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The Hoosac Tunnel Electrification

The electrification of the Hoosac Tunnel of the Boston & Maine Railroad is a notable achievement. In less than a year from the time that the New Haven interests took over the control of the Boston & Maine the directors had authorized the change of motive power, all the engineering work was done and the construction work was completed under most difficult conditions without interrupting the operation of trains for a day. When the time came to turn on the current from the new power house and begin regular operation with electric locomotives nothing went wrong or had to be done over. Electric operation has proved an engineering success and undoubtedly it will prove an economic success. The Hoosac Tunnel has long been the neck of the bottle for freight traffic and the fly in the ointment for passenger traffic. The Fitchburg division of the Boston & Maine parallels its only competitor for through traffic, the Boston & Albany, and except for the tunnel has as favorable a location across the State of Massachusetts. Yet it never has been able to obtain its share of the passenger traffic or handle its share of the freight. Electric operation through the tunnel will avoid all discomfort to passengers and will greatly reduce the congestion of freight. The project has not been expensive as railroad improvement work is judged, and the saving in time to freight trains alone in its effect on the whole road should more than pay the interest on the investment which has been made in the electric equipment.

The Language of Depreciation

A fairly large part of the paper by Mr. Floy in regard to depreciation, presented before the American Institute of Electrical Engineers this week, is devoted to definitions of terms. In our abstract, published elsewhere in this issue, we give the essence of the definitions of the author, which he made unusually full in order to emphasize the need of uniformity in the use of these terms. The real reason why there has not been a more general agreement upon the language of depreciation is that the question of depreciation has generally been treated as one of academic interest rather than as one of practical importance. This fact militates against the consideration of precise terms to describe conditions the existence of which is denied by many. If the costs of depreciation are recognized universally as fair charges against earnings, authoritative definitions of terms will follow as a matter of course, but where there is no agreement as to the practical aspects of the subject itself it becomes difficult to secure concerted action on words and phrases. There is no unanimity of action even as to the real meaning of maintenance, which is construed by some companies to comprise no more than current repairs. Mr. Floy's study of the subject is based upon court and commis-

sion decisions rather than upon company practice. His citations of rulings in important cases in which depreciation is regarded as an element in the cost of the service support his earnest plea for a thorough consideration of the whole subject.

Action on the Interurban Code

Advance publication of the report of the committee on interurban rules of the American Electric Railway Transportation & Traffic Association gives to the member companies an opportunity which they ought not to neglect. The early action of the committee places in the hands of all operating officials of member companies a copy of the revised code, together with a compilation in convenient form of the rules in which changes are made, the changes proposed and the reasons therefor. Now the committee asks for criticisms of its work. It has made a unanimous report, representing the combined judgment of officials of companies located in various and widely separated sections of the country. Its code is one under which the different members of the committee presumably are satisfied to operate. Other companies will undoubtedly be willing to accept the recommendations of the committee without change. If they approve the code as it stands with the recommended changes they should so notify the committee. It is reasonable to ask that legitimate criticisms of any rule be sent to the committee without delay in order that further revision, if desirable, may be facilitated at the convention next October. We have no doubt that the committee, in furtherance of its aim to develop a workable code that shall be acceptable to all interurban roads, will welcome criticisms from non-member companies. Since the need of a uniform code is urgent, there is no reason why suggestions from sources outside of the association should not be made freely. The recommendation of the code by a committee of the Street Railway Association of the State of New York and the resultant approval of that association at its annual meeting this week constitute a support which the committee that is responsible for the revision must appreciate.

Passenger Shelter Stations

At a recent conference of interurban electric railway managers there was a rather ardent discussion on the subject of shelter stations. No one of the gentlemen present was inclined to dispute the value of such stations, but many feared the supposed high expense of such conveniences for intending passengers. It is true, of course, that the average interurban railway cannot afford to put up at every crossing a windowed structure with heating and toilet facilities. Even if the first cost of such buildings was low, they would involve a considerable charge for attendance. Furthermore it would be practically impossible to keep them free from the mutilations, defacements and nuisances to which isolated buildings are subject. But it is not necessary that a shelter station should be anything more than a rain and wind shield, since people do not expect to spend more than a few minutes in such a station while waiting for a car. Simple shelters of this kind can be erected for very little money. In fact, if a company wished to do so, it could usually arrange with a local merchant to install them at no expense to the company because of their billboard or advertising sign value. One Pennsylvania railway worked out a plan of this kind and it proved so popular with both the merchants and the public that similar shelters were installed at every other stopping place on the line. No doubt other companies would prefer to install their own shelter stations, as the expense is not great when the station is built of wood and but slightly more when of concrete. Many architecturally attractive designs have been worked out, among them several whose plan would be represented by an "x" or cross, rather than one with three or four inclosing walls. The "x" type of shelter, when provided with a roof with broad eaves, furnishes as complete protection from the weather as the rectangle, and has the additional advantage that it is easier to keep clean and is less subject to nuisance. The ordinary suburban and interurban road does not require elaborate shelters, but some such buildings are extremely convenient at times for waiting passengers. They also also undoubtedly shorten station stops.

CAR SCHEDULE ECONOMIES

The maintenance of car schedules at the lowest cost consistent with good service is an omnipresent problem to the transportation departments of all but the smallest systems. The search for economy in schedule construction has many resemblances to a game of golf. A man may be proud of the good work that he has done, but he can never justify the claim that he has reached perfection. He no sooner attains one low record than he begins to consider whether by a little closer calculation of the various factors with which he has had to deal he could not improve his performance so as to do better next time. There are so many controllable elements in the game as well as so many that are uncontrollable that the lowest possible score for each individual seems always to lie just beyond the point already gained. In the game of schedule making the street railway manager, his timetable specialist and his division superintendent have a problem which is even more interesting and involved than that confronting the player on the links, because the changing volume and distribution of traffic constantly require new investigations of the problem of how closer to fit the service to the patronage.

The most successful line of attack on inefficiency in handling traffic must be purely local. It usually represents long study of conditions on given divisions, including limitations of topography, power supply, location of stopping and passing points, track layouts of carhouses, signaling, the system of assigning work to trainmen, etc. Out of this host of factors, however, it is possible to emphasize certain sources of inefficiency or excessive expense which are common to operating companies generally without regard to local conditions.

Irregularity of running and the necessity of filling gaps at route termini by extra or set-back cars are probably the two chief sources of financial loss involved in schedule making to any large company serving an extended area. Irregularity of headway leads to the overcrowding of some cars and the underfilling of others. The latter means waste

of money and the former means loss of fares both because conductors cannot make prompt and accurate collections and because would-be patrons desert the service and walk when the gaps in headway are excessive. These gaps also result in complaints on the part of the public that the company does not operate a sufficient number of cars, a charge which is untrue in the majority of cases, because the total number of trips per day is seldom greatly influenced by temporary interruptions. But these interruptions do require the introduction of extra cars and thus a larger service than is necessary if the regular cars are moved properly.

The difficulties we are considering may sometimes be overcome, at least in part, by closer attention to the operation of cars along the entire route, but the fundamental trouble is more often in the schedules themselves. Assume, for instance, the frequent case of two lines which branch from a common point some distance from a downtown terminus and that the traffic demands a shorter headway on one line than on the other. In such case the schedule should be planned so as to approximate as closely as possible an even headway of all cars between the downtown terminus and the junction point. It may not be possible to attain close harmony of movement in all cases, but as a rule the greater density of service on the inward side of a junction point tends to offset slight irregularities of movement there.

In dealing with the headway of outbound cars a new problem arises, chiefly from the fact that the running times may be different between an outlying terminus of two routes whose in-town destinations are not the same. Under such conditions an even headway between cars leaving the suburban terminus becomes distorted at the point where the routes join on the return trip. One remedy for this condition, if it is serious enough to be rectified, is to shorten or lengthen the headway on one of the two routes so as to get the alternate movement desired at the suburban terminus. Another plan is to consolidate the service to the suburban terminus as far as practicable. With liberal transfer arrangements this latter change might be made a source of economy.

Other factors bearing on the question of train service economy are the enforcement of discipline in connection with running time, the elimination of an excessive number of stopping points, increased punctuality in starting cars, the reduction in time required to change crews, efficient coaching of new men by inspectors, the selection and maintenance of motive power suitable to the requirements of specific routes, and the more extended use of the telephone between street inspectors and carhouse starters. The latter remedy is especially worth considering in connection with cutting out set-back trips of perhaps a mile or two at the ends of lines, where time can in part be made up. There is no question that the use of set-back cars has been an important factor in retaining the patronage on many systems in which sharply competitive conditions are found, but they are expensive as compared with regular car movements and practically duplicate the service. Hence any means to reduce their number deserves thorough investigation from the standpoint of economical management.

THE QUESTION OF SHOP APPRENTICES

The creation of a committee on engineering apprentices by the American Electric Railway Engineering Association represents the first step in a praiseworthy attempt to raise the standard of shop labor. It is too much to expect, however, that the first report of this committee should be much more than a preliminary survey of the conditions which would aid or hinder the development of workmen who are to be specifically trained for service in electric railway shops and carhouses. There are many reasons why this must be so, because the subject is far more complex than any in which the factors of economics, sociology and human nature are not of controlling importance. Even the training of cadet engineers is simple by comparison.

The first difficulty which would have to be overcome would be that of inducing parents or guardians to indenture their boys for such an extended period as three or four years. Apprenticeship contracts are more common in European countries where traditions of the medieval trade guilds are still strong, but they have never had much chance for development in a young country with such rapid industrial changes as the United States. To overcome this prejudice it will probably be necessary to offer better wages than the prevailing rate for beginners in office or factory positions, to lay stress on the permanence of the work offered, and to assure the pupil that he will be trained to become a skilled, well-paid workman. The second difficulty relates to the employer's side of the contract. He can, of course, insist upon a clause which will permit him to discharge an apprentice who proves incompetent after say three months' or six months' trial, but he must also be able to keep the competent graduate from being tempted away by higher wages from other employers just as soon as he has become of real value to his instructors. Possibly this difficulty could be overcome by a plan by which a certain part of the apprentice's salary would be in the form of a bonus or of several bonuses, to be paid by him after the completion of his course or parts of it. The third difficulty is that involved in the ultimate aim of the courses, namely, will they lead to a foremanship or simply to the standing of master workman? Doubtless it would be easier to get and retain applicants if the higher position was promised to them, but this would be a ruinous policy since no one could tell in advance whether the boy would develop into a man with the necessary executive ability. The fourth difficulty is the unfriendly attitude of American boys, especially in cities, toward any career which calls for much manual labor. For this the boys are far less to blame than their parents. It is not unusual for fond but foolish fathers who are earning good wages as mechanics to insist that their children study for professional callings for which they have no aptitude. The inevitable consequence is that many ill-trained youngsters drift into uncertain clerkships at salaries which are generally below the earnings of the mechanic, who becomes self-supporting at a much younger age.

The foregoing comments are not intended to discourage the efforts to create a shop apprentice system, but rather to point out some of the ramifications of this

problem. The present big percentage of riff-raff shop labor can be eliminated only by training men for the special needs of the electric railway business. If this object is to be accomplished, the work must be taken in hand seriously, preferably by several companies at once, and under conditions which will attract the service of boys who are ambitious to learn a trade with ever-widening opportunities.

STUDIES IN HIGH-VOLTAGE TRANSMISSION

The convention of the American Institute of Electrical Engineers just held furnished important material for the electric railway engineer. More and more he has to deal with long-distance transmissions of power at steadily increasing pressures, and he is vitally interested in the precautions which must be taken to secure that continuous operation without which electric railroading is a cripple. It is not altogether easy to say what the actual condition of electrical power transmission at the present time really is with respect to continuous operation. Some plants within our knowledge have been kept in absolutely continuous operation for a year at a time and for twenty-four hours per day, though at a cost which one hardly dares to estimate. Other plants have broken down so often as to cause bitter complaints among the users of transmitted energy. On some systems there have been three or four breakdowns a week. Of these, it is true, most were not of long duration, and many, perhaps, were only of a few minutes' interval, but others put the system out of business for one or several hours. Even a few minutes' interruption in railway business is serious; an hour or two is a disaster to the public service. Nothing but correct design and scrupulously careful construction can secure in a high-voltage transmission anything like complete continuity of service.

Three of the papers in particular presented at the Chicago convention deal with subjects which are vital to the matter in hand. One of these is Professor Whitehead's beautiful study of the electric strength of air, which will repay careful reading. As most engineers know, the limiting factor in the increase of transmission voltage is not the dielectric strength of insulators so much as it is the failure of the air itself. The point at which this failure of the air occurs depends upon numerous factors but chiefly upon the maximum electric stress encountered and on the size and spacing of the wires. One of the things which Professor Whitehead's paper brings out with particular clearness is the fact that the critical voltage above which coronal discharge freely takes place may exist and be observed in existence only at the very peak of the wave, so instantaneous is the phenomenon, yet it responds in the fullest manner to the momentary peaks of voltage which may appear in generally smooth wave forms or may be superimposed upon them by even minor surges. Where the ultimate top of the electromotive force wave is, there one finds the real danger point as respects this coronal effect. When the coronal discharge begins there is a breakdown in the dielectric strength of the air and trouble is imminent. Another point carefully investigated was the effect of using stranded cable on the critical voltage at which the coronal discharge begins. Theory would indicate that a stranded cable presenting small surfaces of very rapid curvature would break down and show coronal discharge more easily than a smooth round wire of equivalent capacity. Such proves to be the experimental fact, although the effect varies considerably in magnitude according to the character of the cable and the absolute dimensions of its elements. Roughly one may generalize the data by saying that cables of moderate size show coronal discharge at a voltage in which it would appear on a solid conductor of about three-quarters the cable diameter. A curious point brought out in the research was that the critical voltage at which the air begins to break down falls only comparatively slightly with increasing frequency, the difference between 25 and 60 cycles being only 2 per cent.

Another paper of interest to the constructor is that of Mr. Robinson, on the computation of spans with relation to stress and sag, a thoroughly worked-out study with many important diagrams for the practical constructor's information. From a theoretical standpoint a very interesting portion of the work is the study of the actual curve of a suspended conductor. This is ordinarily treated as a parabola, although technically it is a catenary if the span is long and the conductor reasonably flexible. The ellipse and the circle have also been used as tentative curves for computation. Mr. Robinson shows that from a practical standpoint all of these curves, except the circle, represent the facts with substantial accuracy on a span of moderate length, say 80 ft. It would be interesting to know at what point of length the curves begin to diverge, although we are inclined to the opinion that for all practical cases the parabola, which has the advantage of a simple equation, meets the requirements sufficiently well.

In another paper Mr. Thomas goes over the sag calculations by a different method, involving the application of the catenary, and his work also indicates pretty close similarity between the results obtained from this curve and from the parabola.

Finally, a long and important paper by Mr. Austin on the suspension insulator comes to the front, too long even for adequate abstract, but it should be carefully studied by those planning high-tension lines. One of the most important points brought out in it, however, is the great effect of the testing time upon the endurance of insulators at high pressures. There is a species of surging effect due to prolonged stress which may not appear at all under ordinary conditions of testing, but must be taken into account if a high factor of reliability is expected upon the resulting line. Mr. Austin's conclusions are strongly in favor of the suspension type of insulator, which now seems to have passed completely out of the experimental stage and to have reached a point at which it is to be considered a practical necessity in dealing with extreme voltages. The critical condition of all high-voltage insulator practice is that encountered in stormy weather, when the surface gets thoroughly wet, and this in particular is best met by the suspension type of insulator. In one of Mr. Austin's tables tests are reported in which the insulators held up to more than one-quarter of a million volts wet before flashing over and had double this insulating capacity when dry. These figures seem preternaturally high, but 2.5 is certainly not too large a factor of safety to allow on a line important enough to be worked on 100,000 volts.

CENTER-ENTRANCE CARS

The design of cars for city service is not alone a matter of structural details and general dimensions. Great progress has been made along these lines in recent years, particularly as regards reduction of weight, but the operating features of modern cars have been subject to far more radical changes, and the end is not yet in sight. Nearly every progressive street railway manager is studying the problem, and new ideas are being brought out almost daily. The most recent innovation, and one of the most radical, in operating features is the "near-side" car, which was illustrated and described in this paper last week. The center-entrance car is another departure from ordinary practice, which, while it is not new, seems to be gaining steadily in favor, as its many advantages are being recognized more generally.

Perhaps the most extended use of the center-entrance is being made in Denver, where it has long been the standard. Many railway men who attended the Denver convention saw cars of this type in operation for the first time, and their comments were almost universally favorable. At that time Seattle was the only other large city in which center-entrance cars were in use, but during the past two years a number of center-entrance cars have been built and placed in operation by several different companies. Among them may be mentioned the Oklahoma Railway, Pittsburgh Railways, West Penn Railways, Port Arthur Traction Company and Shore Line Electric Railway, not to mention a few other instances in surface traction and the center-entrance subway and elevated cars in Boston, New York and Philadelphia.

From an operating standpoint the center-entrance car has several marked advantages. The car is divided by the steps into two halves, and in loading and unloading the congestion at the entrance and exit is greatly reduced by reason of the fact that passengers have only half as far to move as in the ordinary end-entrance car. The prepayment principle and, if desired, gates or doors over the steps can be applied to center-entrance cars quite as easily as to end-entrance cars. While the conductor stands all the time at the entrance and exit, he is inside the car, where he is protected from the weather and has a clear view in both directions, so that he can see the signal of any passenger who wishes to alight. By the use of doors to close the step opening a center-entrance car can be kept much warmer in cold weather than is possible with a car having end doors, which frequently are opened while the car is in motion.

The seating capacity of a center-entrance car is proportionately larger than that of an end-entrance car of the same over-all length, by reason of the elimination of the end platforms. For cars which are operated always in one direction the entrance and exit passageways are required on one side only, and the entire length of the car body with the exception of a step opening on one side, not exceeding 6 ft. wide, can be utilized for seats. For double-end operation, of course, an entrance and exit must be provided on the opposite side of the car, but by using trap-doors to cover the step opening and folding seats such as are used in the New York subway cars this space can also be utilized for seats, as in cars operated in one direction only.

The center-entrance car has another advantage in preventing accidents which is attained also in the "near-side" car, described last week. The passenger who alights must wait for the car to proceed half its length before crossing in the rear and running the risk of being struck by a car or vehicle passing on the opposite track. In the matter of speed of operation it has been found by experience in the New York subway that, no matter how wide the end doors are made, passengers will leave the car in a single line and will board the car in the same way. A center-entrance car with a railing dividing the steps in the center affords two separate passages for entrance or for exit. In leaving the car the passengers move toward the center in two converging streams and in boarding they move up the steps and toward opposite ends of the car in two separate lines. Except at transfer points, where the operation of collecting ticket fares is always done more quickly than cash fares can be handled, the usual conditions in street railway operation are that most of the passengers board the car at points where few passengers alight, and vice versa. The advantage of having widely separated exits and entrances, therefore, is more apparent than real.

One possible disadvantage of the center-entrance car is the fact that if the stops are made at street intersections so that the step is opposite the crosswalk, either the front end or the rear end of the car projects beyond the curb line of the intersecting street, depending upon whether the stop is made at the near side or the far side. Where the streets are paved this objection is not a serious one, and as a rule the unpaved streets in most American cities are in the outskirts, where traffic on the intersecting street would not be obstructed.

Structurally the center-entrance car is more difficult to build and maintain without sagging at the center than the end-entrance car. With most steel cars the lower half of the side is designed as a plate girder and is depended upon to carry a large part of the load between the bolsters. Even in wooden car construction the side sill and the posts and braces below the belt rail form a structure which has considerable stiffness and will carry a good part of the load. If the entire side of the car from the sill to the plate is cut away at the center to form entrance and exit passages the strength of the side framing is largely destroyed. By lowering the top of the step opening somewhat below the level of the side plate it is possible to reinforce the side framing around the step opening in such a way that its strength is only slightly diminished. Still another method of getting around the difficulty is to use deep center sills to carry the entire load and make the sides of the car just as light as possible. The entire floor load and the weight of the body framing may then be transmitted to the center sills through transoms and cross bearers in much the same way as is done in the Long Island Railroad steel cars, which were described in the ELECTRIC RAILWAY JOURNAL of June 17. On the other hand, if the side sill should be left intact, one or two steps like those supplied by the running boards of open cars could be used, or folding steps might be employed.

Electrification of the Hoosac Tunnel

The Hoosac Tunnel of the Boston & Maine Railroad Is the Longest Railroad Tunnel in the United States. All Trains Are Now Being Hauled Through It by Electric Locomotives Receiving Single-Phase Alternating Current at 11,000 Volts from Overhead Trolley Wires. The Catenary Construction, Repair Shops and Operating Features Are Described in This Article.

On May 27 the Boston & Maine Railroad began operating all freight and passenger trains through the Hoosac tunnel with electric locomotives. In a little more than eight months from the time the electrification work was authorized by the directors both tracks in the tunnel and the yards and approaches on each side, a total of 21.31 miles of single track, were equipped with overhead trolley wires, a power house of 6000-kw capacity was designed and constructed, a high-tension transmission line 2.42 miles long was erected and five electric locomotives were built. At no time during the construction work was the operation of trains through the tunnel by steam locomotives interfered with, although the installation of the wires and supports in the tunnel was carried on under the most trying and dangerous conditions.

Hoosac Tunnel—Cross-Catenary Construction in North Adams Yard

The Hoosac tunnel is the longest railroad tunnel in the United States. It pierces the range of high hills between the valleys of the Hoosac and Deerfield Rivers, and is 25,031 ft. long from portal to portal. It was begun in 1851 by the Troy & Greenfield Railroad and it took twenty-four years to complete the work. The first train went through the tunnel on Feb. 9, 1875. As it forms part of the main line of the Fitchburg Division of the Boston & Maine Railroad connecting Boston with Albany and Troy, N. Y., the traffic passing through it is very heavy, averaging 95 to 100 trains per day in both directions. With steam locomotives hauling trains the twelve minutes required to pass through the tunnel cause great discomfort to passengers, and the longer time required for freight trains results in frequent blockades at the portals and long delays. When the Boston & Maine passed into the control of the New York, New Haven & Hartford Railroad in the summer of 1910, one of the first official acts of President Mellen of the New Haven was to order the immediate electrification of the Hoosac tunnel and the approaches at each end, including the North Adams yard.

