the variety and quantity of the work which the company is doing. The new building will be used largely for the manufacture of sheet steel gear cases, and by moving this department from its present location the foundry can be greatly enlarged. Later in the afternoon a hard-fought baseball game was played by teams made up of supply men and railway men. The score was tied when the game was called to permit a number of the players to take part in a golf tournament over the Forest Park links. Eight handsome silver cups were competed for. At the conclusion of the golf tournament Mr. Buehler was presented a large loving cup, the gift of his many friends, who joined in wishing him continued success in conducting the business which he has built up in the electric railway field.

ADVERTISING LITERATURE

Dorner Railway Equipment Company, Chicago, Ill., has published list C for 1910, of cars, power plant equipment, etc., which it has on hand for immediate shipment.

Weir Frog Company, Cincinnati, Ohio, has issued a 208-page catalog, No. 8, in which are listed and illustrated the different types of frogs, switches, crossings, etc., which it manufactures.

Allis-Chalmers Company, Milwaukee, Wis., has issued bulletin No. 1071, describing and illustrating type C jet condensers; also the second edition of bulletin No. 1070, which is descriptive of type B barometric condensers.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has issued a complete catalog on Westinghouse direct suspension line material. The catalog contains 200 pages, and cancels special publication No. 7060.

Ohio Brass Company, Mansfield, Ohio, has issued its annual catalog, No. 8, on electric railway and mine haulage material. The book is copiously illustrated, and lists a variety of overhead line material and many other specialties made by this company, such as the car signal system, arc headlights, radial couplers, sander equipment, hose bridge, etc. The publication also contains a large number of wire and other tables of value to line and power engineers. Owing to the extensive development of its catenary line material, the company has published catalog No. 20 to cover that subject exclusively. In addition the Ohio Brass Company has issued catalog H, which is descriptive of the complete line of Ohio valves and steam specialties.

The J. G. Brill Company, Philadelphia, Pa., prints in the *Brill Magazine* for June a biographical sketch of Thomas E. Mitten, president of the Chicago (Ill.) City Railway. The sketch is accompanied with an excellent portrait of Mr. Mitten as a supplement. Among the feature articles are the following: "Conditions Which Govern the Type of Car for City Service—Glasgow, Scotland"; "Pay-As-You-Enter Type Cars for Roanoke and Lynchburg," "Cars for Akron Lines of Northern Ohio Traction & Light Company," "More Pay-As-You-Enter Cars for Chicago" and "Cars for the Toledo Railways & Light Company." The J. G. Brill Company has also issued a new catalog, entitled "City and Interurban Car and Trucks," in which are listed and illustrated the various patented types of cars, trucks and car parts which it manufactures. The publication contains 58 pages, and is printed in English, Spanish and French.

NEW PUBLICATIONS

Railway Special Work. By Walter E. Silsbee and Percy E. Blood. New York: McGraw-Hill Book Company; 107 pages; flexible leather. Price, $2 net.

Track engineers will find this book a useful pocket guide for the calculation of frog work and special curves. The authors have used approximate methods for clearance curve problems, as absolute exactness would not lead to better practical results. A valuable feature of the book is the insertion of such adjuncts to calculation as tables on the reduction of inches to decimals of a foot, and on common logarithms, so that the engineer can get all needful data from one handy volume. A simple explanation of the use and value of the Mannheim slide rule also is included.

TABLE OF MONTHLY EARNINGS.

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

Company	Period	Gross Income	Operating Expenses	Gross Income Less Operating Expenses	Deductions From Income	Net Income
AKRON, O. Northern Ohio Tr. & Light Co.	1m., May '10	207,323	111,250	96,074	43,375	52,699
	1 " " '09	188,749	103,833	84,917	43,809	41,107
	5 " " '10	865,662	501,105	364,557	216,541	148,015
	5 " " '09	775,739	445,389	330,349	219,075	111,275
BANGOR, ME. Bangor Ry. & Elec. Co.	1m., May '10	42,875	21,134	21,741	13,102	8,639
	1 " " '09	39,936	22,203	17,733	13,011	4,722
	11 " " '10	510,230	221,978	288,252	144,208	144,044
	11 " " '09	478,464	227,143	251,321	136,751	114,570
BATON ROUGE, LA. Baton Rouge Elec. Co.	1m., Apr. '10	8,303	5,162	3,140	1,959	1,182
	1 " " '09	7,344	6,053	1,291	1,921	†630
	12 " " '10	104,433	69,832	34,601	22,883	11,718
	12 " " '09	93,971	65,709	28,262	.....	.....
BELLINGHAM, WASH. Whatcom Co. Ry. & Lt. Co.	1m., Apr. '10	32,661	19,091	13,571	8,370	5,201
	1 " " '09	31,552	18,002	13,550	8,138	5,412
	12 " " '10	413,567	236,546	177,021	100,882	76,139
	12 " " '09	371,906	217,545	154,361	101,733	52,628
CHAMPAIGN, ILL. Illinois Traction System.	1m., Apr. '10	466,497	288,990	177,507	.....	.....
	1 " " '09	415,058	237,232	177,826	.....	.....
	4 " " '10	1,893,509	1,120,662	772,847	.....	.....
	4 " " '09	1,677,715	959,523	718,192	.....	.....
CHICAGO, ILL. Aurora, Elgin & Chicago Railroad.	1m., Apr. '10	120,384	71,150	49,234	33,310	15,924
	1 " " '09	106,412	64,182	42,230	28,552	13,677
	10 " " '10	1,302,282	726,760	575,523	307,264	263,257
	10 " " '09	1,183,401	653,439	529,962	280,245	249,717
CLEVELAND, O. Cleveland Southwestern & Columbus Ry.	1m., Apr. '10	76,020	43,791	32,229	27,875	4,354
	1 " " '09	67,609	41,625	25,984	25,181	803
	4 " " '10	281,012	176,213	104,799	111,422	†6,623
	4 " " '09	242,677	155,849	86,828	91,610	†4,782
DALLAS, TEX. Dallas Electric Corporation.	1m., Apr. '10	113,405	74,510	38,896	26,599	12,296
	1 " " '09	100,964	61,678	39,286	28,832	10,454
	12 " " '10	1,371,826	877,527	494,299	328,226	166,074
	12 " " '09	1,217,574	787,967	429,607	344,517	85,090
DULUTH, MINN. Duluth-Superior Trac. Co.	1m., May '10	90,289	49,825	40,464	‡19,417	21,048
	1 " " '09	81,533	47,331	34,202	‡18,417	15,785
	5 " " '10	416,311	253,051	163,260	‡97,083	66,177
	5 " " '09	369,455	233,888	135,567	‡92,083	43,484
EAST ST. LOUIS, ILL. East St. Louis & Suburban Co.	1m., May '10	183,478	102,738	80,740	50,351	30,389
	1 " " '09	171,072	95,538	75,534	49,429	26,105
	5 " " '10	918,799	493,189	425,610	250,396	175,214
	5 " " '09	792,328	453,750	338,578	247,850	90,728
EL PASO, TEX. El Paso Elec. Co.	1m., Apr. '10	49,490	28,874	20,616	8,306	12,310
	1 " " '09	46,493	29,304	17,189	7,900	9,289
	12 " " '10	624,844	359,327	265,516	100,599	164,917
	12 " " '09	547,361	374,527	172,834	90,087	82,747
FAIRMONT, W. VA. Fairmont & Clarksburg Trac. Co.	1m., May '10	51,827	17,012	33,275	12,609	20,666
	1 " " '09	42,122	13,362	28,760	12,309	16,451
	5 " " '10	216,455	82,766	133,689	62,684	71,005
	5 " " '09	170,171	63,940	106,231	61,564	44,667
FORT WORTH, TEX. Northern Texas Elec. Co.	1m., Apr. '10	111,280	61,001	50,278	19,083	31,198
	1 " " '09	97,837	56,532	41,305	17,190	24,115
	12 " " '10	1,319,993	714,953	605,040	209,712	395,329
	12 " " '09	1,142,510	668,124	474,387	200,449	273,937