The single-phase alternating-current system with overhead catenary construction and 25-cycle, 11,000-volt current was adopted in view of the marked success of this system on the main line of the New York, New Haven & Hartford Railroad between Woodlawn, N. Y., and Stamford, Conn.

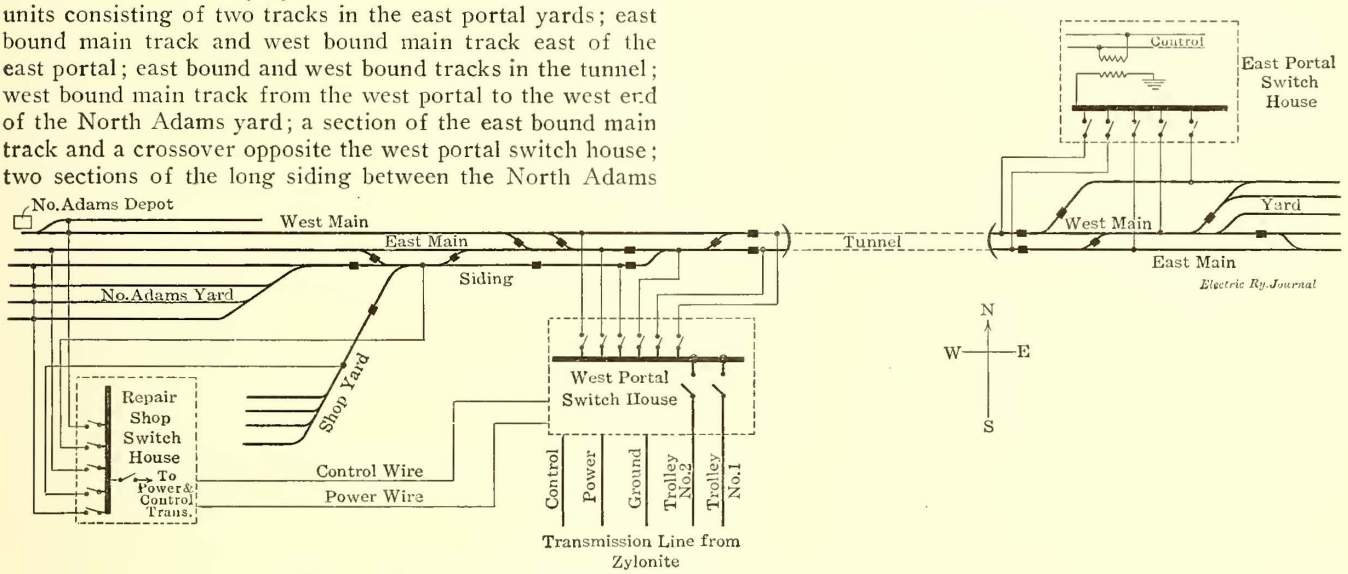
The electrification project was assigned to the engineering department of the New York, New Haven & Hartford Railroad, of which E. H. McHenry is vice-president and W. S. Murray electrical engineer; all plans involving policy of electrical operation and details of construction being there developed. The firm of L. B. Stillwell was retained as engineers locally in charge of the work, H. S. Putnam being placed in immediate charge of making many of the detail working plans, placing contracts and supervising the construction. A contract covering the installation of the overhead trolley and transmission line and the erection of the power house building, repair shop and switch house buildings was made with F. T. Ley & Company, Inc., Springfield, Mass., as general contractor, and actual construction was begun on Nov. 1, 1910.

GENERAL PLAN OF ELECTRIFICATION

The electrified zone, which is 7.92 miles long, begins at the west end of the North Adams yard, 2.09 miles from the west portal of the tunnel. Just east of the North Adams depot is a yard with five side tracks in addition to the two main tracks, all of which have a trolley wire above them. Between the east end of this yard and the west portal are three tracks. Through the tunnel are two tracks and just outside of the east portal is a yard about ¾ mile long consisting of from three to five tracks. Single catenary construction is used throughout. Where more than three tracks are covered the wires are supported by cross-catenary cables attached to steel A-frame towers. For the two and three-track sections outside of the tunnel trussed steel bridges are used to support the wires. In the tunnel the messenger cables are suspended on insulators supported on special hanger brackets carried by bolts in the rock roof.

Current is generated at 11,000 volts, single-phase, at the Zylonite power station and is transmitted at that potential to a switch house at the west portal of the tunnel, a distance of 2.42 miles, over a double-circuit transmission line, consisting of five wires carried on steel towers. Two wires carry the trolley current, one is a ground wire, one carries current for power and lighting, and the remaining wire supplies energy for the operation if the remote-control high-tension switches in the switch houses.

The overhead trolley system is sectionalized into twelve units consisting of two tracks in the east portal yards; east bound main track and west bound main track east of the east portal; east bound and west bound tracks in the tunnel; west bound main track from the west portal to the west end of the North Adams yard; a section of the east bound main track and a crossover opposite the west portal switch house; two sections of the long siding between the North Adams yard and the west portal switch house; the shop yard; four tracks in the North Adams yard, and the east bound main track from the west end of the North Adams yard to the west portal switch house.



Hoosac Tunnel—Diagram of Trolley Feeders and Sectionalization

The trolley bus in the west portal switch house feeds the two tunnel sections, the east bound and west bound main tracks west of the portal, the easterly section of the long siding and the short section of the east bound main track and the crossover opposite the switch house. At the east portal of the tunnel both trolleys in the tunnel are connected to a trolley bus in the east portal switch house, from which three sections beyond the tunnel are fed. In the repair shop switchhouse the east bound and west bound main track sections, which are fed from the west portal switch house, are connected to a trolley bus from which are fed in turn the North Adams yard, the shop yard and the westerly section of the long siding track. It will be seen therefore that the switch houses at the east and west ends of the system are not connected to the main transmission line but are fed through the trolley wires of one or both main tracks. As long as current is on either one of the main track trolley wires the remainder of the system can be operated.

A control wire and power wire connect the west portal switch house and the repair shop switch house, but no separate high-tension wires are run through the tunnel, and the control circuits, lights and motors in the east portal switch house are fed through a transformer connected directly to the trolley bus.

CATENARY CONSTRUCTION

The supporting bridges and cross-catenaries in the yards are spaced 150 ft. apart on tangents and curves of moderate radius. The messenger cable over each track is stranded steel ⅝ in. in diameter. Below it is a No. 0000 grooved copper conductor wire suspended by rigid hangers of varying lengths at intervals of 10 ft. The contact wire, which is No. 0000 grooved Phono-electric, is carried 1¾ in. below the copper conductor wire by double clips attached in the center of the 10-ft. spans between hangers. On curves the conductor and contact wires are both suspended from the messenger by inclined hangers having double clamps which hold the two wires in a vertical plane. This construction was illustrated in the ELECTRIC RAILWAY JOURNAL of April 16, 1910. These hangers offset the contact wire toward the inside of the curve a sufficient distance to compensate for the deflection of the pantograph shoe due to the super-elevation of the outer rail. Outside of the tunnel the normal height of the contact wire above the rails is 22 ft.

In the tunnel the catenary span is reduced to 100 ft. and two No. 0000 Phono-electric contact wires are carried in the same horizontal plane by twin hangers. In order to provide maximum conductivity a ⅝-in. stranded copper cable is used for the messenger. Owing to the limited clearances under the roof of the tunnel the two Phono-electric contact wires over each track, which are mounted in the same horizontal plane 5 in. apart, are lowered to 15 ft. 6 in. above the rails and the messenger cables are suspended 14 in. inside the center line of each track. This gives a minimum clearance of 12 in. between the messenger and the roof of the tunnel. The brackets which support the messenger insulators are in turn carried on secondary insulators resting on hangers dropped from the roof. The position of the hangers is adjustable vertically by varying the length of the hanger bolts, and the primary insulators can be adjusted horizontally on the lateral brackets to provide for slight changes in alignment.

The twin contact wire hangers used in the tunnel are of special design to allow some vertical movement of the trolley wires. They consist of a yoke carrying the two trolley wire clips and a suspension rod ½ in. in diameter on the top of which is screwed the messenger cable clamp. The suspension rod passes through a tapered hole in the center of the yoke, and a spherical faced nut is screwed on

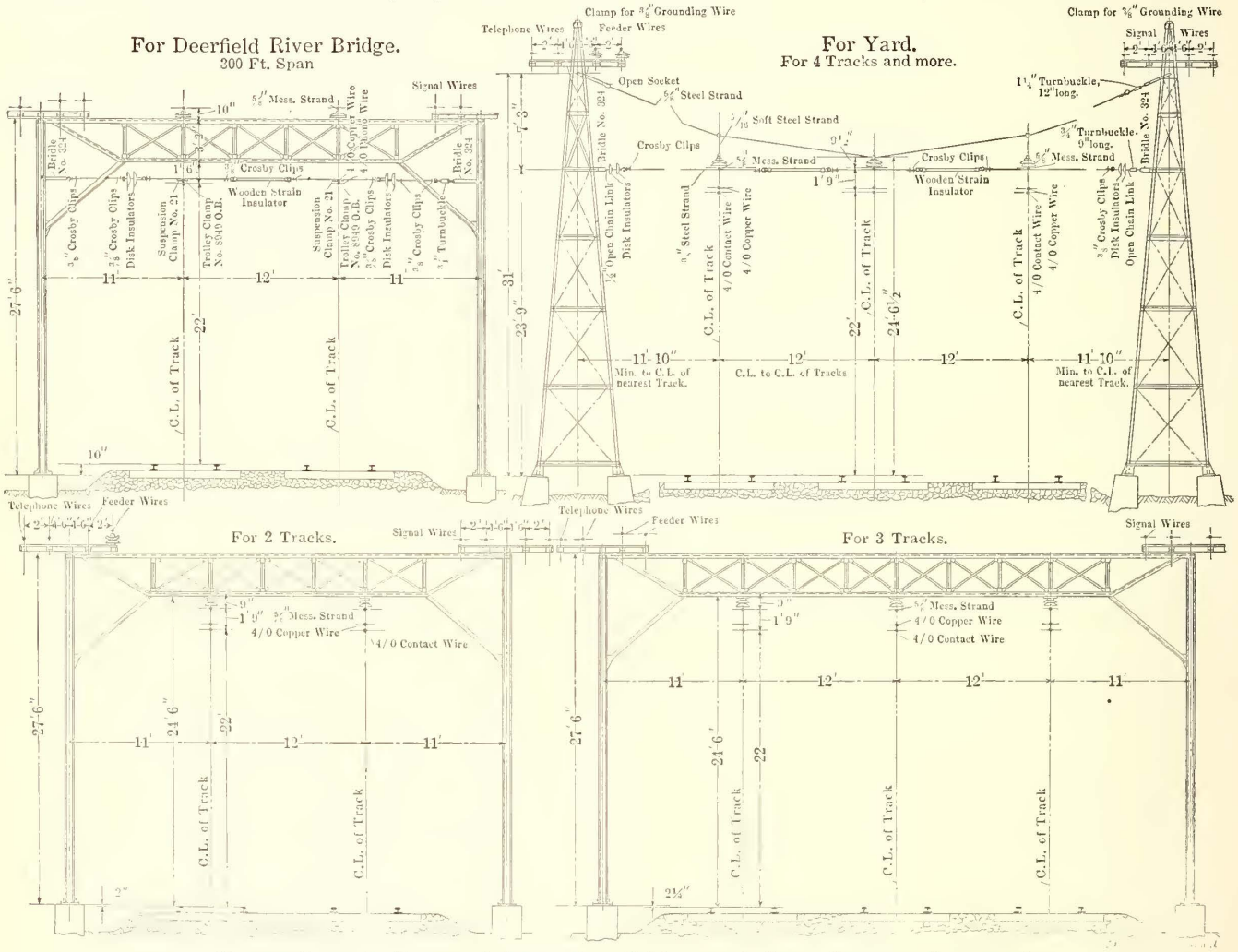
the bottom of the rod. The yoke is slotted and the nut on the end of the suspension rod is free to move in this slot through a vertical distance of about 1½ in. All parts of the tunnel hangers are made of bronze.

INSULATORS

In the tunnel the primary and secondary insulators are of brown porcelain of the triple petticoat pin type. Each insulator is capable of resisting 150,000 volts to ground, and as the primary and secondary insulators are in series the combined dielectric strength is 300,000 volts. The outside insulators are of the suspended type. They consist of an upper petticoat with the concave side turned up in the shape of the brim of a hat and a lower semi-spherical petticoat 15 in. in diameter with the concave side down. A hollow malleable iron pin is cemented into the lower petticoat and the malleable iron cap by which the insulator is suspended is cemented on the outside of the upper petticoat. These insulators were all required to stand a dry test of 110,000 volts, or ten times the normal working voltage. The strain insulators used for dead-ending the messenger cables and contact wires are of porcelain of the spool type and each one was tested to 110,000 volts under 35,000 lb. mechanical strain before erection. They have an ultimate tensile strength of 50,000 lb. For cross-catenary steady strain wire attachments two disk insulators in tandem were used at each anchorage. Impregnated hickory wooden strain insulators are inserted in the steady strain cables between each pair of tracks where required to preserve the sectionalization of the trolley wires.

BRIDGES AND CROSS-CATENARY CONSTRUCTION

The supporting bridges for the two and three-track sections outside of the tunnel are built-up trusses formed of 7-in. and 8-in. channel top and bottom chords with light angle posts and double diagonal rod braces in each panel. The two-track bridges have a span of 34 ft. and the three-track bridges a span of 46 ft. They are supported at each end by A-frame towers constructed of two 8-in. channels braced with light angles. The plane of these towers is parallel to the center line of the tracks. The channels have bed plates riveted on the bottom for bolting them down on the concrete foundation piers. An angle cross arm for supporting the feeder, telephone and signal power wires is attached at each end to the top channel of the bridge truss. In the yards where more than three tracks are equipped with overhead wires the cross-catenary span wires are suspended from A-frame steel towers built of 8-in. channels. The legs of these towers, however, lie in a plane at right angles to the track. The cross-catenary cable, which is stranded steel, 5/8 in. in diameter, is attached either at the apex of the towers or just below the single steel cross arm. From it are suspended the messenger cable insulators by 5/16 in. stranded steel wires of suitable length. The steady strain cable is stranded steel ⅜ in. in diameter and is attached to the tower on each side by a bridle and two disk strain insulators in tandem. Each tower is grounded with a ⅜-in. cable running up to the apex, where it is securely clamped. The anchor bridges are box trusses supported on heavy A-frame towers with latticed legs stiffened with double diagonal braces.



Hoosac Tunnel—Types of Supporting Bridges and Cross-Catenary Construction

TUNNEL VENTILATION

The erection of the hanger brackets and stringing of wires in the tunnel was carried on under the most difficult working conditions. Only one track at a time was given up to the contractors and trains were operated constantly on the other track at intervals as frequent as safety permitted. At all times when work was being done in the tunnel

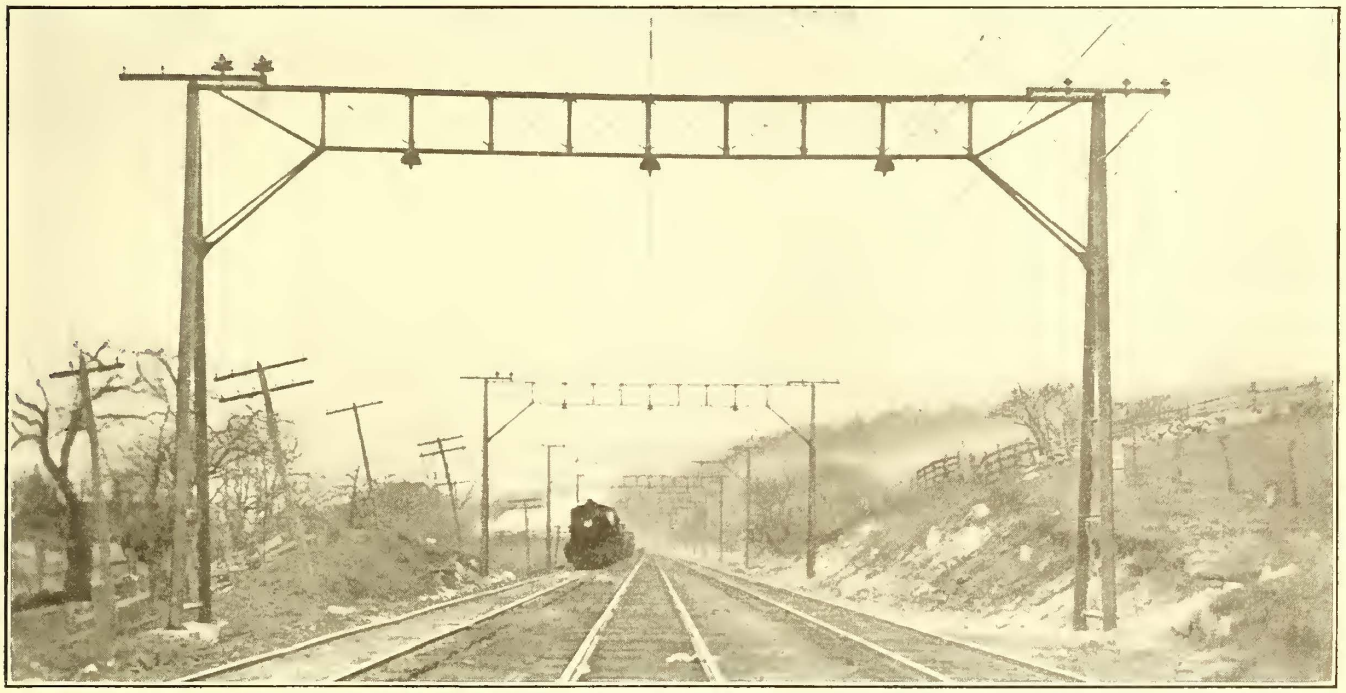
the air was very bad because of the smoke and gases from oil and coal-burning locomotives passing through on the single track in use. After the passage of a train, all work had to be suspended for ten to twenty minutes, sometimes longer, to allow the worst of the smoke to clear out. It was found necessary to construct air compartments on the train supplied with cleaned air from the compressor car to serve as refuges for the men during such periods. Owing to atmospheric and traffic conditions, the construction force was able to utilize less than one-half the time in actual work. These factors more than doubled the time that would otherwise have been necessary for the construction work in the tunnel. The tunnel is ventilated from a central shaft 1100 ft. deep, at the top of which is a large suction fan which draws fresh air into the tunnel from both portals and exhausts the smoke and gases up through the shaft. With a strong wind from the east or west the far end of the tunnel is sometimes very poorly ventilated.

CONSTRUCTION TRAINS

The railroad furnished and equipped for the contractor two special tunnel work trains, each consisting of an oil-burning locomotive, two locomotive tenders, a box car containing an engine-driven generator, a box car containing three blacksmiths' forges and anvils, an air compressor car, thirteen platform cars, a coach fitted up as a dining car and a freight caboose. The platform cars were ordinary flat cars on which were built working platforms 11 ft. above the rail with low sides to prevent the workmen from falling off. Posts 6 in. x 4 in. were set in each stake pocket and cross beams of the same size were framed across to support the 2-in. plank floor. The car floors and the working platforms were made continuous throughout the train by steel aprons at the ends. Trap doors were built in each working platform so that the men could reach the car floor by ladders. A 1½-in. air pipe for the compressed air supply was run along each side of the working platforms and globe valves were inserted at frequent intervals for attaching the drills. On the floor of every third platform car a wooden air lock 14 ft. x 5 ft. x 4 ft. was built, into which the men could retreat during and after the passage of a train. An air valve was provided inside these locks which when partially opened created sufficient pressure to keep out the surrounding smoke and gases and provided fresh air for the men in the lock.

The equipment on each train for drilling the roof holes for the hanger bolts consisted of seven H.C.-12 Ingersoll-Rand hammer drills and several pneumatic hammers which were used for drilling holes in the side walls for the attachment of signal cable brackets. In the compressor car, which was placed next to the locomotive, was mounted a steam-driven class A-1 compressor with a capacity of 285 cu. ft. of free air per minute. It received steam from the locomotive at 90 lb. pressure and delivered the air at 90 lb. pressure into a receiving tank of 77 cu. ft. capacity. A small steam pump was used for pumping cooling water from the tenders through the compressor jacket and back to the tenders. The compressor intake was carried down close to the rails, where the air was purest, and was covered with a fine-mesh wire screen to keep out as much dust and dirt as possible.

The generator was a 28-kw direct-current machine, and was driven by a marine engine supplied with steam from the locomotive. In spite of the moisture and dirt in the tunnel at all times neither of the generators on the two trains failed in any way during the time they were in use. The trains were wired throughout and six sockets for attaching five-light reflector clusters were placed along the railings of the working platform on each car. Strings of incandescent lights were also run along the sides of the cars for general illumination of the tunnel walls. Each train was also equipped with a system of signal lights in the caboose, locomotive cab and compressor car by means of which the conductor could signal the engineman to move the train forward or back and signal the compressor attendant to start or stop the compressor.