GALVESTON, TEX. Galveston-Houston Elec. Co.	1m., Apr. '10	104,550	66,059	38,491	23,540	14,951
	1 " " '09	93,721	55,245	38,475	21,259	17,216
	12 " " '10	1,239,449	745,649	493,800	270,407	223,393
	12 " " '09	1,129,450	655,736	473,715	249,743	223,972
GRAND RAPIDS, MICH. Grand Rapids Ry. Co.	1m., May '10	93,207	45,732	47,475	19,574	27,901
	1 " " '09	85,243	40,706	44,537	18,893	25,644
	5 " " '10	430,871	216,861	214,010	99,309	114,701
	5 " " '09	388,045	190,921	197,124	94,574	102,550
HARRISBURG, PA. Central Penn. Trac. Co.	1m., May '10	69,934	48,960	20,974	.....	.....
	1 " " '09	66,350	46,720	19,630	.....	.....
	5 " " '10	319,795	237,021	82,774	.....	.....
	5 " " '09	290,850	220,778	70,072	.....	.....
HOUGHTON, MICH. Houghton County Trac. Co.	1m., Apr. '10	24,248	13,479	10,769	6,317	4,453
	1 " " '09	25,727	14,257	11,470	6,242	5,228
	12 " " '10	322,125	167,617	154,508	76,008	78,500
	12 " " '09	285,724	158,704	127,020	63,124	63,896
JACKSONVILLE, FLA. Jacksonville Elec. Co.	1m., Apr. '10	47,213	24,443	22,770	9,290	13,480
	1 " " '09	40,307	23,931	16,376	9,345	7,031
	12 " " '10	521,035	275,572	245,463	112,295	133,168
	12 " " '09	449,838	261,617	188,220	86,434	76,787
KANSAS CITY, MO. Kansas City Ry. & Lt. Co.	1m., Apr. '10	601,477	407,208	194,268	158,790	35,478
	1 " " '09	552,628	308,610	244,018	156,271	87,747
	11 " " '10	6,563,191	3,761,675	2,801,515	1,734,970	1,066,546
	11 " " '09	6,052,696	3,438,830	2,613,866	1,728,348	885,519
MILWAUKEE, WIS. Milwaukee Elec.Ry. & Lt. Co.	1m., May '10	384,866	279,919	104,948	47,659	57,289
	1 " " '09	346,908	219,964	126,944	47,512	79,431
	5 " " '10	1,879,343	1,351,753	527,590	233,336	294,254
	5 " " '09	1,688,095	1,133,942	554,153	233,749	320,404
Milwaukee Lt., Ht. & Traction Co.	1m., May '10	130,404	54,677	75,727	55,378	20,349
	1 " " '09	115,924	41,583	74,341	51,278	23,063
	5 " " '10	586,270	238,948	347,322	276,712	70,610
	5 " " '09	528,522	198,350	330,172	252,885	77,287
MINNEAPOLIS, MINN. Twin City Rapid Transit Co.	1m., May '10	627,946	289,382	338,564	140,112	198,451
	1 " " '09	569,217	260,970	308,247	140,251	167,996
	5 " " '10	2,931,643	1,446,451	1,485,192	701,029	784,163
	5 " " '09	2,656,964	1,361,601	1,295,364	687,507	607,857
MONTREAL, CAN. Montreal St. Ry.	1m., May '10	370,234	199,617	170,617	54,435	116,182
	1 " " '09	329,339	181,148	148,192	45,891	102,301
	8 " " '10	2,707,235	1,607,443	1,099,792	318,550	781,242
	8 " " '09	2,437,055	1,501,283	935,773	284,557	651,216
NASHVILLE, TENN. Nashville Ry. & Lt. Co.	1m., Apr. '10	147,519	*87,993	59,526	33,690	25,836
	1 " " '09	139,939	*85,196	54,743	32,607	22,136
	4 " " '10	581,833	*336,291	245,542	134,760	110,782
	4 " " '09	544,354	*327,583	216,771	130,120	86,651
NEW ORLEANS, LA. New Orleans Ry. & Lt. Co.	1m., Apr. '10	537,475	276,131	261,344	176,380	84,964
	1 " " '09	494,827	262,981	231,846	173,790	58,056
	4 " " '10	2,140,821	1,108,104	1,032,717	701,947	330,770
	4 " " '09	2,048,057	1,074,427	973,630	691,180	282,450
OKLAHOMA, OKLA. Oklahoma City Ry.	1m., May '10	53,861	31,825	22,036	.....	.....
	1 " " '09	37,533	21,694	15,839	.....	.....
	5 " " '10	227,916	131,198	96,718	.....	.....
	5 " " '09	149,144	96,795	52,349	.....	.....
PADUCAH, KY. Paducah Trac. & Lt. Co.	1m., Apr. '10	20,389	12,342	8,047	7,047	1,000
	1 " " '09	18,352	11,137	7,215	7,033	182
	12 " " '10	234,796	140,899	93,897	81,694	12,203
	12 " " '09	223,638	133,554	90,084	82,624	7,460
PENSACOLA, FLA. Pensacola Electric Co.	1m., Apr. '10	22,263	12,754	9,508	4,937	4,571
	1 " " '09	18,559	11,468	7,091	4,322	2,769
	12 " " '10	254,445	145,892	108,553	54,657	53,896
	12 " " '09	222,958	140,371	82,587	51,998	30,589
PHILADELPHIA, PA. American Railways.	1m., May '10	335,599	.....	.....	.....	.....
	1 " " '09	310,683	.....	.....	.....	.....
	11 " " '10	3,067,977	.....	.....	.....	.....
	11 " " '09	2,847,522	.....	.....	.....	.....
PLYMOUTH, MASS. Brockton & Plymouth St. Ry. Co.	1m., Apr. '10	8,744	6,581	2,163	1,807	355
	1 " " '09	9,096	7,025	2,071	1,758	313
	12 " " '10	129,792	93,677	36,115	20,871	15,243
	12 " " '09	124,421	85,978	38,443	25,332	13,111
PORTLAND, ORE. Portland Ry., Lt. & Power Co.	1m., May '10	466,436	197,109	269,327	132,969	136,358
	1 " " '09	399,590	177,921	221,669	125,027	96,642
	5 " " '10	2,166,734	929,777	1,236,957	659,561	577,396
	5 " " '09	1,842,036	877,733	964,303	609,161	355,142
ST. JOSEPH, MO. St. Joseph Ry., Lt., Ht. & Power Co.	1m., May '10	79,587	45,276	34,311	22,683	11,628
	1 " " '09	77,187	42,622	34,565	21,536	13,029
	5 " " '10	408,614	227,264	181,350	111,359	69,991
	5 " " '09	377,924	205,271	182,553	104,868	67,685
SAN FRANCISCO, CAL. United Railroads of San Francisco.	1m., Apr. '10	648,015	366,427	281,588	.....	.....
	1 " " '09	620,626	345,527	275,099	.....	.....
	4 " " '10	2,494,867	1,455,829	1,039,038	.....	.....
	4 " " '09	2,337,252	1,391,270	945,982	.....	.....
SAVANNAH, GA. Savannah Elec. Co.	1m., Apr. '10	50,651	32,740	17,910	17,901	9
	1 " " '09	47,488	30,802	16,686	17,442	†756
	12 " " '10	608,256	395,066	213,190	211,134	2,056
	12 " " '09	601,671	370,767	230,904	208,986	21,919
SEATTLE, WASH. Seattle Electric Co.	1m., Apr. '10	460,490	273,266	187,224	108,708	78,516
	1 " " '09	422,129	261,843	160,286	104,140	56,145
	12 " " '10	6,049,682	3,515,783	2,533,899	1,278,810	1,255,089
	12 " " '09	4,721,194	2,787,651	1,933,542	1,152,322	781,221
TACOMA, WASH. Puget Sound Electric Ry.	1m., Apr. '10	158,919	105,573	53,346	50,546	2,800
	1 " " '09	143,581	103,887	39,694	46,001	6,307
	12 " " '10	1,927,477	1,291,724	635,753	591,378	44,375
	12 " " '09	1,685,618	1,115,632	569,986	526,627	43,359
SYDNEY, N. S. Cape Breton Elec. Co., Ltd.	1m., Apr. '10	20,730	11,660	9,070	5,049	4,021
	1 " " '09	16,511	11,209	5,302	5,056	247
	12 " " '10	254,757	144,231	110,526	60,636	49,890
	12 " " '09	240,348	141,767	98,580	59,623	38,957
TAMPA, FLA. Tampa Elec. Co.	1m., Apr. '10	48,362	31,209	17,154	4,590	12,564
	1 " " '09	46,432	28,634	17,797	4,797	13,001
	12 " " '10	609,325	346,822	262,503	55,700	206,803
	12 " " '09	570,137	363,376	206,761	49,539	157,222
TOLEDO, OHIO. Toledo Rys. & Lt. Co.	1m., May '10	238,226	148,213	90,013	76,174	13,839
	1 " " '09	213,156	126,612	86,544	70,871	15,673
	5 " " '10	1,220,320	730,317	490,034	379,910	110,093
	5 " " '09	1,086,241	621,110	465,131	354,652	110,479
WASHINGTON, D.C. Washington, Baltimore & Annapolis Elec. Ry.	1m., May '10	68,990	30,640	38,350	.....	.....
	1 " " '09	58,990	36,026	22,964	.....	.....
	11 " " '10	584,295	336,359	247,936	.....	.....
	11 " " '09	546,502	378,511	167,991	.....	.....