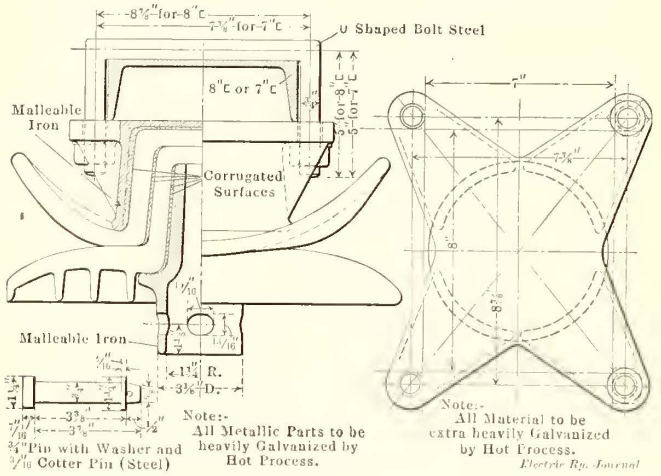


Hoosac Tunnel—Three-Track Bridge Supports on Tangent

The coach, which was fitted up as a dining car, was used to supply the men with hot coffee and sandwiches and to heat any other food the men brought with them. In order to stand the effects of the smoke and gases it was found necessary to keep the men well supplied with food, and they were alowed to go back to the dining car at frequent intervals to get food or coffee. The dining car was fitted with an air valve the same as the locks on the platform cars so that the air was kept fresh at all times. A complete outfit of surgical and first-aid-to-the-injured supplies was kept in the dining car, as also were an oxygen tank and air helmet for rescuing any one overcome by gas out in the tunnel. These helmets were never needed, however,

although a number of men were overcome during the construction work.

About forty men were employed on each train. These included a foreman in charge, four sub-foremen, one steam engineer, one electrician, one carpenter, one cook, one blacksmith and helper, and thirty laborers, in addition to the locomotive engineer and fireman, brakeman and con-



Hoosac Tunnel—Suspension Insulator for Outside Catenary

ductor. In spite of the trying conditions under which the men worked not a single man employed on the tunnel trains quit work while the construction was in progress. The construction forces of the contractor were directed by M. J. Daly, general foreman in charge of the work.

CONSTRUCTION WORK IN THE TUNNEL

The construction work in the tunnel included the drilling of 1000 holes 2½ in. in diameter and 18 in. deep in the roof of the tunnel for the catenary hangers; 1500 holes 1¾ in. in diameter and 6 in. deep in the side walls for telephone and signal cable hangers; drilling and blasting down the rock roof of the tunnel in many places to obtain the necessary clearances and erecting the catenary and trolley wires. A preliminary survey of the tunnel was made to determine the height of the roof at the hanger locations so as to prepare in advance the hanger rods of proper length. This survey also showed that the roof would have to be blasted down in many places to obtain the necessary clearance.

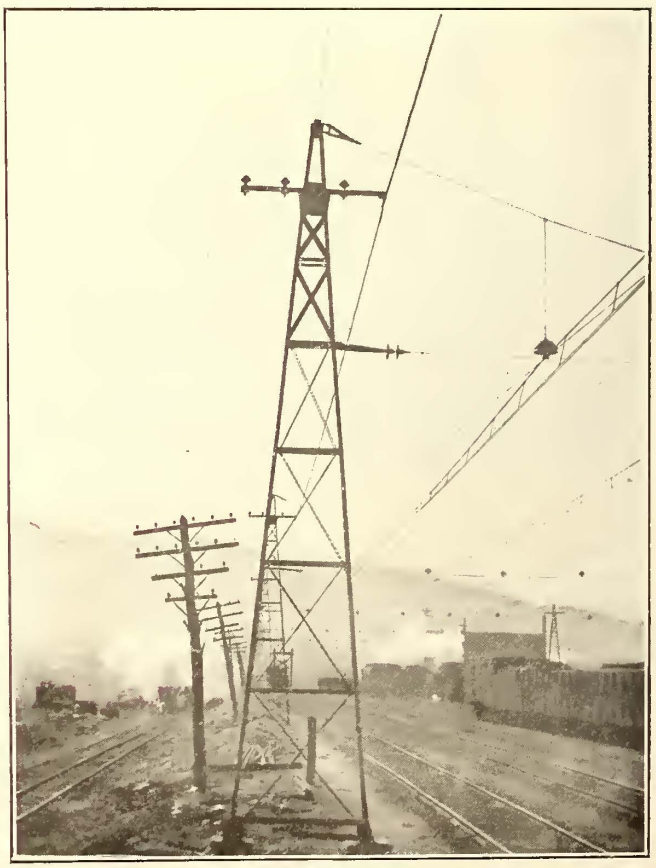
The first work train was run into the tunnel on Nov. 6,

Hoosac Tunnel—Erecting Tunnel Catenary Brackets

1910, and the second was equipped and put in use on Nov. 29. Both trains were stored in the North Adams yard when not in the tunnel. The work of drilling the roof and side wall holes was carried on from both ends of the tunnel, with the two trains progressing toward the central shaft. It was necessary to keep the two trains on opposite sides of the central ventilating shaft with the locomotives always coupled to the ends of the trains nearest the shaft so that the men on the platform cars would not be bothered by the gas of either locomotive. One track was given over to the work trains for periods of from nine to twelve hours, beginning at 5:30 a. m.

The drilling of holes for the roof bolts was carried on simultaneously at five locations 100 ft. apart above each train. The train was spotted by manipulating the conductor's valve on the caboose and was moved only as required by the progress of the drilling. The time required to drill each hole varied from twenty minutes to four hours. Some of the rock was very hard and at one location 65 drills were required to drill three holes each 18 in. deep. A large stock of drills was carried on each train and one or two blacksmiths and helpers worked continuously in the forge car sharpening the drills as they were removed from the drilling machines. All holes required for blasting down the roof were drilled from the work trains, but the blasting and cleaning up was done by the force of miners regularly employed in the tunnel by the railroad company.

The drilling above the west-bound track was completed before the east-bound. As the roof holes were drilled the bolts were set as the work progressed. In the brick portion of the tunnel 1½-in. double extra-heavy wrought-pipe bolts were used and in the rock portion 1¼-in. solid wrought-iron bolts. In both cases the bolts were split at the upper end and were hammered home on a wedge. Prior to setting the bolt the hole was filled with a plastic mixture of neat cement, the surplus cement being forced out as the bolt was driven home. To fill the holes with cement a brass tube was first filled and inserted into the hole. As it was



Hoosac Tunnel—Tower for Cross-Catenary Span

withdrawn a rammer or plunger was used to ram the plastic mixture into the bottom of the hole to make sure that no air pockets were left. The cement rather than the wedge was relied upon to hold the bolt securely. Though these bolts were afterward subjected oftentimes to severe strains in the erection of the brackets and catenary material, not a single bolt showed any signs of weakness. The bolts

are threaded at the lower end to receive a bronze coupling, which in turn receives a bronze nipple of the proper length for the support of the special bracket to bring the trolley wires 15 ft. 6 in. above the rail. Each bronze coupling is provided with a flange on its lower side for the support of a cement cone, which protects the support from corrosion at the point of contact with the roof of the tunnel.

The U-shaped hangers which are parallel to the rails were then attached over each track and leveled up, after which the secondary insulators were applied and the cross hangers put up. The messenger cable and both trolley wires over each track were strung simultaneously. The messenger was pulled up to the proper sag and the trolley wires were adjusted as to tension with a dynamometer at every fifth hanger, where they were clamped preparatory to clipping.

OUTSIDE CONSTRUCTION

The steel towers and bridges outside of the tunnel were all erected with a derrick car furnished by the railroad. A train of platform cars was equipped at each end of the tunnel for stringing the wires. These cars had platforms 17 ft. high above the rails for convenience in working on the trolley wires, which are suspended 22 ft. above the rails in the open. The steel messenger cable and the trolley wires for the open sections were received from the manufacturer in lengths of about 1 mile and were run out simultaneously as in the tunnel. All of the steel catenary bridges, cross-catenary towers and transmission line towers were fabricated by the Archbold-Brady Company, Syracuse, N. Y.

OPERATION OF TRAINS DURING CONSTRUCTION

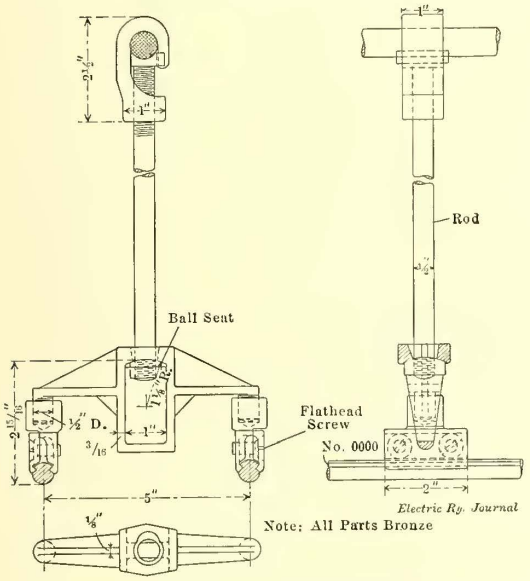
While the construction trains were at work on one track in the tunnel freight and passenger trains were operated in both directions over the other track with the use of a train staff, the 5-mile tunnel section constituting an absolute block. As soon as the work trains emerged from the tunnel after a day's shift normal operation was restored on both tracks. Right-of-way was given to passenger trains at all times and as a consequence freight trains often filled the yards at both ends. In order to pass the maximum number of cars through the tunnel while both tracks were open, from three to five freight trains frequently were coupled together with all the locomotives at the head end. During the time construction work was in progress the traffic was the heaviest ever handled on the Fitchburg division. In January 52,000 cars passed through the tunnel in both directions.

TROLLEY CROSSING IN NORTH ADAMS

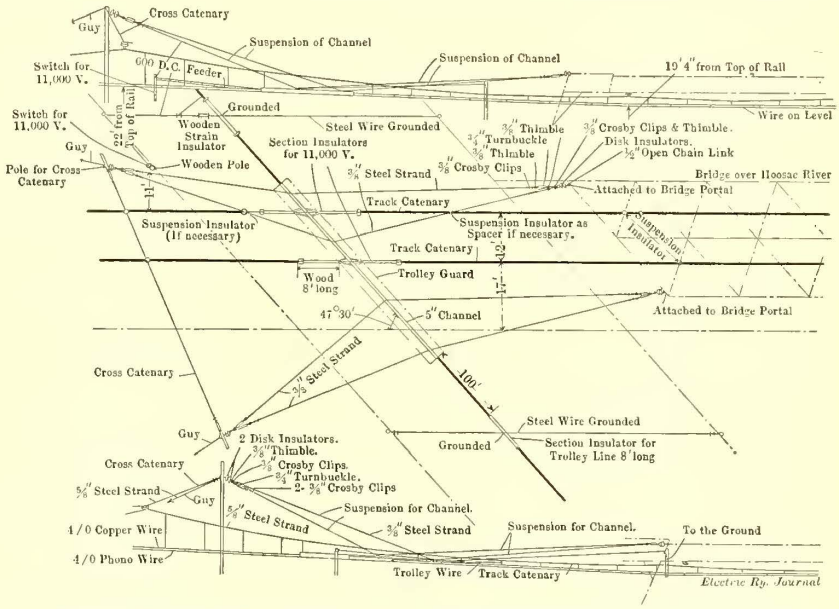
An interesting detail of the overhead construction is a crossing of the two 11,000-volt a.c. trolley wires with a single 600-volt d.c. trolley wire of the Berkshire Street Railway on State Street, North Adams, just west of the passenger station. The crossing is at an angle of 47 deg. 30 min., and the high and low-tension wires are in the same horizontal plane. The 600-volt trolley is sectionalized with wooden section insulators 8 ft. long at a distance of 100 ft. on each side of the crossing, and is carried over the crossing under an inverted 5-in. channel which is supported by four ⅜-in. stranded steel cable span wires. The 11,000-volt trolley wires are sectionalized with similar section insulators inserted on each side of the channel, so that the d.c. trolley wire normally carries no current of any kind. On the north side of the crossing a feeder is taken off the 600-volt trolley wire and carried to a switch mounted on top of a wooden pole set just outside the curb line. The other side of this switch is connected to one of the steel span wires supporting the crossing channel. A wooden rod runs down the pole from the switch and by pushing up on this rod the switch may be closed and 600-volt direct current fed to the crossing channel and trolley wire so as to permit a street car to pass over the crossing with current on. As soon as the switch rod is released it drops by gravity and opens the switch again. The section insulators in the 600-volt trolley are grounded at the center of their length so that the 11,000-volt current cannot leak past them to the d.c. trolley in case of breakdown of any of the 11,000-volt section insulators. The only combination by which 11,000-volt current can be fed to the d.c. trolley is that the pole switch be closed while a locomotive is on the crossing with one pantograph on the trolley wire and the other on the crossing channel.

ELECTRIC LOCOMOTIVES

Five electric locomotives have been built for hauling freight and passenger trains. Two of these locomotives have a high-gear ratio and are intended for hauling passenger trains through the tunnel. Otherwise they are of the same size, weight and design as the three locomotives which will haul freight trains. The locomotives are of the articulated truck type, each truck consisting of two pairs of driving wheels 63 in. in diameter and a pair of radial pony wheels. The general design is the same as locomotive No. 071, of the New York, New Haven & Hartford Railroad, which was described in the ELECTRIC RAILWAY JOUR-



Hoosac Tunnel—Twin Hanger for Tunnel Trolley Wires



Hoosac Tunnel—Crossing of 11,000-Volt and 600-Volt Trolley Wires in North Adams

nal for Sept. 25, 1909, and May 7, 1910. To each pair of driving wheels is geared a single-phase motor of 396 hp, normal hourly rating. The motors are spring-supported on the truck frames. The freight locomotives will each haul a trailing load of 1600 tons up the 0.5 per cent grade in the tunnel at a speed of 20 m.p.h.

It is expected that the five locomotives will be able to handle all trains through the tunnel for some time to come. By coupling and uncoupling the electric locomotives at the tunnel portals and not running them through the yards at each end, considerable time can be saved in the event of very heavy traffic movement or temporary breakdown of one of the locomotives. The intention, however, is to haul all trains from end to end of the electric zone by electric locomotives so as to give the crews of the steam locomotives ample time to get their fires in the proper condition to give off the minimum smoke and steam while drifting through the tunnel. The steam locomotives of all trains will be hauled through the tunnel.

TRAINING OF CREWS

Twenty electric locomotive crews were selected from among the oldest locomotive engineers and firemen on the division, who were given an opportunity to apply for the positions. These crews were sent to Stamford, Conn., for a period of three weeks or longer to study the operation of the New Haven electric locomotives. Their salaries and expenses were paid by the railroad during this instruction period. The men were instructed in the practical details of operation and emergency repairs under the direction of H. Gilliam, electrical superintendent at Stamford, and were given a thorough examination before returning to North Adams. Practice runs were made by all the men in the North Adams yard for several weeks prior to beginning regular operation.

LOCOMOTIVE REPAIR SHOPS

A brick building, 109 ft. 4 in. x 78 ft. 4 in., has been built at the east end of the North Adams yard for use as a locomotive house and repair shop. Four tracks enter the building at the east end; a fifth track for storing wheels is built between two of the entrance tracks in the south bay, which is spanned by a 15-ton electric traveling crane. The two tracks in the north bay have pits 50 ft. long and extend beyond the ends of the pits 29 ft. In the south bay the two entrance tracks have pits 36 ft. long, which are connected at the west end by a cross pit 6 ft. wide, used for wheel changing. In a one-story brick lean-to, 10 ft. 4 in. x 87 ft. 5 in., on the south side of the building are a washroom, office for the electrical superintendent, tool room, store room and heater room. A switch house, 24 ft. x 24 ft., adjoins the locomotive house on the northwest corner. The tool equipment includes a shaper, drill press, 42-in. lathe, 14-in. lathe, and two grinders. These tools are all belt driven from shafting mounted on the west wall above the windows, which in turn is driven by a 15-hp motor mounted on a wall shelf. A motor-driven air compressor supplies compressed air, which is piped into each pit for blowing out motors and other apparatus on the locomotives.

In the cross pit in the south bay are three hydraulic jacks, one under each track. These jacks have been installed for wheel changing and other heavy repairs requiring the lifting of the locomotive trucks. The floor of the cross pit is 5 ft. 4 in. below the shop floor, and the jack cylinders, which are 16 in. in diameter inside and 9 ft. long, are sunk flush with the floor of the pit. The jack plungers are 6½ in. in diameter and are roughened on top. With 220 lb. water pressure supplied by a motor-driven pump, a load of 22 tons can be lifted by each jack. Two 90-lb. rails are laid in the floor of the cross pit to a gage of 3 ft. 4 in., so that wheels can be moved to one side on two small trucks.

Hoosac Tunnel—Anchor Bridge at East End of North Adams Yard

OPERATING ORGANIZATION

The operation and maintenance of the overhead and transmission lines and electric locomotives is in charge of L. C. Winship, electrical superintendent. The power house is in charge of C. H. Baker, chief engineer. In all matters relating to locomotive repairs the electrical superintendent reports to the division master mechanic and in the maintenance of the overhead lines to the engineer of maintenance of way. J. D. Tyter, assistant superintendent in charge of the western district of the Fitchburg division, has authority over the electric locomotive crews and all other matters pertaining to operation of trains through the tunnel.

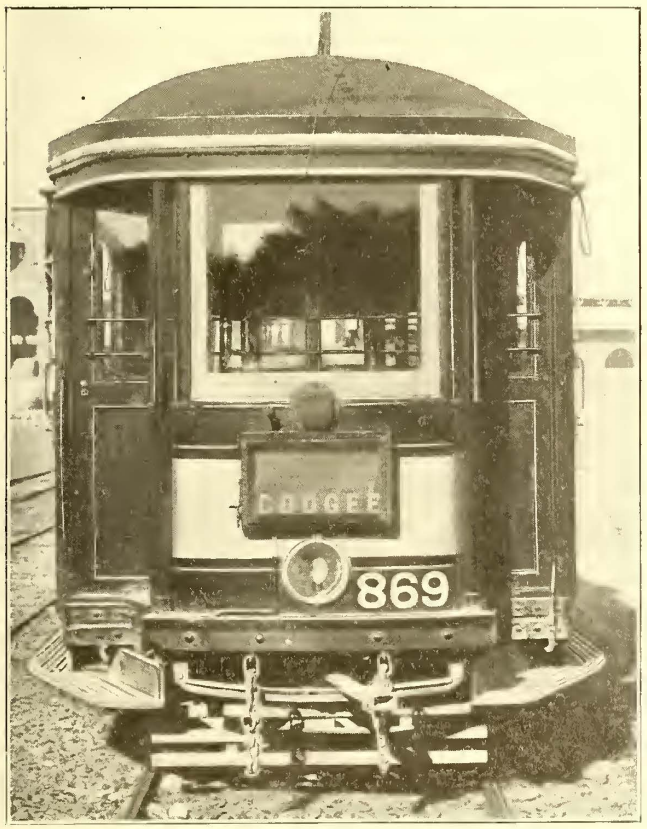
POWER HOUSE AND TRANSMISSION LINE

The new power house at Zylonite, 2½ miles south of North Adams, and the transmission line connecting the power house and the switch house at the west portal of the tunnel will be described in a second article which will be printed in an early issue.

Standard Car of the New South Wales Government Tramways

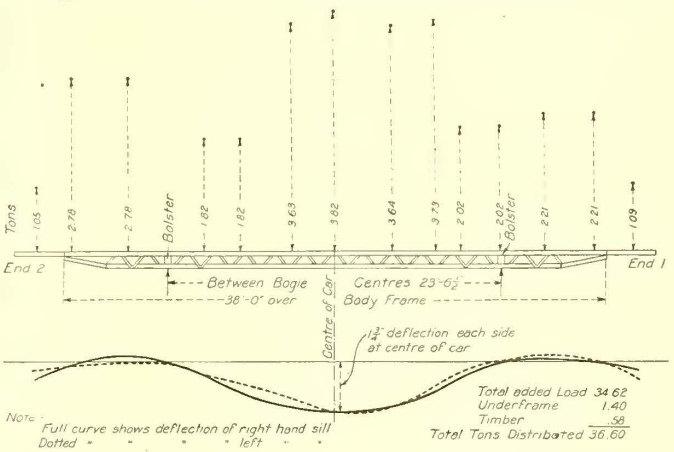
This Type of Car Combines Large Seating Capacity with Exceptionally Light Weight. The Body Is Framed Separately from the Structural Steel Underframe and Is Bolted Down on the Underframe.

The New South Wales Government Railways & Tramways has in service in Sydney 195 double-truck cars of an interesting design which has been adopted as standard by the tramways department. They are of the combination open and closed type and seat eighty passengers in sixteen cross seats arranged back to back. The inclosed section of the car body, which is 19 ft. long, contains eight cross seats and is entered from the running boards through four double sliding doors in each side. The open sections at each end are inclosed by canvas curtains which are stiffened with galvanized iron strips sliding in grooves in the posts. Glass-inclosed motormen's vestibules are provided at each end of the cars. These vestibules are narrower than the car body, and are tapered to allow proper clearance between two cars passing on a curve of 66-ft. radius with tracks on 12-ft. centers.

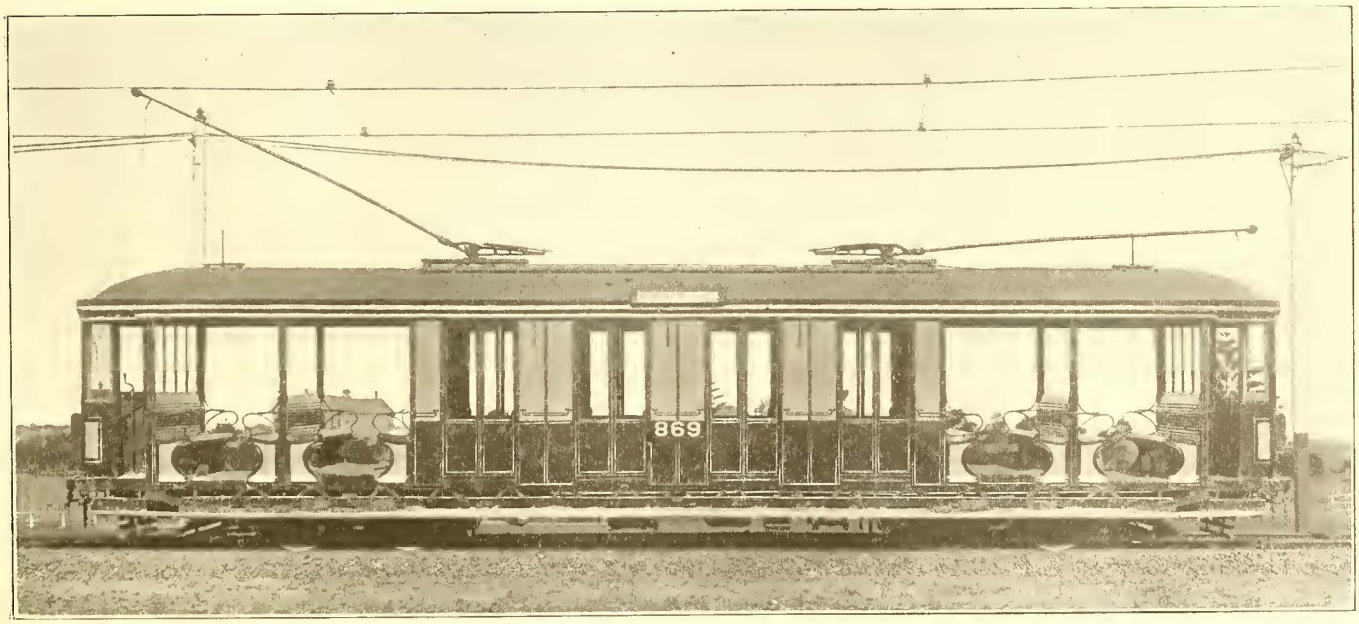


New South Wales Car—End View

The car body is built separately from the steel underframe, and is bolted down on the top flanges of the side sills. The two principal members of the underframe are the latticed girder side sills. These are built up of two 3-in. x 3-in. x ⅜-in. angles and 1½-in. x ⅝-in. lattices. Each piece of lattice is continuous for four or five panels in order to reduce the number of rivets in the top member, so as not to interfere with the bolts used for attaching the car body. The girders are stiffened at the bolsters with a ¾-in. flat



New South Wales Car—Deflection Test of Underframe



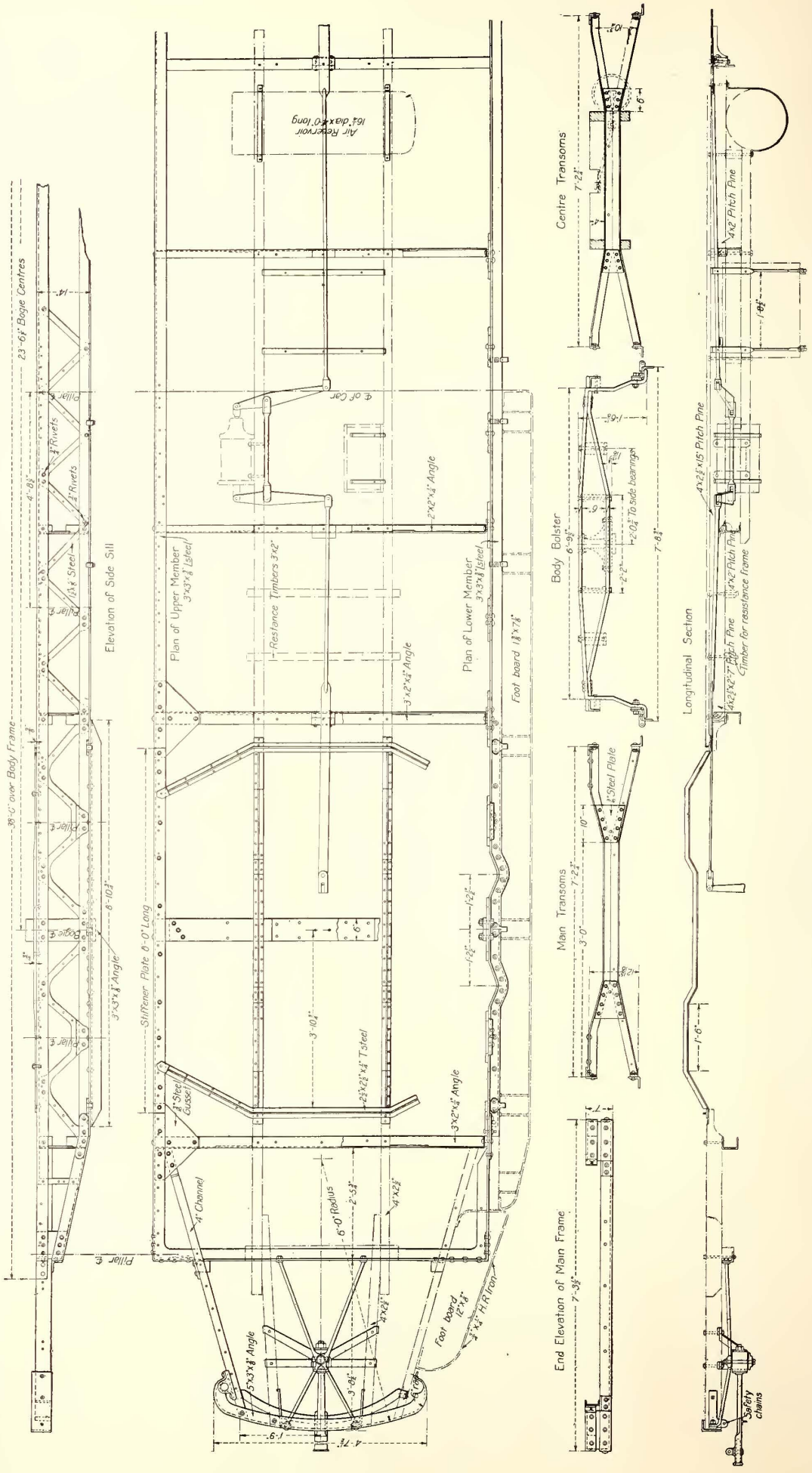
New South Wales Car—Side View

plate, 8 ft. long, riveted to the top member, and an angle 3 in. x 3 in. x ⅜ in. x 10 ft. long, riveted to the bottom member.

The body bolsters are built up of two 1-in. x 6-in. plates. The top plate is bent down inside of the top angles of the side sills. Six angle iron transoms connect the two side sills and support the central longitudinal filling pieces on which the car body rests. On each side of the bolsters light T-irons are riveted across between the side sills to support the ends of two similar longitudinal members which rest on top of the bolster and carry the motor trap doors in the car floor. The end sills are 3-in. x 3-in. x ⅜-in. angles, bent around the corners and riveted to the bottom angles of the side sills.

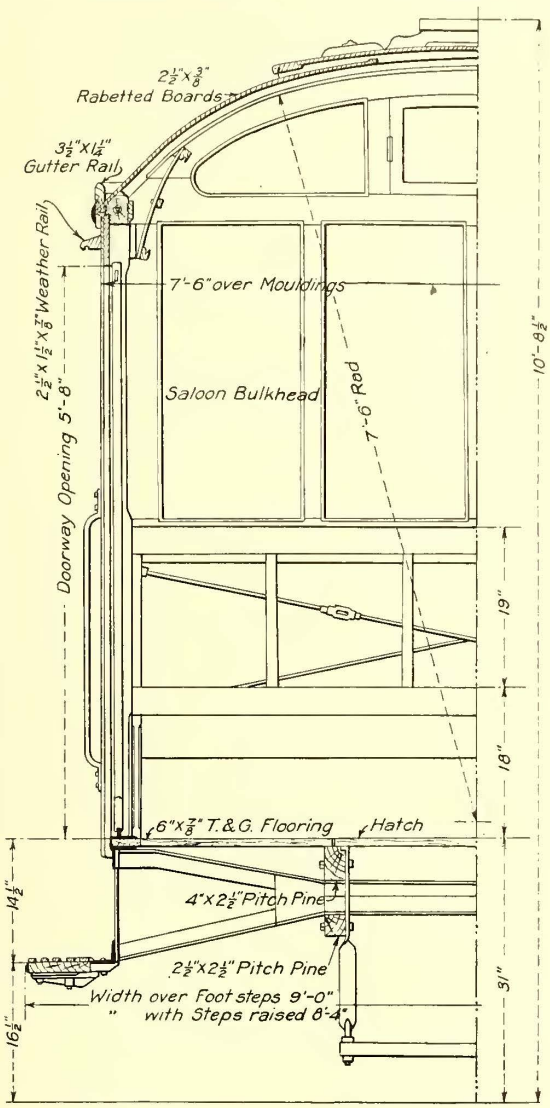
The platform underframing consists of two 4-in., 7-lb. channels, bolted under the gusset plates of the transom nearest the end sill and resting on top of the end sill. These channels support the 5-in. x 3-in. angle-iron bumper. The platform floor is supported in the center by two wooden sills, 4 in. x 2½ in., which rest on the body end sill but are not bolted or otherwise fastened to the body flooring. This platform construction was employed in order to minimize the damage to the car body and underframing in the event of collisions, and it has proved entirely successful, for in three severe collisions the platforms have been the only parts damaged in either car.

The steel under-



New South Wales Car—Plan, Elevations and Sections of Steel Underframe

frame weighs only 3140 lb., but it is very rigid. Assuming a maximum load of 160 passengers, the uniformly distributed load on each sill is 33 lb. per inch of length. The diagram on page 13 shows the deflection of a complete underframe under a test load of 82,000 lb., which is equivalent to 72.5 lb. per inch per sill. With this load the maximum deflection at the center of the car was 1¾ in., and the two side sills showed approximately uniform bending at all points. In riveting up the latticed girders they are given a camber of ¼ in. at the ends and 3/16 in. in the center.

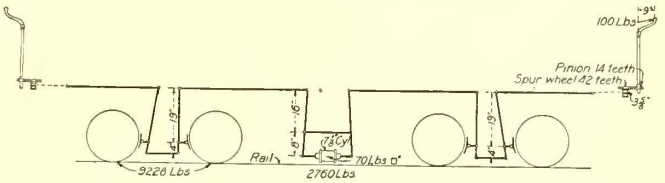


New South Wales Car—Half Cross Section

The car body is built almost entirely of wood, and is a separate structure from the steel underframe to which it is bolted. It has an arched roof, the interesting feature of which is the gutter, which is continuous around the eaves. The water which collects in this gutter is carried down to the roadbed through a 1½-in. iron pipe, which forms one of the end stanchions for the motorman's vestibule. The seats in both the open and closed sections of the car are made of hardwood slats. The floor of the car is only 31 in. above the rails, except in the two compartments immediately over the body bolsters, where it is raised to 34 in. The two seats in each of these compartments are raised 2 in. higher than the other seats to offset the rise in the car floor. Pressed steel seat end frames weighing 9¾ lb. each are used on the open compartment seats.

Of the 195 cars in service 144 are equipped with General Electric Type M multiple-unit control and the remaining fifty-one cars have K-6 platform controllers. Four interpole motors of 30 hp each are applied on 174 of the cars, and the other twenty-five cars have motors of the same size without interpoles. The interpole motors were furnished by Dick, Kerr & Company, Ltd., and the motors without interpoles by the General Electric Company. One hundred and thirty additional cars of the same type are now being built. They will be equipped with 30-hp motors without interpoles and multiple-unit control.

The cars are fitted with Allis-Chalmers air brakes and Sterling geared hand braes. The air and hand brakes are

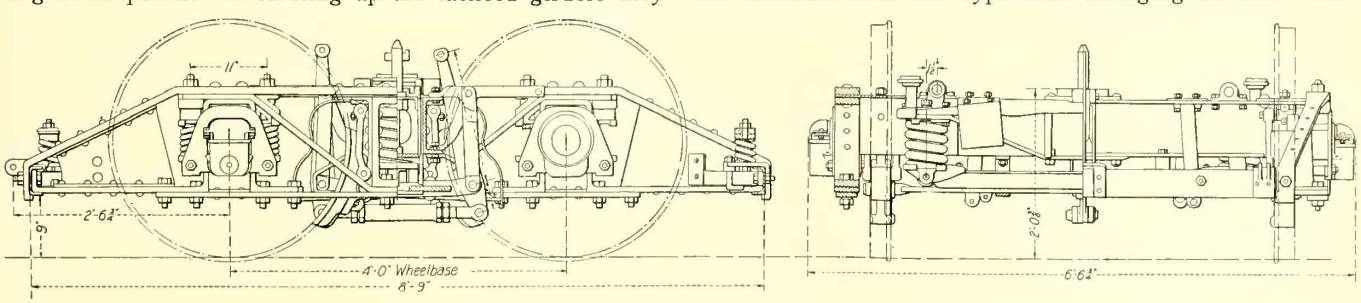


New South Wales Car—Diagram of Brake Leverage

connected to the truck brake rigging independently; that is, the air brake rods are connected to the two inside truck brake levers and the hand brake rods are connected to the outside truck brake levers. When the air brake is applied the truck brake levers to which the hand brakes are attached act as dead levers, and their upper ends bear against the truck transoms. The wheels cannot be locked by the cumulative pressure of both air and hand brakes, nor can the breaking of any one part cause the entire braking power to be lost. The ratio of the foundation brake gear is 11½ to 1, and while this is slightly higher than is generally considered good practice the gear has been used satisfactorily for more than three years. The gear hand brake multiplies the pressure on the brake handle 14.9 times, so that with 100-lb. pressure on the handle the total braking force at the shoes is 34,270 lb. With the air brake and 70-lb. cylinder pressure a total braking force of 31,740 lb. is obtained.

TRUCKS

The trucks used under these cars are a modified design of the diamond arch bar type with swinging bolster. The bolster is supported at each end by a double coil spring instead of the usual elliptic spring, and the load on the side frames is transmitted to the journal boxes through two small coil springs supported on a yoke which straddles the journal box. The axle journals are only 3½ in. x 3¾ in. The trucks, as well as the car bodies, were built by the Meadowbank Manufacturing Company, Sydney, New South Wales.



New South Wales Car—Motor Truck

WEIGHT

The following table gives the detail weights of one car with interpole motors and multiple-unit control:

	Pounds.
Car body, including running boards	7,503
Underframe, including drawbar	4,798
Motors, gears and gear cases	9,824
Control, conduit, trolley bases, etc	3,028
Brakes	1,153
Trucks	4,852
Wheels and axles	5,104
Miscellaneous, including headlights, etc	649
Total	36,911

This is equivalent to 461 lb. per seat, 812 lb. per foot of length and 108 lb. per square foot of floor area. The cars with K-6 control and motors without interpoles weigh only 33,851 lb., which is equivalent to 423 lb. per seat, 743 lb. per foot of length and 99 lb. per square foot of floor area.

The New South Wales Government Railways & Tramways are managed by a commission of three members headed by T. R. Johnson. The chief officers of the tramway department are J. Kneeshaw, traffic superintendent, who has supervision over the conductors and motormen; G. R. Coudrey, tramway engineer, who is in charge of buildings and track, and O. W. Brain, electrical engineer, who is in charge of power generation and distribution, and the construction and maintenance of the rolling stock. The new standard cars were designed in the office of Mr. Brain.

THE RESPONSIBILITIES OF ELECTRICAL ENGINEERS IN MAKING APPRAISALS*

BY H. M. BYLLESBY, CHICAGO

In the brief period of from thirty to thirty-four years, the profession of electrical engineering as applied to the generation of, the transmission of and the utilization of large quantities of electricity has come into existence. In the broadest sense of the term this development has required the creation of a new art.

The development of electrical engineering has been a continued series of advances, step by step and leap by leap. There has been more obsolescence and more retirement of electrical machinery and tools and devices far in advance of their natural life, due to the continuing improvement, than has taken place in the history of any other art.

In our profession one has to read the daily press and carefully study the columns of the technical press at all to keep pace with the new developments, the new achievements and the new victories of the profession from which we all make our livelihoods. This tremendous growth from the dynamo of 50 hp to the generator of 30,000 hp; from the incandescent lamp as a luxurious curiosity to the incandescent lamp which is as much a feature of our modern civilization as our running water; from the transmission distances of a mile or two to transmission distances of 200 miles; from the electric motor existing as a laboratory toy to the electrical motor of universal use and of 10,000 to 15,000 hp has taken place within the span of years conventionally covered by the term a "generation."

It is probable the annals of civilization do not contain a parallel, but along with this proper pride, with the feeling of well-merited satisfaction, let us not forget that collaterally and a part of it, something without which it could not have taken place, has been the work of the promoter and the banker. No new industry can be established or when established can continue and no art can grow to the dimensions of ours without the continued presence of the individual who supplies the capital, the money, the financial resources to the inventor and the engineer. Large and continuing supplies of capital are required for research, for producing inventions, for the carrying out of the inventions and the development through their period of incipiency, of temporary failures and disappointments.

We should give to the promoter, to the capitalist, to the man who is able to influence capital and to place it at the disposal of the men of our profession, the credit that is properly due him. The achievement of the electrical engineer would not have been possible if it had not been for the presence of the man with money who believed in the commercial possibilities of our art as from time to time developed and who produced the capital with which to continue development of that art.

Our profession has indeed been fortunate in having had associated with it from its inception men who were sufficiently intelligent, courageous and far-sighted to see the merit of the inventions and developments which from time to time were produced and who had withal the faith and the ability to continue to stand behind these inventions and developments with their capital during that period which we all know has taken place, when these inventions and these developments were under criticism, were temporary failures, and while only disappointing results were being reached. During this period of disappointment, of hazard, during this period of modifications from the original plans and disappointments and changes, the man or corporation with money was present to tide the infant invention or industry over the shoals and hazards which surrounded it, and except for the presence of men of the type of which I am speaking, with their courage, their faith and their capital, many of the inventions and developments of our profession would have been buried in the grave of permanently disappointed hopes and non-fulfilment.

To-day our art is developed. The products of the brains of the electrical engineers are so well known, their commercial utility is so thoroughly established, particularly in the principal lines of our achievements, as to lead us to be forgetful, perhaps, of that period which the older of us recollect so clearly. This period, due partly to the crudity of our own devices and the undeveloped condition of our own inventions, due partly to the unstable condition of the collateral features upon which we depended, such as steam engines, boilers, water wheels and manufactured articles, was a period attended with heart-breaking anxieties not only to the inventor and engineer, but do not forget that it was also a period of heart-breaking anxieties and disappointment to the man who had invested his capital in those things.

FRANCHISE TERMS

To-day there is a world of discussion regarding the value of a franchise, the terms of a franchise, the privileges it affords, the obligations it carries and the fraud which in the minds of the public is supposed always to be inseparably connected with anything bearing that name. There is much comment, nearly always unfavorable, regarding the conditions under which franchises for electric light and power transmission companies and trolley roads have been issued. If those who, probably with the best intentions possible, are criticising these matters had gone through the experience of the earlier days, they would change their opinions.

In those days franchises were given freely. Anyone who applied for a franchise would receive it and, as a rule, without burdensome restrictions. The community which was favored by having capital build for its service an electric light plant to furnish what it believed to be a luxury and which otherwise it would not have had, or a community which was favored by a company which in return for a franchise would spend the money necessary to change the cruel and totally inadequate intramural animal transportation of that town or city to an electric transportation system, was properly and deservedly welcome.

Until recently the laws governing the ownership of the

*Abstract of a paper read at the annual convention of the American Institute of Electrical Engineers, Chicago, Ill., June 27, 1911.

power in the stream were believed to be pretty fairly understood along the lines handed down from our Anglo-Saxon ancestors. The company or individual who came into the community and produced the capital to develop these streams was royally welcome and he was viewed generally with some wonderment regarding his financial obliquity. If a brief and unprejudiced study is made of the history of these earlier electric light, trolley and water-power companies, it will be impossible to depart from the conviction that the persistence and courage of the promoter and the capitalist who carried them through their earlier periods of disaster and lack of credit is quite as notable an achievement as that of the inventors and engineers who introduced the physical and scientific part of these enterprises.

This enterprise and this courage which heretofore have been wisely fostered by the commonwealth have given the United States of America the most universally extended, the best operated public utility plants in the world. In the vast majority of cases the service rendered by the corporations is furnished to the public—with superior service with its wide extensions—at less cost than in any other country. Various contributing causes have produced this result. Among these causes has been the natural inherent courage and enterprise of the American. In addition to this, however, have been the liberal franchise grants issued in the past and the freedom from onerous restrictions both for occupancy of streets and the purchase and development of water-powers. A broad and liberal construction which has justified the issuance of stock which would eventually pay to the projectors and developers of these enterprises when they became successful something in addition and beyond a mere fair interest return on their investment has also had a profound influence upon giving to our country the best utility corporations of the world. Without these features this development with its low charge to the public could not have taken place.

ABUSES OF THE PAST

Abuses have taken place in the past on the part of the corporations, on the part of the public served by the corporations and on the part of the legislative and law administering bodies. At the present time my opinion is that both the public and corporations are reaching a common meeting ground, requiring public service corporations to be protected and regulated monopolies; these corporations to be governed as to their rates and to be protected from competition by so-called "public service commissions." With this doctrine as such, the public service engineer and operator has no quarrel. We do file a plea, however, that these public service commissions be composed of men of character, men of ability, men who have accomplished something in the world; that these commissions be composed of men who while fair and upright are conversant with the business which, under the laws governing their action, they are controlling.

The abuses which have undoubtedly taken place in the dealings between the municipal bodies and the public service corporations have been as distasteful to the corporations as to the public, and the cry of the corporations is for a fair hearing, for an intelligent hearing, for fair recognition of the benefits they have conferred and a demand to be relieved from the hardships and frauds which in many cases they have suffered at the hands of politicians, a partially educated public sentiment and the municipal governing bodies. It is believed that properly constituted public service commissions, appointed for "good behavior," composed of high-class men, suitably paid and operating under broad and liberal laws, will accomplish this much-to-be-desired object.

The public should recognize that the so-called public service corporations should be encouraged and fostered instead of being strangled and discouraged. The widest latitude should be afforded the operations of public service corporations under monopoly and protection, and fair laws administered by conservative and able public service commissions.

The electrical engineer must recognize that in addition to the multiplicity of duties he has been called upon to discharge, he is now confronted with a new class of responsibilities from which he cannot shrink. To these responsibilities he must give the best that is in him of experience, of fair-mindedness, of wisdom and of justice.

Old methods and old standards are passing away; new methods and new standards are demanded. It will be a shame if the present crisis fails of a solution more rational and with less hardship and destruction than has attended previous solutions of economic and social crises. Out of the present controversies we must endeavor manfully and fairly to bring a condition of justice to all concerned, and in our share of duty in these matters we must make every effort to be intelligent and not to be found wanting in fair dealing and honesty between man and man, between corporations and the public and between governing bodies and corporations. Principal among these new responsibilities which are being rapidly thrust upon our profession is making appraisals to determine the value of the property of a public service corporation.

APPRAISAL AS A BASIS FOR RATES

These values, in accordance with the unmistakable present trend of the times, are to be made a basis upon which are fixed the maximum rates which these corporations are to be allowed to charge for service rendered. In the majority of cases the property to be appraised represents a continuing growth or a construction period from its inception. Much of the construction work we are called upon to value is concealed from view, such as foundations of buildings, foundations for machinery, submerged portions of hydraulic construction, conduit systems and gas pipes. In every case the structures or plants have been built in "piecemeal" fashion. Almost every public service corporation has started from a small beginning and added to its plant continuously, and the finished structure to-day represents construction work which has been continued from the time the original property was created. In meeting the questions to which the spirit of the times is demanding answers, very properly a demand is made by all parties to the controversy that absolute and entire frankness and complete candor pervade the negotiations. Properly a period has been put to the practice of dissimulation and trickery and misrepresentation on the part of the public, the governing body and the corporation. From a long experience I can state for my part that trickery and dissimulation and unfair dealing in the past have been fully as great on the part of the public and the governing bodies, if not greater, than on the part of the corporations. Following this proper demand for candor, I desire to call attention to the painful fact that it is extremely rare for a professional engineer or constructor in any branch of industry, in any branch of construction, to estimate the cost of such construction with accuracy and that the practically uniform experience has been that all such estimates have proved woefully less than the cost of the completed project.

Every one of us whose duties require him either as a principal or in an auxiliary capacity to be responsible for the furnishing of capital to build any given public service construction or to develop any given enterprise knows full well from a long and painful experience that unless he provides for indefinite excess charges or leaves some other avenue of escape, the enterprise or construction when finished will be burdened with a floating debt which seldom is of small relative proportion. This debt is the difference between the estimated cost of building the undertaking and the actual cost as developed after the event. I believe there has not been a considerable piece of public

service construction in recent years where the finished cost complete has not overrun the estimated cost by a minimum in a few cases of 10 per cent to 15 per cent to a maximum in a majority of cases of a dangerously large percentage which not infrequently has gone to an excess cost of 100 per c

RESPONSIBILITY OF APPRAISAL

How careful, therefore, how fair-minded and liberal should be the point of view of the professional engineer in appraising the value of another man's or another corporation's property for the solemn and serious purpose of having based upon his appraisal the return which that man or that corporation is to be allowed to receive upon his investment! It is unfair that an engineer or appraiser who recognizes at the bar of his own conscience that his own estimates have been uniformly overrun should make his appraisals without taking into consideration and manfully applying to his estimate his own factor of individual inaccuracy, his own personal factor of nearly unfailing underestimating.

If the profits to be allowed public service companies were to be on a broad and liberal basis this feature would be of less importance. The spirit of the times, brought around partly by mistakes, by selfishness, by unfairness, on the part of all parties to the contract, the tendencies of the times, actuated to a degree by certain irresponsible magazine writers, magazines and papers, and by certain politicians, all tend to reduce the return of the public service corporation to a low point. At best it would indicate allowing the public service corporation, after paying its operating expenses and depreciation charges, a distributable sum equivalent to from 7 per cent to a possible 10 per cent upon its reproduction value, the higher percentage being rather hoped for than indicated. I think the situation is one of the most momentous which confronts our profession to-day. A large part, I presume 90 per cent, of the activities of our profession have resulted from the continuing growth and existence and development of public service corporations.

Capital will leave any given field with great speed if it finds that it is receiving an unfair or unjust recompense or other fields offer greater inducements. Without capital modern enterprise is impossible. The most beneficial use of capital is to have it employed in developing new enterprises, extending existing enterprises, which in turn develop and add to the wealth of the communities served. The profession in which the members of this association are engaged could not exist at all if capital withdrew its support from enterprises depending upon the genius and ability and conscientious effort of the electrical engineer.

Avoid the influence of the idea that the professional engineer can get along without the services of capital. Capital on its part must treat the public, the laboring man and the professional man with fairness and liberality, with more fairness and liberality than it has in the past. On the other hand, the professional man, who from the nature of his calling and its dignity carries a large influence in the community in which he operates, must not forget the close correlation between brains, labor and capital, and neither through professional indifference or professional jealousy allow himself to give capital an unfair hearing or an unjust decision.

We must avoid the fallacy that only the physical portion of a corporation's property is entitled to a value. Beyond the naked physical value there is required a very large and material sum to change that naked inert mass of physical construction into a live, progressive, earning entity. The omission of the cost of making a going concern in addition to its naked physical value has been the root and cause, in my judgment, of a large proportion of the disasters which have overtaken enterprises in the field in which we operate.

These remarks and more to the same effect apply to the question of intangible values, and I hope the fullest consideration will be given to them. These intangible values generally embrace interest during construction, accidents and insurance during construction, engineering charges, supervision charges, and they should include proportionately the tremendously large sums expended by public service corporations in developing the business, in educating the public, and producing a sale of their commodity, whose reflex effect in subsequent reduction of the operating charges should be considered as proper cost in the value of the property. Further proper charges, of an absolutely legitimate nature, to the intangible value account include the legal expenses of organization and of putting the enterprise on its feet, the discounts on securities sold or brokerage paid for finding of the capital, and, particularly in the case of the older companies, the large sums spent in absolute good faith in what was really a period of experimenting to obtain the best apparatus, the best systems and methods adapted to the requirements of the company that happens to be in question. Due regard should always be given to the added cost of piecemeal construction which has been an unfailing incident of all of these corporations. In all fairness it should include the losses due to obsolescence and the discarding of workable machinery long before its life had been exhausted, this discarding being for the purpose of keeping pace with the times and in the last analysis for the better serving of the public.

There is a tendency, I hope a diminishing tendency, to be unfair to public service corporations and to be entirely oblivious of the hazards and risks they have incurred in the building of their business and to be forgetful of the profound importance and great benefit they have been to the communities they serve.

A recent example, and a very pertinent one, of this tendency to be unfair has occurred in the appraisal of the value of one of the largest utilities in a large Western city. It was found that a material part of the distributing system of this company was now under paved streets, but that, due to the enterprise or necessity of the company in the past, a part of its underground system had been placed in the streets in question before they were paved; that is, the paving above this underground system on a material portion of the company's property had taken place after its distribution system was in the ground. The ruling of the body making this appraisal was that this company was not entitled as a part of its value to the cost to which it would have been put of placing this distribution system under the paved streets, and the difficulty of sustaining this ruling is plainly evident from the fact that wherever this company has put its distributing system underneath paved streets, or where it is doing it to-day, the cost of that paving has applied to this company and is allowed as a part of the value of the plant. It would be hard to conceive of a more direct effort to discourage enterprise than this particular ruling.

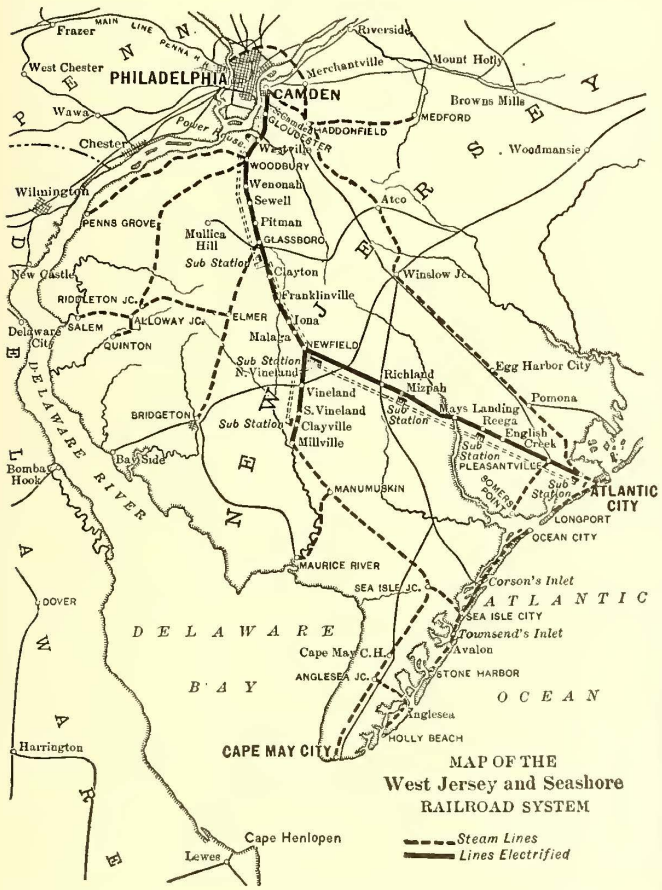
We all believe we are approaching a far better understanding between all parties concerned on these questions than has existed in the past. The effort of all of us must be by conscientious effort, by candor and sincerity to bring around this better condition.

The Berne power station in the Berne Highlands has just been put into operation. The water power of the Kander River is utilized for the operation of turbo-generators of from 9000 to 12,000 hp. It is intended to use the power in the form of high-pressure single-phase alternating current for the working of the Lotschberg Railway, and perhaps also for other lines. It is assumed that the federal railway authorities will soon approach the question of the conversion of the St. Gothard Railway to electric traction, as otherwise the stream of tourist traffic will presumably be diverted to the new Lotschberg-Simplon Railway.

ELECTRICAL OPERATION OF THE WEST JERSEY & SEASHORE RAILROAD *

BY B. F. WOOD

A general impression prevails that operating officers of railroads will not consent to the publication of their operating costs. This to some extent may be true, but where such figures are correctly understood and properly used there should be no objection to their publication. When the question of presenting certain data pertaining to the operation of the electrified portion of the West Jersey & Seashore Railroad before the American Institute of Electrical Engineers was discussed with the management of the Pennsylvania Railroad, the reply was made that not only would the information be furnished, but that it would be a pleasure to have such information made public through the proceedings of the Institute. The data included in this paper were taken direct from the operating records



West Jersey & Seashore—Map of Steam and Electric Divisions

and no effort was made to curtail or to modify them in any respect. No attempt has been made to analyze or compare the data with any that have heretofore been presented.

No detailed description of the construction used in the electrification of the West Jersey & Seashore Railroad was thought necessary for the purpose of this paper. A complete description was published in the STREET RAILWAY JOURNAL for Nov. 10, 1906, and Oct. 12, 1907. The accompanying map shows the electric lines and the steam lines which are operated by the West Jersey & Seashore Railroad.

The portion of the line which is electrically operated extends from Camden, via Newfield, to Atlantic City, a distance of 64.6 miles; and from Newfield to Millville, a distance of 10 miles. With the exception of the Millville branch, which is a single-track railroad, the line is double-tracked, with a third-track extending for a distance of about 6 miles north from Woodbury.

This portion of the West Jersey & Seashore Railroad was originally operated by steam and was a single track line south of Newfield. In the latter part of the year 1905 it was decided to electrify. The work was undertaken in December, 1905, and had progressed to such a point that in the early part of July, 1906, the first train was moved electrically. Regular operation by electric service was established in September of the same year. The direct-current over-running third-rail system operating at 675 volts was chosen for this installation.

TABLE I.—COST OF CONSTRUCTION

Power Stations:		
Building, stacks, coal and ash handling machinery	$354,000	
Equipment	640,900	
Total		$994,900
Transmission line		241,500
Substations:		
Buildings	$72,000	
Equipment	419,560	
Total		491,560
Third-rail		557,636
Overhead trolley		80,500
Track bonding		102,659
Cars		1,135,900
Car repair and inspection sheds		46,674
Right-of-way, additional		592,100
Reconstructing tracks		763,800
Constructing new tracks		2,071,000
Terminal facilities and changes at stations		252,400
Signals and interlocking plants		561,900
Changing telegraph and adding telephone facilities		105,100
Fencing right-of-way, cattle guards, etc		88,400
Miscellaneous items		44,200
Total		$8,130,229

UNIT COST OF ELECTRIFICATION.

Power station, cost per kw	$110.00
Transmission line, cost per mile	3,485.00
Substations, building and equipment cost per kw	28.90
Third-rail, cost per mile	4,235.00
Overhead trolley, cost per mile	4,120.00
Track bonding, cost per mile	684.50
Cars, including electrical equipment each	12,214.00

TABLE II—COST OF OPERATION OF ELECTRIC LINES IN CENTS PER CAR MILE, 1909-1910

Year 1909

	Repairs, Electric Equipment of Cars.	Repairs Passenger Cars.	Other Maintenance of Equipment Costs.	Electric Power at Car Shoes.	Yard Service Shifting Costs	Motormen	Trainmen.	Train Supplies and Expenses.	Total.	Other Expenses	Total Expenses.	Car Miles, Total.	Average Cars per Train.
January	1.06	2.05	0.48	4.78	0.51	0.93	1.53	1.20	12.53	10.25	22.78	279,210	3.113
February	1.07	2.42	0.38	4.63	0.51	0.91	1.49	1.22	12.63	10.99	23.62	258,130	3.163
March	1.18	1.97	0.35	4.99	0.52	0.99	1.65	1.18	12.83	10.17	23.00	279,193	3.092
April	1.26	2.03	0.25	4.43	0.46	0.89	1.40	0.61	11.32	9.14	20.46	317,963	3.483
May	0.84	1.73	0.26	3.98	0.44	0.88	1.45	0.45	10.03	9.18	19.21	318,006	3.482
June	0.40	0.68	0.31	3.58	0.25	0.86	1.41	0.42	7.91	9.35	17.26	339,294	3.530
July	0.33	0.44	0.12	2.82	0.20	0.80	1.25	0.40	6.36	6.95	13.31	478,203	3.669
August	0.28	0.40	0.14	2.75	0.20	0.75	1.18	0.36	6.06	6.29	12.35	517,223	3.921
September	0.43	0.67	0.14	2.75	0.25	0.83	1.32	0.42	6.81	6.87	13.68	428,571	3.584
October	0.64	0.71	0.24	3.84	0.31	0.92	1.53	0.62	8.81	10.21	19.02	307,825	3.046
November	0.52	0.39	0.29	3.85	0.29	0.95	1.70	0.82	8.81	9.30	18.15	291,816	3.327
December	0.87	1.08	0.29	12.31	0.30	1.00	1.72	1.30	18.87	15.05	33.92	292,175	3.318
Avg. per mo.	0.68	1.10	0.25	4.30	0.33	0.88	1.44	0.69	9.67	9.08	18.75	4,107,609	3.457

Year 1910

January	0.86	1.03	0.67	4.59	0.46	0.96	1.64	2.24	12.45	7.22	19.67	292,523	3.169
February	0.79	1.78	0.33	5.38	0.50	0.97	1.48	1.07	12.30	12.44	24.74	262,488	3.137
March	1.04	1.13	0.28	3.87	0.48	0.88	1.51	0.89	10.08	12.91	22.99	333,252	3.445
April	0.62	0.76	0.31	4.57	0.49	0.97	1.62	0.70	10.04	11.55	21.59	302,463	3.344
May	0.57	0.78	0.24	2.78	0.48	0.89	1.41	0.44	7.59	9.92	17.51	351,994	3.651
June	0.79	0.67	0.24	2.80	0.45	0.97	1.62	0.58	8.12	10.13	18.25	375,023	3.406
July	0.44	0.46	0.18	2.47	0.34	0.89	1.39	0.36	6.53	6.66	13.19	565,787	3.641
August	0.29	0.57	0.15	2.48	0.33	0.85	1.38	0.37	6.42	5.62	12.04	594,852	3.811
September	0.37	0.54	0.21	2.71	0.39	0.85	1.42	0.42	6.91	7.34	14.25	487,543	3.771
October	0.73	1.19	0.28	3.05	0.47	0.91	1.69	0.52	8.84	12.34	21.18	339,789	3.564
November	1.40	2.45	0.47	3.71	0.51	0.96	1.71	0.54	11.75	10.58	22.33	311,882	3.379
December	0.63	1.94	0.21	3.93	0.51	0.93	1.71	0.74	10.60	12.13	22.73	334,936	3.494
Avg. per mo.	0.66	1.01	0.27	3.33	0.43	0.91	1.52	0.67	8.80	9.39	18.19	4,552,532	3.518

CONSTRUCTION DETAILS

In order that the accompanying statements of cost of operation and detentions to train service may be more readily understood, the following general data relating to the electrified sections are given:

*Abstract of a paper read at the twenty-eighth annual convention of the American Institute of Electrical Engineers, Chicago, Ill., June 26-30, 1911.

The track consists of 100-lb. and 85-lb. rails. The total length of single track, including sidings, is 150 miles. The power station is located at Westville, N. J., on Big Timber Creek, 5.6 miles from Camden Terminal. Its rated capacity is 8000 kw. It contains four 2000-kw, 6600-volt, three-phase, 25-cycle Curtis turbo-generators with separately driven exciters, and three blowers, with a capacity of 20,000 cu. ft. of air per minute each. The boiler room contains sixteen Stirling water-tube boilers of 358 hp each, equipped with superheaters. Fourteen of the boilers are equipped with Roney stokers and two are equipped with Taylor stokers.

The alternating current, which is generated at 6600 volts, is stepped up in the power house by means of twelve 700-kw single-phase transformers to 33,000 volts. It is transmitted to the substations over transmission lines 69.3 miles long, which consist of two duplicate circuits, Y connected and having the neutral phase grounded. The wires are No. 1 B. & S. gage, hard-drawn solid copper. The transmission line poles are chestnut, 45 ft. high and spaced 125 ft. apart. A ground wire for lightning protection is strung on the top of the poles 4 ft. above the nearest wire. The signal line and the lighting circuit also are carried on the transmission line poles.

There are eight substations between Camden and Atlantic City. These substations contain from two to three rotary converters and their total rated capacity is 17,000 kw. They convert the alternating current into direct current at 675 volts.

Of the 150 miles of single track, 141.73 miles are equipped with third rail, which is Pennsylvania Railroad standard

TABLE III—COST OF MAINTENANCE OF TRANSMISSION SYSTEM, 1910

	High tension		Overhead trolley		Third rail		Running track bonding	
	Total	Per mile	Total	Per mile	Total	Per mile	Total	Per mile
January	$142 96	$2.04	$690 84	$35.32	$492.96	$2 74	$26 67	$1.51
February	409 74	5.85	266 38	13 62	580 80	4.41	562.82	3 75
March	198 62	2 84	381.28	19.49	495.55	3 76	39 26	0 26
April	403 44	5 76	446.57	46.71	745.16	5 26	30 24	0.20
May	256 14	3 66	291 51	30.49	1,126.40	7 95	190.05	1 27
June	123 21	1 76	864.62	90 44	957.42	6 75	312 08	2 08
July	167 90	2 40	393 62	41.17	818 29	5 77	494.79	3 30
August	357.20	5 10	317.49	33 21	1,631 72	11 51	32.99	0 22
September	508 51	7 26	389 73	40.77	838.87	5.92	202.05	1 35
October	604.93	8.64	245 75	25.70	647 27	4.57	98.66	0 66
November	171.58	2 45	363 35	38 01	11,062.98	7.50	189.83	1.26
December	100.34	1 43	244.02	25 52	1,466 71	10 35	125.03	0.83
Year	3,444.57	4.10	4,895.16	36.70	10,864.13	6.46	2,445.72	1.36

†Credit for scrap 58.75

TABLE IV—DETENTIONS TO ELECTRIC TRAIN SERVICE, 1909

Causes	Train detentions, number, time and per cent for various causes				
	Number of detentions		Minutes detention		
	Total	Per cent of total	Total	Per cent of total	Car miles per minute detention
Transportation.					
Boat connection	51	0.553	180	0.403	22,815.36
Baggage, express and mail	1898	20.575	8373	18.749	490.47
Heavy travel	1232	13.355	4612	10.328	890 45
Collecting tickets	72	0.781	334	0.748	12,295.70
Train connections	977	10.591	5517	12 354	744.38
Traffic ahead	1723	18 677	7842	17.561	523.68
Held at signal	1390	15.068	4767	10.675	861.50
Stops on order	73	0.791	165	0.369	24,889.49
Fast schedule	34	0.368	57	0.128	72,048 50
Picking up and cutting off cars	411	4 455	1312	2 938	3,130.15
Fog	41	0.444	127	0.284	32,336.73
Signal failure	208	2.255	860	1 926	4,775.31
Accidents	26	0.282	261	0.584	15,734.73
Obstructions	33	0.358	194	0.434	21,168.89
Miscellaneous	283	3.068	1427	3.196	2,877.90
Total transportation	4852	91.621	36028	80.677	113.98
Motive power.					
Power house trouble	16	0.163	69	0.155	59,518.30
High tension line trouble	14	0.152	81	0.181	50,700 80
Lightning	12	0.130	47	0.105	87,377 90
Overloads in substations	11	0.119	61	0.137	67,324 00
Third rail shorts	3	0.032	14	0.031	293,340 40
Third rail out of place	1	0.011	8	0.019	513,345.13
Third rail anchor on fire	1	0.011	5	0.011	821,353.00
Third rail protection out of place	1	0.011	1	0.002	4,106,765.00
Trolley wire trouble	253	2.742	1920	4.299	2,138.94
Train equipment	237	2.569	1568	3.511	2,619.11
Total motive power	548	5.940	3774	8.451	1,088.17
Weather Conditions.					
Snow, head winds, wet rail	178	1.929	4043	9.054	1,015.77
Sleet on third rail	47	0.510	812	1.818	5,057.59
Total weather condition	225	2.439	4855	10.872	845.88
Grand total	9225	100.00	44657	100.00	91.26
Total car mileage					4,106,765
Car miles per detention					445.18
Car miles per minute of detention					91.96

TABLE V—OPERATING AND MAINTENANCE COSTS OF SUBSTATIONS, 1910

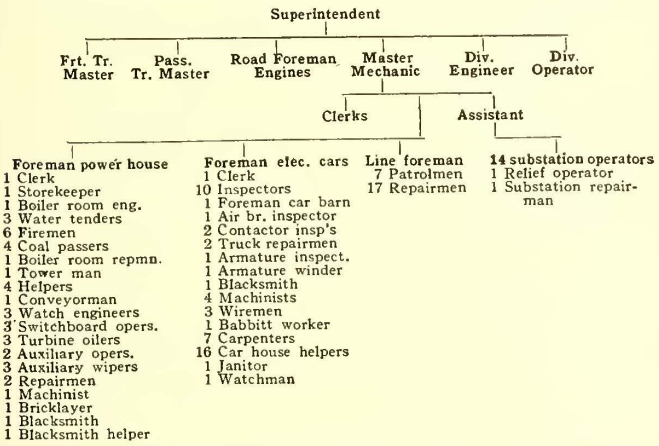
	Total for eight substations				
	Operation	Maintenance	Total	Cost per kw-hr.	Substation output kw-hr. 675 volts direct-current
January	$1,573 82	$373 10	$1,946.92	$0 001136	1,655,800
February	1,601 78	147.39	1,749 17	0 001157	1,460,200
March	1,618.16	174.27	1,792 43	0 001035	1,678,400
April	1,728 98	275.64	2,004 62	0 001251	1,554,900
May	1,760 46	370.91	2,131 37	0 001267	1,635,900
June	1,794 44	432.55	2,226 99	0 001310	1,655,600
July	2,006.97	317.62	2,324.59	0 001047	2,175,700
August	1,751.03	194.13	1,945 16	0 000811	2,349,000
September	1,776.14	903.45	2,679.59	0.001285	2,035,200
October	1,744.23	145.99	1,890 22	0 001069	1,712,100
November	1,750.62	142.23	1,892 85	0 000986	1,860,100
December	1,745 68	130.02	1,875 70	0 000829	2,199,400
Year	$20,852.31	$3,607.30	$24,459 61	$0 001082	$21,972,300

TABLE VI—POWER GENERATION AND DISTRIBUTION DATA, 1907-1910

	1907				1908			
	Alternating Current kw-hr Power Station Output	Cost in Mills per Kw-hr. Output	Lb. of Coal Kw-hr. Output	Efficiency Power Sta. Bus to Substation Bus	Alternating Current Kw-hr. Power Station Output	Cost in Mills per Kw-hr Output	Lb. of Coal Kw-hr. Output	Efficiency Power Sta. Bus to Substation Bus
January	1,911,600	8.83	3 91	72.6	2,009,600	6.10	3.49	73.3
February	1,691.500	7.95	3.63	74.5	1,913,100	6.35	3.55	73 6
March	1,583,000	7.76	3.96	71.5	1,873,300	6.17	3.46	72 3
April	1,464,300	7.43	3.95	74.0	1,836,200	5.86	3.45	71.8
May	1,400,400	6.81	3.53	72.1	1,744,900	6.06	3.40	69 6
June	1,395,700	7.65	3.98	70.6	1,707,500	5.91	3.52	74.8
July	1,938,100	6.05	3.65	71.6	2,104,300	5.43	3.37	75.6
August	2,082,000	6 00	3 43	71.6	2,268,000	5.43	3.18	75.8
September	1,855,300	6.07	3.46	71.7	1,849,200	5.76	3.18	74.7
October	1,849,800	5.99	3.53	82.8	1,786,700	5.78	3.25	72.8
November	1,893,600	5.86	3.51	71.3	1,802,000	5.78	3.35	74.7
December	2,053,600	6.00	3.51	72.5	1,993,000	5.80	3 25	76.2
Av. for year	1,759,900	6.80	3.67	72.2	1,907,300	5.92	3.37	73.8
	1909				1910			
January	1,959,700	5.67	3.23	76.1	2,131,000	5.15	3.31	81.8
February	1,756,500	5 71	3 25	76.1	1,865,300	5.73	3.46	82.4
March	1,903,600	6.04	3.33	76.1	2,168,600	5.42	3.27	81.3
April	1,869,300	5.90	3.27	75.0	2,031,400	5 62	3.22	80.1
May	1,788,800	5 65	3.26	75.5	2,115,900	5.25	3.27	79.5
June	1,749,200	5.77	3.22	77 7	2,167,500	5 68	3.14	80.3
July	2,426,000	5.21	3 25	78.0	2,784,300	5.88	3.16	82.5
August	2,324,400	5.27	3.34	81.5	3,088,300	5.11	3.06	80 7
September	2,056,100	5.28	3.34	80.3	2,590,400	5.17	3.31	82.9
October	1,836,600	5.40	3.27	80.1	2,229,000	5.48	3.17	80.8
November	1,869,500	5.49	3.41	80.7	2,381,500	5.19	3.29	81.9
December	2,154,800	5.42	3 41	81 0	2,759,300	5.31	2.39	83.4
Av. for year	1,962,600	5.55	3 30	78.4	2,359,400	5.42	3.25	81.6

section and composition, weighing 100 lb. per yard. The third rail is of the top contact type and for the most part is unprotected. It has a conductivity equal to 1,200,000 circ. mil of copper. No feeders are used in connection with the third-rail. In the approach of the Camden terminal 9.55 miles of single track are equipped with overhead trolley. A No. 0000 grooved copper wire supported 22 ft. above the rails with span wire construction is used.

The car equipment consists of 79 motor coaches having a seating capacity of 58 passengers each; two combination passenger and baggage motor cars, having a seating capacity of 36 passengers each; six baggage and mail motor cars and six baggage motor cars. The coaches weigh 94,500 lb., or 1630 lb. per passenger seat. The electrical equipment of each car consists of two 200-hp G.E. motors



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with type M multiple-unit automatic control. The gear ratio is 29:46. Fifteen steel coaches having a seating capacity of 72 passengers have recently been authorized. These cars will weigh 103,500 lb., or 1445 lb. per passenger seat.

Table I on page 19 shows the cost of construction in connection with the electrification and includes the cost of work made necessary by electrification. It will be noted that the electrification costs represent less than half of the total cost involved in the change of motive power.

ORGANIZATION

With the introduction of electric service the organization of the road was not changed, but was expanded to provide for the new duties. A chart of the motive power organization is reproduced, which shows the number of employees engaged in the various departments.

COST OF OPERATION AND MAINTENANCE

The cost of operation and maintenance of the Westville power station for the year 1910 was $153,449.79. The total net output of the station was 28,312,500 kw-hours, making the total cost per kw-hour equal to 0.542 cent. The cost of operation alone was $136,324.66, or 0.481 cent per kw-hour. The largest items of operating expenses were labor, $29,170.42; and coal, $102,715.31. The coal used cost $2.235 per ton of 2000 lb. and one kw-hour was produced from 3.246 lb. of coal. The maximum monthly output of the station was 3,088,300 kw hours in August and the minimum was 1,865,300 kw-hours in February.

Table II shows the cost of operation of electric train service for the years 1909 and 1910 in cents per car mile. The table also shows the total car miles per month and the average number of cars per train. The heading "Other Expenses" in this table includes the cost of maintenance of way and structures, dispatching trains, telephone and telegraph, crossing gatemen and all traffic and general expenses.

Table III shows the cost of maintenance of the transmission system, which includes the high tension lines, overhead trolley, third-rail and track bonding.

Table V shows the operating and maintenance costs of the substations, together with their total output in kw hours. The total substation output for the year is only 21,972,300 kw-hours, as compared with a power station output of 28,312,500 kw-hours.

DETENTIONS TO TRAIN SERVICE

A detailed statement of the detentions to electric train service for the year 1909 is given in Table IV. This table includes detentions to trains from all causes. The column headed "Number of Detentions" shows the number of trains delayed, while the column headed "Minutes' Detention" shows the total train minute detentions for each cause.

In 1909 the failures of car equipment were responsible for total delays of 1568 minutes. The number of car miles per detention in that year was 17,328 and the number of car miles per minute detention was 2619. In 1910 the total number of delays due to failures of car equipment was 314 and the total detentions were 1694 minutes. In the latter year the car miles per detention were 14,497 and the car miles per minute of detention 2687.

(A complete tabulation of the causes and duration of delays due to failures of car equipment for the years 1909 and 1910 was included in the paper, but is not reproduced.—Editors.)

The paper also included a complete tabulation of the renewals of such parts as third-rail shoes, brake shoes, fuses and other details of equipment. From this table it appears that the average life of third-rail shoes was 24,020 miles and the average life of brake shoes was 5976 miles.

Table VI shows by months for the four years from 1907 to 1910 inclusive some data relating to the generation and distribution of power. An improvement will be noted in the reduction of cost of power as well as a reduction in the coal consumption per kw-hour. The most marked improvement, however, is shown in the efficiency of transmission and conversion, which is accounted for by the fact that the operation of the substations is followed up with care so as to minimize the idle operation of rotaries.

DEPRECIATION AS RELATED TO ELECTRICAL PROPERTIES*

BY HENRY FLOY

The courts repeatedly use "fair value" as the only one which should be recognized, and it is this value that the engineer must bear in mind when estimating depreciation. Fair value includes something in addition to physical values, in which the engineer is primarily interested.

There is much evidently sincere but nevertheless mistaken opposition to the application of any principle of depreciation in determining the value of going properties; and yet a consideration of what depreciation—if any—has taken place in the physical property of every corporation must be had, in order to obtain a safe—though it may be only approximate—indication as to proper or improper capitalization.

APPLICATION OF TERMS

Depreciation.—Webster defines "depreciation" as the "act or state of lessening the worth of," and in this sense it will be used by the writer regardless of the source or method of worth reduction, or by what means it may or may not be removed.

Physical Value.—This includes primarily "those things which are visible and tangible, capable of being inventoried"; but, secondarily, certain non-physical charges "which are an inseparable part of the cost of construction but which do not appear in the inventory of the completed property." These secondary values are expenditures for such items as engineers' and architects' fees, administra-

*Abstract of paper read at the twenty-eighth annual convention of the American Institute of Electrical Engineers, Chicago, Ill., June 27, 1911.

tion expenses chargeable to construction and provision for various incidentals and contingencies, incomplete inventories, unforeseen requirements, etc.

Development Expenses, Intangible or Overhead Values.—Development expenses generally cover most or all of the following expenditures:

1. Legal and other expenses of preliminary promotion, incorporation and organization, procuring consents of property owners, condemnation proceedings, obtaining franchises, consents and certificates from public service commissions and other public bodies, title examinations and insurance.

2. Technical expenses in connection with preliminary work, surveys, expert estimates, etc.

3. Interest on capital and bond issues, wages of superintendence and administration not chargeable to construction ordinarily necessary in connection with putting a property in going order; and also sometimes the deficiency in operating expenses and taxes until the property is put on a paying basis.

4. Taxes which must be paid until the property is completely a "going concern."

5. Discounts on securities, brokerage or other customary and necessary expenditures in connection with financing such an undertaking and marketing securities.

6. Reasonable promotion profit, possibly also compensation for risk of capital, estimated at 5 per cent to 10 per cent of the cash investment.

Development expenses are not ordinarily depreciated in the same way as the physical property, though some authorities have indicated that such procedure is proper. Development expenses may well be amortized. The rate of amortization might well be based on the life of the securities, whereas the depreciation of the physical property would have to be based on its rate of deterioration through life, which the Wisconsin commission reports to average for electric lighting properties 17.46 years, telephone plants 11.24 years, and electric railways 18.02 years.

Original Cost.—This refers to the actual amount of money paid for the physical property including original construction plus all additions since that time.

Cost to Reproduce New, or Cost of Reproduction.—These terms refer to an estimated value based on the cost of reproducing the physical property new, on the basis of prices current at the time of estimate—prices that fluctuate considerably are averaged for five years preceding—and includes everything that can be inventoried.

Scrap Value.—All physical property unless offset in whole or in part by cost of removal, has a certain scrap or junk value beyond which there is no depreciation.

Wearing Value.—If from the cost—taken on whatever basis is determined to be the correct one—there is subtracted "scrap" or "salvage" value of given physical property, the remainder is a value known as "wearing value," which will deteriorate and entirely pass away.

Service Value.—Physical property honestly and intelligently purchased with a view to its suitableness for the service intended, aside from some hidden defect or untoward accident, maintains its original value practically throughout its life except for such deterioration as results from wear and tear or deferred maintenance. Going value may or may not accrue in addition to and over and above service value. Going value relates to establishment of earnings while service value exists regardless of earnings.

Present Value.—The more frequent application of the term is to that value obtained by deducting from "original cost" or "cost to reproduce new" the accrued depreciation, which may be either absolute depreciation or the sum of both absolute and theoretical depreciation. Appreciation as well as depreciation must be considered in determining "present value" as indicated by the Supreme Court. (Wilcox vs. Consolidated Gas Company, 212 U. S., page 52.)

Going Value.—This refers to an estimated worth recognized by the highest courts and ingeniously figured and allowed for by at least one State commission in connection with a wise expenditure made in increasing the business of an established plant.

Good Will.—A monopoly, as is generally admitted, has no good will which can be evaluated, and the courts have sustained this view.

Franchises.—The present tendency, largely by reason of legislative enactments, is to prohibit the capitalization of franchises beyond the absolute expenditures made in good faith in obtaining said franchises.

CLASSES OF DEPRECIATION

The subject of depreciation from an engineering standpoint practically divides itself as follows:

Wear and Tear, or Maintenance.—This includes such depreciation as may ordinarily be removed or offset by proper expenditures at such time as the worn-out parts may be economically replaced.

Age or Decrepitude.—Depreciation of this sort is due to the aging of apparatus that usually has a life extending over a period of years.

Inadequacy or Supersession.—When street railway service has increased to such an extent that many and frequent small single-truck cars are required to do the work that can be done by larger double-truck cars at less cost and with less interference with street traffic, both economy and necessity compel superseding the smaller equipment by the larger, and thus, through inadequacy, investment in the smaller equipment is depreciated before the property is worn out or becomes decrepit. Furthermore, the introduction of heavier cars may make inadequate the rails and carhouses.

Obsolescence.—Obsolescence means the depreciation of property through the development of something newer and either more economical or more of a fad. By reason of rapid advance and development in the art, obsolescence has heretofore probably caused the greatest expenditure for depreciation account, unless it is wear and tear; but as time goes on obsolescence may become a less important factor, though it would probably be at the cost of improvements and development.

Deferred Maintenance.—The several classes of depreciation hereinbefore referred to assume that the property will be kept in good operating condition and efficiency. Deferred maintenance is only another term for neglect and always reflects to the discredit of the management or the financial ability of a corporation.

"ABSOLUTE" AND "THEORETICAL" DEPRECIATION

Where property is no longer of service it must be depreciated down to the value at which it may be sold, even though that value is as low as scrap value. On the other hand, apparatus that is in use and rendering a service economically may, for the purpose for which it was intended, be as valuable as when originally installed, although its age may be approaching the limit of its life.

The erroneous application of rates of depreciation in the attempt to determine present commercial values is fairly common, one of the most notable cases, because of the large amounts of money involved, being that of the Public Service Commission of New York, First District, in the matter of the Third Avenue Railroad reorganization.

The "straight-line" method of depreciation has been more largely used than any other, probably because the life of much apparatus is brief; and, furthermore, the application of this method is the most simple, direct and easily understood, and hence favored by the legal fraternity and a large proportion of the members of public utility commissions, many of whom, not technical men, naturally incline toward the more easily appreciated elements of the questions which they are compelled to consider and discuss.

As indicating the possible error in attempting to estimate "theoretical" depreciation, it is frequently found that the length of life assumed has been greatly surpassed by apparatus which is still giving reliable and satisfactory service. For apparatus still giving satisfactory service after the expiration of its assumed life it is only fair in estimating theoretical depreciation to allow a value greater than scrap value. The minimum value of all types of engines, boilers, pumps, heaters, condensers, line transformers and shafting is, at present being taken by the Wisconsin commission, for example, at 25 per cent; generators, motors, rotaries, arc lamps, wood and iron poles, 20 per cent; station transformers, 40 per cent; storage batteries, 35 per cent, and switchboard instruments and electric meters, which must be kept in a high state of repair, 80 per cent, as the minimum percentage of reduction in cost for apparatus still in use though theoretically "dead."

DEPRECIATION ACCOUNTS OR RESERVE FUNDS

For a small company or where relatively large proportions of the invested capital are locked up in few or single pieces of property, it is preferable to accumulate, in advance out of operating income, reserve funds from which to provide for all classes of depreciation. But such method may be unnecessary and possibly an inexpedient accounting complexity with large corporations, where the investments in any single piece of physical property are small relative to the total investment. In brief, where the properties are large enough depreciation becomes only normal wear and tear, but in any case operating expenses should be made to provide for ultimate loss in value, whether reserve funds are accumulated or all depreciation is charged to the "wear and tear account." It is on this theory that, a large property having numerous physical elements, all deterioration becoming simply "wear and tear" and a part of operating expenses, the receiver of the Third Avenue Railway in New York City declines to obey the order of the Public Service Commission and provides no depreciation fund whatever, simply removing deterioration when it occurs and charging it as maintenance in operating expenses.

It has been the too frequent practice in the past to regard wear and tear as the only elements of depreciation chargeable to the operating expense and to charge capital account in whole or in part with expenditures for age, inadequacy and obsolescence. The error of this procedure is now almost universally recognized and the injustice of such improper handling of depreciation to both the investor and the public served is clear.

APPLICATION OF DEPRECIATION

There has been such marked development and improvement in all mechanical appliances, particularly along electrical lines, that inadequacy and obsolescence have usually come into effect before age, and, in consequence, knowledge of the depreciation of all electrical properties due to age has not yet been fully established.

The determination of depreciation due to inadequacy and obsolescence is a particularly delicate matter, it depends so largely on local conditions and especially upon individual judgment and equipoise. Inadequacy and obsolescence usually develop so quickly that very frequently the property in question becomes inadequate or obsolete within a few weeks or months, and has depreciated to scrap value almost as soon as these classes of depreciation are recognized; a space of time entirely too brief in which to apply ordinary methods of offsetting depreciation.

Information should be collected so as to make clear the causes of depreciation and the rate at which it has progressed. For example, wear and tear would probably have to become subdivided into maintenance and accident. Obsolescence might be divided so as to show whether the obsolescence was caused by city ordinance or the invention of new apparatus. In obtaining age depreciation, care must be exercised that the apparatus is abandoned through exhaustion of life, not through inadequacy or obsolescence.

In determining the total amount of deterioration due to inadequacy and obsolescence, only those elements of the property which have clearly and unequivocally so depreciated should be written off to this account. On the other hand, in determining the rate of depreciation for making provision covering inadequacy and obsolescence, the engineer should be sure to provide a rate high enough to take care of these classes of depreciation out of the operating income.

As the United States Bureau of Internal Revenue provides that reduction in value authorized for depreciation "shall include all expense items under the various heads acknowledged as liabilities," it will be seen that the proper understanding of the question of depreciation is a vital one for those connected with corporation management, because if no depreciation fund is set up nothing can be included in the cost of operation as necessary to provide for depreciation, as would be essential in a case involving rate regulation, for example. Moreover, the State public service commissions are now generally requiring depreciation accounts and reserves on a basis to be decided by each corporation itself.

The manner of determining the amount to be set aside for annual depreciation varies, there being three general methods recognized.

a. An estimate based on a percentage of the cost of the property being depreciated. The special master in the Columbus (Ohio) case held that the amount of operating expenses chargeable to depreciation should be "5 per cent of the total cost of the plant including real estate, real estate constituting but 7 per cent of the total valuation." The present laws of Massachusetts provide in respect to municipally owned gas or electric plants that there shall be included an amount for "depreciation equal to 3 per cent of the cost of the plant exclusive of land and water-power appurtenant thereto."

b. A fixed percentage of the gross earnings. This method is sometimes taken to include wear and tear and sometimes not. The practice in this regard is illustrated by the following companies:

Name of Company.	Per Cent. of Gross Revenue Expended or Appropriated for Maintenance.	Depreciation.
Milwaukee companies:		
Railway departments	11.3	9.9
Gas, electric light and steam heat departments	6.15	8.12
United Railways Company of St. Louis	13.67	10.0
Union Electric Light & Power Co., St. Louis	4.95	16.0
Suburban Electric Light & Power Co	7.10	10.85
Detroit Edison Company and subsidiaries	6.45	10.23
Omaha & Council Bluffs Street Railway Co	...	10.0
Chicago street railways	6.0	8.0

c. On the basis of kw-hours output or car miles run. The New York Edison Company charges monthly for renewals and replacements, etc., one cent per kw-hour on current sold to general consumers in addition to wear and tear. In Cleveland 5 cents per car mile is provided to cover both maintenance and other deterioration. In Brooklyn the subsidiaries of the Brooklyn Rapid Transit System allow amounts varying from 2.7 cents to 4.4 cents per car mile for equipment of surface roads and from 1.4 cents to 2 cents per car mile for equipment of either elevated or partly elevated railways; from 2.2 cents to 2.4 cents per car mile for way and structures for surface roads; from 1.1 cents to 1.8 cents for elevated or partly elevated railways, to cover not only obsolescence, inadequacy, renewals and replacements, but also repairs and maintenance.

Total Depreciation.—From the cost should be deducted the absolute depreciation in order to obtain the present real or service value of the property. If it is desired to go further than this and obtain a theoretically depreciated value, the absolute depreciation must be increased by a theoretical depreciation determined by the use of estimated amounts to cover assumed deterioration for age and nonexistent, but expected, inadequacy or obsolescence.

Very many authorities agree that in making an estimate of the amount of depreciation effective in any property, "used or useful," there should at least be included in the amount to be deducted an estimate of the amount of wear and tear, deferred maintenance, if any, also scrap value of property that has been worn out or superseded as well as inadequate or obsolete property provided it is still inventoried.

The only allowable exception to the inclusion of inadequate or obsolete property as a part of depreciation is where inadequacy or obsolescence has so suddenly and largely affected a property that its earnings have not permitted the writing off at the time or since such developed depreciation; then in such cases it may be that capitalization or earning basis should not be reduced by taking account of any such depreciation.

Whether or not "theoretical depreciation" should be included as part of the total depreciation in determining fair value of physical property is a mooted question. The public service commissions have rather leaned to the opinion that such depreciation should be considered in determining fair value. On the other hand, many, if not all, of the court decisions are against such inclusion of theoretical depreciation.

Provided a property is kept in good order and at 100 per cent working efficiency so as to render service to the public equivalent to that of a new plant, the question of rates or value of property in its service to the public has absolutely nothing to do with the amount of reserve funds the corporation may or may not have accumulated. While the engineer must be quick to recognize loss of value where it actually exists and to make deductions for property that has been worn out or superseded, he should not be misled into including purely hypothetical or academic values.

The confused state of mind that prevails with regard to the application of depreciation in determining present value results largely from the misapplication of principles established by the courts in rate cases. These decisions expressly provide that allowances to cover the deterioration of all sorts, including ultimate replacement, are to be provided out of operating income.

FIFTY PER CENT METHOD

A quick and it seems to the writer a very fair method of obtaining the theoretical depreciation of certain classes of physical property has been used in some utility appraisals and may be called the "50 per cent method." It has been used by Prof. M. E. Cooley in connection with his figuring of depreciation in the Michigan State appraisal; H. P. Gillette in the appraisal he conducted for the State of Washington; B. J. Arnold in appraisal work for the Public Service Commission of the First District of New York, and the writer in connection with the reorganization of the Third Avenue Railway in New York City. It has, I understand, also been approved by the Master Car Builders' Association in connection with the appraisal of rolling stock. It will be seen that this method of determining depreciation will be fallacious if the installation does not consist of a large number of similar elements or has not been in use for a sufficient length of time to permit the repair account reaching its normal maximum, which it would not do unless practically all parts have been renewed once and renewals are constantly taking place; hence it could not be applied to the buildings of a corporation which owned few buildings and probably not even to engines or generators because usually they would be too few in number—except for the very largest organizations—to permit their being replaced without abnormally affecting the amount annually appropriated on account of depreciation. The net result of the application of the 50 per cent method is at once apparent; 50 per cent of the cost, less salvage, will be immediately written off as depreciation.

DEPRECIATION OF CONTINGENT PERCENTAGES

The percentages added to structural costs to cover engineering, incidentals, contingencies, etc., in order to obtain physical values have usually been considered an inherent part of the cost of the physical property and treated as such in connection with the depreciation of the physical property. With certain parts of the property this is undoubtedly a correct procedure and for the sake of simplicity and consistency may be recommended; but, as a matter of fact, the original engineering investment in certain parts of the physical equipment, for example, roadbed and track, still remains there and is as much a part of the property as the real estate, although the rails and ties, which have been cited, may have been many times relaid and paid for as a part of operating expenses. It would be no more unreasonable to leave such investment percentages undepreciated than it is to depreciate the physical property entirely independent of development expenses or going value, which seldom, if ever, has been practised. It has been held by some that the discount on securities should be written off at the same rate as depreciation of the physical property; but the more usual plan is to amortize such costs at a lower rate, determined by the life of the bonds. In some cases it may not be advisable to amortize investments of this character at all.

SUMMARY AND CONCLUSIONS

1. The necessity for a more general agreement on and uniform use of the terms used in considering and discussing depreciation.

2. The rate of depreciation adopted for accruing depreciation must not be confused with the total sum of depreciation in physical property, which is an estimate for a given time.

3. The difference between absolute and theoretical depreciation should be recognized and the amounts separately considered.

4. Theoretical depreciation must be assumed and provided for as operating expenses if capital is to remain unimpaired and rates are to give maximum service at minimum expense.

5. Service value, determined from consideration of the "absolute" not the "theoretical" depreciation of physical property, is to be used, in connection with certain proper non-physical values, as the basis on which rates are to be fixed, capitalization allowed and taxes assessed.

6. While usually preferable, there exists no necessary reason for always writing off certain costs such as engineering, incidentals, etc., at the rate at which the physical property of which they are an inherent part is depreciated.

7. Development expenses bear no fixed relation to the cost of the physical property and their amortization has no necessary relation to the rate of depreciation of the physical property.

8. The amount of depreciation of physical property can be accurately determined only by inspection on the part of competent and conscientious engineers.

9. There exists an urgent demand for co-operation among engineers, manufacturers and service corporations for the intelligent collection and correlation of data on which properly to base estimates of depreciation.

Mr. Dalrymple, general manager of the Glasgow Corporation Tramways, Glasgow, Scotland, has submitted an interesting report to the Town Council on the question of equipping the Glasgow cars with vestibules. Several years ago various devices were tried to protect the motormen, but these were all unsuccessful. The present vestibule incloses the whole platform including the steps. After its experience of twelve months with the present vestibule the committee has decided to equip every car in service with the full vestibule.

LET THE PUBLIC KNOW*

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

Let the public know; tell them all about yourselves. It is a duty you owe not only to the people but to yourselves as well.

Of all the modern inventions of urban and suburban life developed within the past half century none has been so wonderful in its growth and ramifications as the electric street railway. Yet because of the misrepresentation of those with ulterior motives, supplemented by the non-presentation of the real facts by those who know, abuse is heaped upon the electric railways.

To-day you introduce to a municipality this wonderfully comfortable means of annihilating time and space and you are hailed as a giver of new life, but a year from to-day the same people will not be greatly adverse to placing you on the cross of craping criticism. To-day you invest all the money at your command, adding to it all the credit you can obtain, in rails, cars and power, all the best products of the art, and then give a service far beyond the wildest dream of the most optimistic citizen, but a year from now your track, your cars, your power and your service are condemned as being antiquated: Your critic continues to live in the same house, use the same furniture, eat from the same dishes, content in the belief that he is doing what is proper. He can readily see the financial folly of wiping out his investment, but he doesn't understand why you should not scrap a $5,000 car. The average citizen goes to his butcher and asking the worth of meat is told and believes; he goes to his tailor and asking the worth of clothing is told and believes. But when this citizen comes to you asking what it costs to make his street car ride possible and is told, thereupon you are made chief in the Ananias club.

The prevailing opinion of the public had its origin in your own lack of comprehension of what you started out to do. In the beginning all you planned was the substitution of motors for horses. You could give, you believed, the same service—perhaps a little better service—at a less cost. Your original cars and their duplicates would do; to them you would fasten motors and string up some wires from which to secure the current of electricity. You would save the cost of feed and the loss of dollars by sickness, old age, or death of animal power. Coupled with these was the certainty of somewhat shortening the running time, so you figured it out that you could perform the public service of transportation not only better but cheaper. You proceeded by contractual relations to perform this service at rates that have since proven to be far less than they should have been. Others, lured by the pot of gold at the end of the rainbow and with less knowledge than you, entered the field with even rasher promises than you believed you could fulfil. You found that the mystifying motors required larger cars and then the larger cars required larger motors. With larger cars and more powerful motors came greater speed, which required rails and roadbeds of costly design. The development of the industry has been a constant succession of putting in new capital and still more capital, with the scrap heap growing apace long before even a fractional portion of the original investment has been returned.

The people have been served lavishly. You have made it possible for them to live far from the smoke and noise of shop and factory; you have given them a means of transportation within the city faster, more frequent and more certain than human mind ever thought possible. You have spread the cities out into the country. You have done all these things, but so intent have you been upon your work that, even though through bitter experiences you have learned that deficits are not surpluses and depreciation must some time be met, you have not set about to tell the user of your street car that every five-cent piece he pays is far from being all profit. You have not gone about it scientifically. To-day your car shops are scientifically organized; you employ engineers to do your track building; you make use of chemists; operating departments are in the hands of men of wide knowledge of the public's needs; you are quick to locate defects in your internal organization, but you have not yet brought to an equally high standard a public information department.

To-day several of the states and provinces have begun a scientific study of the art of transportation through trained men in the employ of the railway commissions. There is deeper investigation of the problem than ever before and eventually the knowledge gained will seep through to the minds of the people. This knowledge should not all be theoretical; the difficulties besetting practical men must be made known in order that there be a clear comprehension. Each railway should do an active work in properly educating the public with which it is in immediate and constant touch.

No public utility receives so much attention to-day in the press as is given to electric railways. Day after day and year after year the name of your railway appears in public print, often with words of truth, often with words of falsity. Occasionally you are being given credit for doing something for the public good and more often you are being accused of crimes you never committed. If a nagged conductor and a crabbed passenger have a quarrel, headquarters are given the blame; if a transfer is wrongfully issued, it is done on the advice of the president of the company after months of consultation with the directors, and should some one coming around the rear end of one car be run over by the car going in the opposite direction it is, of course, all deliberately planned by the general manager. Your patron may oversleep and perforce have to snatch an unsatisfactory breakfast, but you must have the car ready for him when he reaches the corner. Similarly you are to blame because you do not buy cars enough and build tracks enough and have an abundance of car crews on hand to take back the armies from the shop, the factory and the ball game within the space of five minutes or less. That the butcher and the grocer cannot assuage one's wants promptly is no excuse for you.

Why not intelligently try to direct the information that goes out broadcast among the people whom you transport? They are entitled to know what you are doing and why you are doing it. You should tell them that your prosperity means their good service and their prosperity means still better service. Let them see that there is a proper, decent relationship between you as the common carrier and them as the riders. Take them into your confidence.

No matter what may be the motive of the man higher up in newspaper control, it should be remembered that the reader believes in what his paper tells him. His newspaper is the source of his information and his school of instruction. The very fact that a man reads a certain paper is the best evidence that he believes it it from first column to last, including, sometimes, the advertisements. Your average citizen believes his newspaper is published primarily to furnish him with local and world information, and so he necessarily believes he is being honestly dealt with, but on the real purposes of the man higher up he has never had occasion to ponder. Make the giving of news a definite department of organization with the same attention to it as to other departments. Let the public know what you have done and what you are doing. Let the public know of your new appointments and of your accidents. Let the public know of your schedule changes, of where you add to the service and where you take off and why.

*Abstract of a paper read at the twenty-eighth annual convention tion, Windsor, Ont., June 6, 1911.

Municipal corporations, through clerks and departments, let the public know what is going on because the public is interested. You should do no less. Don't be afraid of printer's ink. Let the public know.

RECENT LEGISLATION AFFECTING ELECTRIC RAILWAY ACCOUNTING.*

BY HENRY J. DAVIES, SECRETARY AND TREASURER CLEVELAND RAILWAY

Two general classes of laws have been enacted within the past few years affecting the accounting of electric railway and lighting companies: First, laws providing for the creation of railroad commissions, or public service commissions, having jurisdiction not only over steam railroad companies, but also over electric railway and other public service corporations, and for the making of annual reports to those commissions containing more or less minute details of earnings and expenditures; and, secondly, laws providing for the taxation of such corporations and the making of reports of securities outstanding and the value of properties owned, as a basis for the assessment of taxes.

These laws have a tendency to induce accurate, clear, open, simple accounting that can be understood by investors and that will lead to more accurate knowledge on the part of the public generally of the real cost of electric railways and the expense of maintaining and operating them.

Under these new laws the accountant becomes as important an officer of the State or the public service corporation as the lawyer or the engineer. He takes equal rank with them. His advice is as necessary as theirs.

In addition to these laws, some of the States—Illinois, for illustration—have passed laws to authorize cities to acquire by purchase or condemnation the property of existing street railway companies; and some cities, in States where municipal ownership of street railways is not authorized by law, notably Cleveland, have granted franchises, or are contemplating the grant of franchises, containing options to the municipalities to purchase the properties of the companies. When cities are making plans to buy street railways at the cost of producing them, and when, at the same time, the taxing officers of cities, counties and States are reviewing the railways for the purpose of placing upon them as high a valuation as possible for taxation, there is little inducement or temptation for street railway companies to place upon them any value but their actual value; and they may, in returning their properties for taxation or in optioning them to the public, safely produce their books, which, of course, should show not only the cost of the physical property, but its present condition as indicated by maintenance reserves to provide for depreciation from wear, and sinking funds to provide for the amortization of that difference that always exists between the par of the outstanding securities of a corporation, even though the capitalization be equal only to the exact cost of constructing the road and the actual value of the plant in average working condition.

If the work of the accountant does not show accurately the cost of production and the relation of outstanding securities to property accounts, it may be difficult to explain why the officers of the company present arguments to taxing officers that are apparently inconsistent with arguments advanced in support of a high valuation of physical property, if the property is to be bought by the franchise-granting authority, or if dividends are to be limited to a fixed rate upon that value. Of course, there will be differences in opinion as to what should be included in the price that a municipality ought to pay for a railway property, even when the basis for fixing the value is agreed upon, and as to what should be included in the taxable value of such a property. Overhead charges are unquestionably a proper part of the cost of producing a railway, and should be included in the purchase price. They should not be included in the value placed upon street railway properties for the purpose of taxation unless they are included also in the value placed upon the properties of all other corporations, firms and individuals. They are more difficult of ascertainment in negotiations for placing a value upon an old property, the cost and current value of which are not definitely shown upon the books, than in the case of new properties, or additions to old properties, the cost of which, under the standard system of accounting, is properly shown in the company's accounts.

Laws providing for the appointment of railway commissions and for the taxation of public service corporations should be as fair and just to the corporations as the corporations are expected to be to the State. This remark is suggested by the title of the Michigan law for the creation of a railroad commission, viz.:

"An act to define and regulate common carriers, and the receiving, transportation and delivery of persons and property, prevent the imposition of unreasonable rates, prevent unjust discrimination, insure adequate service, create the Michigan Railroad Commission, define the powers and duties thereof, and to prescribe penalties for violations thereof."

This title seems to accuse the railroad companies of being unreasonable in the making of their tariffs, partial, unfair and unjust to their patrons, and disposed to give the people inadequate service. Of course, these conditions should be prevented; but a law that defines its purpose to be to insure reasonable rates, adequate service and justice, not only to the public, but to the corporations that serve the public, will accomplish every purpose of the act referred to, and do it without reflection on those citizens of the State who are lawfully and honorably engaged in the transportation business.

OHIO

Under recent Ohio laws electric railway companies of that State are required to file three annual reports, two with the Tax Commission, one of which must contain a statement of the company's gross earnings, on which a tax of 1.2 per cent is collected by the State. The other must show the number of shares of capital stock, the par and market value thereof, the amount of capital stock subscribed, the amount of capital stock actually paid in on stock subscriptions; a detailed statement of the real estate owned by the company in Ohio, where situated, and the value thereof as assessed for taxation; a full and correct inventory of the personal property, including moneys, investments and credits, owned by the company in Ohio, where situated, and the value thereof; the value and a general description of the real estate owned by the company and situated outside of Ohio, and a description or inventory of the personal property owned by the company outside of the State, giving the location thereof and its value; the total amount of bonded and other indebtedness; the gross receipts; the gross expenditures in detail; the length of line within and without the State, its character and value; the character, classes, number, values, locations, ownership or control and use of rolling stock; the actual value of depots, station houses, section houses, freight houses, machine and repair shops, and all other buildings, structures and appendages connected thereto, including machinery and tools; all telegraph and telephone lines, and their value; and the gross earnings for the year, within and outside of the State.

The elaborate blanks prepared by the Tax Commission for these reports have, because of their detail, and because they call for information that has not in many cases been on the books of the railway companies, re-

*Abstract of paper read before Central Electric Accounting Conference, Springfield, Ill., June 24, 1911.

quired a great deal of work on the part of the accounting departments of the electric railway companies. They seem to call for more information than is necessary for the purpose of carrying out the provisions of the law, and the arrangement of the statistics is illogical. A revision of the form will probably be made within the current year.

The third report is required by the new public service commission law. The form of report has not yet been prepared.

Section 12 of the new law provides that a system of accounts shall be established by the commission which, when practicable, shall conform to the system provided by the Tax Commission of Ohio. It is likely, therefore, that the report required by the Tax Commission will answer the purpose of the reports that the Public Service Commission will ask the railway companies to file. Section 12 is as follows:

"The commission may establish a system of accounts to be kept by public utilities, or classify utilities and prescribe a system of accounts for each class, and prescribe the manner in which such accounts shall be kept. Such system shall, when practicable, conform to the system prescribed by the Tax Commission of Ohio. It may, also, in its discretion, prescribe the form of records to be kept by public utilities, and the commission may require that no other records be kept, except as may be required by the laws of the United States or as may hereafter be required by the laws of this State. The commissioner shall at all times have access to all accounts kept by public utilities, and may designate any of its officers or employees to inspect and examine any and all such accounts. The commission may, if it shall determine that any expenditures or receipts have been improperly charged or credited, order the necessary changes in such accounts."

The report to the Tax Commission takes the place of the returns of personal property for taxation heretofore made by public service companies to county auditors.

MICHIGAN

The laws of Michigan require reports from common carriers, including electric railway companies, similar to the reports required by the Interstate Commerce Commission, on blanks prepared by the Railroad Commission.

PENNSYLVANIA

The laws of Pennsylvania provide for a tax at the rate of 5 mills upon each dollar of the actual value of the entire capital stock, common, special and preferred, of street railway companies and other corporations; and, for the purpose of determining the amount of this tax, corporations must file with the State a report for each year ended the first Monday of November, showing the amount of capital stock authorized, the amount of stock sold in the year, the amount and rate of dividends paid, the earnings, the expenditures, the amount of funded and floating debt, the amount set aside for sinking funds, the surplus, the cost of the road or line, the cost of equipment, of real estate and buildings, of securities of other companies, the amount of cash and current assets, etc. The president and the secretary or treasurer of each company are required to take an oath to estimate and appraise the capital stock of the company at its actual value in cash, and then to make such estimate and appraisal of the actual value in cash of the capital stock "as it existed beween the first and fifteenth days of November, not less, however, than the average price which said stock sold for during said year, and not less than the price or value indicated or measured by net earnings or by the amount of profit made and either declared in dividends or carried into surplus or sinking fund, and not less than the actual value indicated or measured by the intrinsic value of its tangible property and assets, the extent and value of its good will and franchises and privileges, and the material results of their exercise."

ILLINOIS

I have not had an opportunity to study, or even see, the latest law of Illinois on this subject. The law of that State authorizing municipal ownership and operation of street railways requires a great deal of accounting work.

INDIANA AND KENTUCKY

I wrote to the railway commissioners of Indiana and Kentucky some weeks ago for a copy of the laws of those States relating to the taxation of electric railway companies and the making of reports by them, so as to be able to incorporate in this paper the provision of the laws of the six States represented in the conference, but have received no reply to my letters.

UNIFORM ACCOUNTING

It would seem desirable that the laws of all the States on the subject of public service accounting be uniform, that the system used as to street and electric railways be the standard system of the American Electric Railway Accountants' Association and the Intersate Commerce Commission, and that one or more of the members of every public service commission be a public service accountant, or a man of practical experience, familiar with the accounts that he is to check.

CHICAGO

The franchises that have been most widely discussed within the past few years are those granted to the Chicago railway companies in 1907, and the Cleveland Railway in 1909. They illustrate or indicate the modern tendency toward government control of railways, containing provisions by which the councils of the two cities may require operation at lower rates of fare than the maximum rates prescribed by the franchises. In the grants of both cities unusual recognition is given to accounting. In the Chicago franchises the most important features, perhaps, are those providing for a board of supervising engineers; in the Cleveland franchise the most important are those relating to accounting.

CLEVELAND

The Cleveland ordinance contains many provisions on the subject of accounting.

In a paper read before the American Electric Railway Accountants' Association last year, I called attention to some of the accounting features of this franchise. It contains one imperfection, from an accounting point of view, that was not mentioned in that paper. The grant provides that the property of the company shall be maintained in such good order and condition that it shall at all times be worth 70 per cent of the cost of reproducing it, and provision is made for a maintenance fund of about 5 cents per car mile for this purpose, but if the value of the property, plus the amount accumulated in the maintenance and renewal fund, shall at any time aggregate more than 70 per cent of the reproduction value of the entire system, the maintenance allowance may be diminished.

These provisions protect the stockholders as to the property that existed at the time the capitalization, or "capital value," to use the phrase of the franchise, was fixed, it having been fixed at the depreciated value of the physical property, plus the value of franchises and one or two other intangible items. But the same provisions apply to property acquired since Jan. 1, 1908, the date of the valuation of the property in existence at the time of the passage of the ordinance, and all that may be added from the present time to the end of the term of the grant, and no provision is made by the ordinance, or permitted by it, for a sinking fund to take care of the difference between the cost of the new property and the 70 per cent of its value, which is assumed to represent its average working condition. The grant contains an option to the city to purchase the property at its termination at a price to be agreed upon between the city and the company, or to be fixed by a board of arbitrators, the price to be the cost of the reproduction of the physical property, less a reasonable amount

for depreciation, and plus 10 per cent. Nothing is to be paid for the company's franchises.

This means that in case of purchase by the city at the end of the grant the stockholders will receive but 70 per cent of their investment, if the new property has depreciated in value 30 per cent. If, during the remainder of the life of the grant, the company should spend $20,000,000 for extensions, betterments and permanent improvements, and if then the city should elect to purchase, having obtained power from the State to do so, it will obtain for $14,000,000 property which cost the stockholders $20,000,000, and the stockholders will lose $6,000,000 of their investment, less, of course, the 10 per cent bonus. This is on the assumption that all of the new property will have depreciated 30 per cent. The company has asked that the ordinance be amended so as to permit it to accumulate a sinking fund to take care of this 30 per cent depreciation, and has pointed out that a tenth of a cent per passenger will be sufficient for the purpose. Another tenth of a cent per passenger would provide for the value placed by Judge Tayler in his capitalization of the company upon the franchises held by the company on Jan. 1, 1908, for which the company is to receive no compensation in case of purchase by the city at the termination of the franchise. The city so far has declined to consent to the suggested amendments. The city street railroad commissioner, however, has recommended the adoption of an amendment changing the price to be paid at the end of the grant to the par value of all outstanding bonds, floating debt and capital stock. This would protect the investment if there were any way of compelling the city to pay the price; but it is not likely that the city will be willing to pay the company the entire cost of physical property that is worth but 70 per cent of its cost, and to pay in addition nearly $4,000,000 for franchises that expired twenty-four years earlier.

The franchise contains provisions indicating that it was the intention of the city and the company that the capitalization should be equal only to the value of the company's physical property, and that the investment should be fully protected. The preamble, for illustration, declares it to be the purpose of the ordinance "to secure to the owners of the property invested in street railroads security as to their property and a fair and fixed rate of return thereon"; and Section 47 contains this provision: "The purpose of this ordinance is to establish and settle the relations between the city of Cleveland and the Cleveland Railway Company by a contract which will secure to the Cleveland Railway Company, unimpaired, the capital value."

But the ordinance makes inadequate provision for the carrying out of the purpose so declared. I have confidence enough in the people, however, to believe that before the expiration of the grant an amendment will be made that will protect the entire principal of the stockholders, or that, if the city should elect to purchase at the end of the franchise, the declaration, frequently made in the ordinance and in the discussion that preceded its passage, of intention to make the investment of capital safe and secure, will be treated as a moral, if not a legal, obligation on the part of the city to pay, or to require its nominee to pay, for the property its whole capital value.

The Illinois act of 1903 "to authorize cities to acquire, construct, own, operate and lease street railways" contains somewhat better provision on this subject. In that act the City Council of any city that may decide to operate street railways is given power to fix rates and charges, "but such rates and charges shall be high enough to produce revenue sufficient," among other things, "to permit the accumulation of a surplus or sinking fund to meet outstanding bonds." And if the city shall purchase any street railway property, it may include in the price to be paid therefor "the value of any earning power of such property, or of the unexpired portion of any franchise granted by said city."

STANDARD CLASSIFICATION OF ACCOUNTS

The classification of accounts adopted by the American Electric Railway Accountants' Association in 1897 was the first attempt by the electric railway companies of the country to form a standard system of electric railway accounting. It was the product of many months of work of a committee appointed by the association for the purpose. The value of the work of the committee was recognized at once, not only by electric railway officers, but by the Interstate Commerce Commission and by State railroad and public service commissioners. By frequent conferences and correspondence with public officials, steam railway accountants and others, the committee on standard classification of accounts has kept fully abreast of the times, and has produced a system of accounting that, for simplicity and clearness, without disregard of details, is probably equal to, if not better than, any system of accounting in any other business, and that, if reports based upon it are properly made and carefully studied by the managers of electric railways, will result in economies that could not be brought about without such standard systematic accounting. The reports may be made still more valuable when opportunity exists to compare them with like reports of other corporations in the same business.

The Central Electric Accounting Conference has done good work along the same line. Such meetings as the conference holds quarterly and the American Electric Railway Accountants' Association annually educate not only the members who attend the meetings, but the other officials of the companies directly interested, and indirectly the general public.

The rulings or decisions of the Interstate Commerce Commission, the Public Service Commissions of New York and the steam and electric railway commissioners of other States on questions of accounting, published in bulletins or pamphlets, constitute a valuable and informing record of present day accounting that should be in the library of every electric railway company, and railway accountants should avail themselves of the opportunity of submitting to these bodies any important question about which they have doubt, or as to which they are in disagreement with municipal or State authorities.

MEETING OF THE CENTRAL ELECTRIC ACCOUNTING CONFERENCE

The seventeenth regular meeting of the Central Electric Accounting Conference was held at the St. Nicholas Hotel, Springfield, Ill., Saturday, June 24, 1911.

The morning session was called to order at 9 o'clock by President Elkins. After the routine business of the conference was disposed of, the members listened to the address of H. J. Davies, secretary and treasurer of the Cleveland Railway, an abstract of which is printed elsewhere in this issue under the title "Legislation Affecting Electric Railway Accountants." At the conclusion of this paper Mr. Davies answered many questions touching the subject of accounting features of the recent statutes governing electric railroads. He asked permission of the conference to present at some future date more information on this line as a result of investigations into the subject.

C. B. Baker, auditor Toledo, Bowling Green & Southern Railway, tendered his resignation as a member of the executive committee, and the vacancy was filled by the appointment of J. D. Maynes, auditor of receipts Illinois Traction System.

The question of affiliation with the Central Electric Railway Association was informally discussed, and the matter of official action deferred, on account of the fact that a representative number of accountants were not present at the meeting. The next regular meeting will probably be held at the same time and place as the meeting of the Central

Electric Railway Association. The report of the subcommittee on affiliation was referred to the full committee, with instructions to report again at the next meeting. This committee is as follows: A. F. Elkins, chairman; E. L. Kasemeier, Walter Shroyer, H. B. Cavanaugh, L. T. Hixson and J. D. Maynes.

After adjournment of the morning session, the members of the conference were guests of the Illinois Traction System officials at an informal luncheon. In the afternoon President McKinley's private car was placed at their service and the members and friends were given a special run into St. Louis over the new McKinley Bridge.

JUNE MEETING OF CENTRAL ELECTRIC RAILWAY ASSOCIATION

The annual outing meeting of the Central Electric Railway Association was enjoyed by more than 100 railway and supply men. The meeting was held at the Edgewater Club, St. Joseph, Mich., where most of the railway men were entertained. St. Joseph is one of the most popular summer resorts on the Great Lakes and entertainment was provided in abundance by the local street railway and the Business Men's Association, the Graham & Morton Transportation Company and the Edgewater Club. About thirty ladies attended the convention.

LONG-DISTANCE TROLLEY TRIPS

A noteworthy feature of this convention was the traveling of practically all of the railway men and their wives to and from St. Joseph in special cars of the Terre Haute, Indianapolis & Eastern, Indianapolis, Crawfordsville & Western and Louisville & Northern Railway & Lighting companies. The first long-distance trolley party to arrive at the convention city consisted of fifty-three persons in the car of the Indianapolis, Crawfordsville & Western, which left Indianapolis at 7 a. m. and reached St. Joseph, 234 miles distant, at 3 p. m. This long run was made over the Indiana Union Traction line from Indianapolis to Peru, the Winona Interurban from Peru to Goshen and the Chicago, South Bend & Northern Indiana from Goshen to St. Joseph.

The second car to arrive was the private car, No. 600, of the Terre Haute, Indianapolis & Eastern Traction system in charge of E. B. Peck, vice-president and comptroller, who is also president of the Central Electric Railway Association. This car left Indianapolis at 6 o'clock in the morning and was routed via Anderson, where Mr. Peck's party was joined by Arthur W. Brady, president, and H. A. Nicholl, general manager, of the Indiana Union Traction Company. At Peru the car was met by William D. Frazer and C. F. Franklin, who escorted the party over their 69-mile road, the Winona Interurban Railway. At some points on this line speeds exceeding a mile a minute were sustained for several miles. At noon, while en route, Mr. Peck entertained his fourteen guests with an elaborate dinner served from the very complete kitchen on this fine private car. The party reached St. Joseph at 3:15.

On the return trip from St. Joseph to Indianapolis private car No. 600, of the Terre Haute, Indianapolis & Eastern Traction Company, made the 234-mile run in 8 hours and 27 minutes. The time over the different roads making up the interline route was as follows: St. Joseph to Goshen (Chicago, South Bend & Northern Indiana), 58 miles, 2 hours and 45 minutes; Goshen to Peru (Winona Interurban Railway), 69 miles, 2 hours and 10 minutes; Peru to Indianapolis (Indiana Union Traction), 107 miles, 3 hours and 22 minutes.

The longest trolley trip made in reaching the convention was that of the Louisville & Northern Railway & Lighting Company's party, which left Louisville at 7 o'clock in the morning and made the run of more than 350 miles in less than twelve hours' time. Twenty-two railway men and their guests made up the party.

ENTERTAINMENT FEATURES

On Wednesday afternoon the convention visitors were guests of the Graham & Morton Transportation Company for a two-hour steamer ride on Lake Michigan. In the evening of the same day the Benton Harbor-St. Joseph Railway & Light Company entertained with a trolley ride from St. Joseph through Benton Harbor to the Springs of Eden and the summer park owned by a peculiar religious sect, the headquarters of which are known as "The House of David." On Thursday, while the meeting was in session, the ladies of the party were tendered an interurban car ride on the Benton Harbor-St. Joe Railway to Paw Paw Lake, and on their return at 1 o'clock were given a luncheon at the Edgewater Club. About forty ladies were thus entertained.

CONVENTION SESSION

The single business session of the convention was held on Thursday morning, with E. B. Peck, president, in the chair. At the opening of the session Colonel W. W. Bean, who has long been interested in electric railway affairs, welcomed the railway men to St. Joseph in a fitting speech in which he called attention to the recently completed through interurban routes from St. Joseph to all parts of Ohio and Indiana and to Northern Kentucky. A. W. Brady and Charles L. Henry replied in fitting speeches, expressing the association's appreciation of the hospitality of the local people.

STANDARDIZATION REPORT

The minutes of the Columbus meeting were read by A. L. Neereamer, secretary, and approved. H. H. Buckman, chairman of the standardization committee, then presented tthe report of that committee, which will be found on page 31 of this issue. When questioned Mr. Buckman said that the manufacturers of air brakes approved the recommendations made in the committee report. Some general discussion was had on the advisability of approving the suggestion of the committee regarding the use of electropneumatic conductors' train signals and as a result it was voted that this section be eliminated from the report at this time, and that the matter be considered further by the committee. With this exception the standardization committee report was adopted.

Thirteen new supply members were voted into the association. Mr. Neereamer read a letter from H. C. Donecker, secretary of the American Electric Railway Association, expressing his regret at not being able to attend the meeting and urging close co-operation between the two associations.

REMARKS OF MR. BRADY

The president then called upon Arthur W. Brady, president of the American Electric Railway Association, who spoke of the American Association affairs and cited the work of the block signal committee and the insurance committee as among the most important features now being carried forward for the benefit of the member companies. Mr. Brady said that the joint signal committee of the Engineering and Transportation & Traffic Associations had just held a successful meeting at Pittsburgh and was preparing a report on block signaling as applied to electric railways which would contain very valuable material not heretofore presented in available form. Until ten months ago no real study had been made of the subject of block signaling for cross-country interurban railways. Druing this year, however, considerable progress had been made and practical results might be expected from the forthcoming report.

Mr. Brady called attention to the organization of the Bureau of Insurance of the American Association. This bureau was expected to procure practical and financial results. Insurance work had been especially well handled

under the guidance of H. J. Davies, of Cleveland, as chairman of the insurance committee. Before the insurance committee began its work it seemed that traction property insurance had been unduly profitable to the insurance companies, notwithstanding numerous large fire losses. The successful work of the insurance committee under Mr. Davies' guidance had resulted in the formation of the bureau, which would be in charge of Henry N. Staats, of Cleveland.

Mr. Brady next spoke of the policy of the American Association, which was not to duplicate any work done by sectional bodies, and was to work in harmony with each association. If any friction had existed in the past it had been eliminated.

Mr. Peck announced that the executive committee of the Central Electric Railway Association had approved the appointment of Henry N. Staats to the same position with it and with the same duties that he now has in connection with the American Association. His services will now be available to member companies and plans under which work may be carried forward will soon be issued by Secretary Neereamer.

Mr. Peck also called attention to the forthcoming visit to Indiana and Ohio of the equipment committee of the American Electric Railway Engineering Association, which would be for the purpose of inspecting rolling stock practices in the Central Electric Railway Association territory. He also announced that through the courtesy of the Graham & Morton Transportation Company those attending the convention would be tendered free transportation and free berths on the night boat to Chicago.

WOOD PRESERVATION

A paper on the advantages of the use of treated timber was next presented by C. P. Winslow, of the Forest Service Department, United States Department of Agriculture, Madison, Wis. This paper, which was printed in abstract in the Electric Railway Journal of June 24, page 1110, was illustrated with numerous lantern slides. At the beginning of the discussion Mr. Winslow, when questioned, replied that probably the most satisfactory timber treatment for the ties of the traction lines in the Central States would be the use of creosote. This would give the most economical results in the long run. Electric railway ties were not subject to severe rail wear and so it was profitable to give them such treatment as would obtain the longest life of the wood. Mr. Winslow spoke of the results of treating steam railroad ties with zinc chloride and with zinc chloride and creosote. The creosote was added to bring the life of the tie up to its mechanical life as determined by rail wear. He said, however, that as zinc chloride was soluble in water it was not well adapted for localities which had heavy rainfalls and wet roadbeds.

He estimated that, with a treatment of ½ gal. of creosote per cubic foot, ties would be preserved beyond their mechanical life. This small amount of preservative would probably best be applied by the empty-cell treatment; that is, filling the cells and then applying the highest degree of exhaustion. The resultant life would be from ten to twelve years. A more generous treatment should afford a life of sixteen to twenty years, if a good penetration was obtained through the sap wood. The exact amount of preservative necessary, however, would depend largely on the nature of the wood.

R. M. Hemming, Columbus, asked how it was possible to know that ties had been treated properly, citing that the small roads could hardly afford to send an inspector to the plant. Mr. Winslow replied that the simplest way would be to saw up a tie and see if the sap wood had been penetrated. If the exact nature of the impregnating material was desired it would be necessary to grind up a portion of the treated wood and have the preservative contained therein analyzed. Mr. Winslow cautioned against the cutting of tie timber in the spring because of the danger of checking and early rot. When treating timber it was well to force in the preservative as far as possible, but full impregnation of the heart would be rather difficult. The speaker said that subjecting wood to vacuum did not affect its strength, but treatment should not subject the wood to over 220 deg. temperature or 20 lb. pressure.

C. L. Henry, Indianapolis & Cincinnati Traction Company, called attention to the good results obtained throughout the country by tie preservation and to the act that only one or two traction companies in the country were prepared to treat their own timber. He felt that the Central Electric Railway Association had the ability to point out a practical plan and lay down a proper schedule for the handling of timber by its members. Thus the practical results based on the experience of others would be obtainable for all. As the result of Mr. Henry's arguments the association voted to instruct the executive committee to appoint a committee to consider further the matter of timber preservation.

Mr. Henry also spoke of the desirability of planting trees. He said that one interurban road in Indiana was using 80,000 ties this year for renewal purposes and that it would be very desirable to have a supply of timber growing along the right-of-way.

Frank P. Smith, Indianapolis, Columbus & Southern, said that the timber preservation plant installed by his road had been profitable. The treatment given was greatly increasing the life of ties, poles, crossing planks and all other timbers. It was the policy to treat all timber except that which would be worn out mechanically before the preservative could have the opportunity of extending its life. The history of timber preservation on his road had been that some years ago considerable loss was experienced by installing in the track ties which had begun to rot. The next ties to be installed were treated by the open-tank method and these were put in the track alongside of other untreated ties for observation. Since then many of these untreated ties had been replaced, but the treated ties were still in good condition. Mr. Smith cited his experience in buying ties. He had seen a great many trees cut which would yield only one tie. As a result of observing this apparent waste of timber his company had bought about 500 acres of young timber and was prepared to hold them until the trees could profitably be cut for ties.

Mr. Winslow, replying to Mr. Hemming's inquiry, said that fence posts could profitably be treated by the open-tank method. He recommended treating the butts only and to a height of about 6 in. above ground. This could be done by setting them in an open tank in which the creosote was heated to about 200 deg. The treatment should last for two hours.

OVERHEAD CONSTRUCTION

A paper on overhead construction, by Edward Heyden, superintendent of overhead construction, Indianapolis Traction & Terminal Company, brought forth a spirited discussion on the relative merits of different materials. An abstract of this paper was printed in the Electric Railway Journal of June 24, page 1110. Mr. Heyden pointed out in the discussion that span wires should last much longer on interurban roads than on city roads because of the freedom in the country from smoke and sulphur. He hardly felt that the span wire now sold in the open market was up to the standard of that sold a few years ago. Also, the galvanizing was not so well done. Mr. Heyden spoke of experimenting with copper-clad steel trolley wire which had been installed on one of the most severe curves in Indianapolis. This was a No. 00 round wire put up in April, 1909. It had outworn two sets of ears and was still in good condition. The life of ordinary trolley wire had been exceeded considerably.

A representative of the Westinghouse Electric & Manufacturing Company spoke of a 2-mile catenary line built alongside of the Pennsylvania Railroad at the Westing-

house works east of Pittsburgh. This line was subjected to the smoke from more than 150 trains a day, as well as smoke from the Westinghouse plant. It had been in use for six years and included 7/16-in. double galvanized wire which was now in good condition, although some ½-in. malleable extension arms that had been japanned when new were now eaten away.

Considerable discussion developed on the proper length for trolley splicing ears, Mr. Heyden recommending a length of from 10 in. to 12 in. Regarding wood strain insulators, while Mr. Heyden had had no bad experiences with them from electrical breakdown, some had been broken by blows from the trolley wheels, and so now none were installed where they might be hit by the trolley poles.

Mr. Buckman spoke of the changes that had taken place in the design of trolley bases. In earlier years it was customary to use trolley bases in which the tension decreased as the pole was raised. When speeds became higher that principle brought about trouble. Now he favored the use of ball-bearing bases in which the tension was increased as the pole raised. When questioned Mr. Heyden said he did not think it would be economical to use all-steel trolley wire supplemented with copper feeders because of the heavy current drawn at 500 volts.

LOW-PRESSURE TURBINES

An illustrated talk on the application of low and mixed pressure turbines to existing electric power plants was made by H. C. Fairbanks, of the turbine department of the General Electric Company at Schenectady. Mr. Fairbanks' remarks were illustrated by a large number of lantern slides showing the development in the design of steam turbines and indicating that the days of experimental work had largely passed. He first called attention to the installation of low-pressure turbines made in 1905 in the plant of the Philadelphia Rapid Transit Company. These machines were still operating satisfactorily, as were the 7500-kw low-pressure turbines which had been installed in the Interborough plant in New York after a very exhaustive preliminary investigation. Mr. Fairbanks said that with average load conditions and low-pressure turbines an increase of 25 per cent in the load could be carried with the same amount of steam as required for Corliss engines.

At the conclusion of Mr. Fairbanks' interesting talk the customary votes of thanks were tendered those who had addressed the association, and also to the Edgewater Club, the citizens of St. Joseph and others who had been instrumental in entertaining the convention delegates.

NEXT MEETING

President Peck in adjourning the meeting stated that the next meeting of the association would be at Cedar Point, on Lake Erie, near Sandusky, Ohio, on Aug. 23 and 24. One day would be devoted to business and the other to pleasure.

The Rätische Bahn (Rhœtian Railway) in the Engadine, running between St. Moritz, Pontresina, Samaden Bevers and Schuls, in Switzerland, has been electrified, with 10,000-volt, 15-cycle operation. The line is 74 km (45.9 miles) long, and at St. Moritz connects with the Bernina Electric Railway. The electric installation as far as Zernez, a distance of about 47 km (29.1 miles), was carried out by the Elektrische Bahnen Zurich—the joint bureau of the Siemens-Schuckertwerke and the Oerlikon Maschinenfabrik, while between Zernez and Schuls—about 27 km (16.7 miles)—it was done by the Alioth Company, in conjunction with the Allgemeine Elektricitäts Gesellschaft. The overhead line has catenary suspension throughout. The trains are hauled by electric locomotives. Brown, Boveri & Company have furnished one of 600 hp and six of 300 hp each, the Elektrische-Bahnen one of 600 hp and one of 300 hp, and the Alioth-Allgemeine Elektricitäts Gesellschaft one of 600 hp and one of 300 hp.

REPORT OF STANDARDIZATION COMMITTEE OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION *

The standardization committee of the Central Electric Railway Association presented the following recommendations as its report:

REVISION OF STANDARD AIR BRAKE CYLINDERS, LEVERS AND BRAKE RIGGING

Recommended that the standard air brake practice should be as follows:

1. All braking power to be based on 50-lb. cylinder pressure. This in order to avoid confusion when stating percentages of braking power that may be figured on different brake cylinder pressures, e. g., 100 per cent braking power on 60-lb. cylinder pressure may be taken to mean greater than 100 per cent on 50 lb. cylinder pressure; and if this is always referred to on a common base confusion will be avoided.

2. All interurban cars to be braked at 100 per cent of light weight on motor axles and 90 per cent on non-motor and trailer axles.

3. All city cars to be braked at 85 per cent on motor axles and 75 per cent on non-motor and trailer axles. Seventy-five per cent with 50-lb. cylinder pressure is practically the same as 90 per cent with 60 lb.

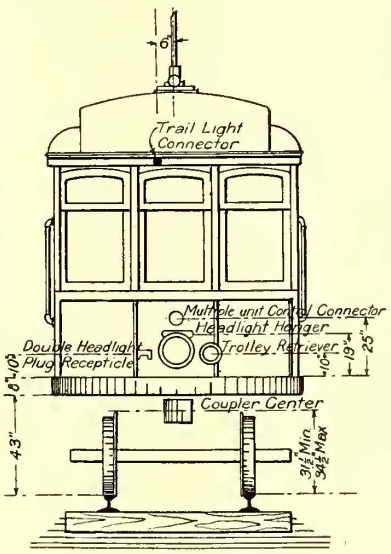


Fig. 1—Location of Connector Receptacles

4. Brake pipe pressure to be 70 lb. per square inch with automatic equipments.

5. Governor adjustment to be 85 lb. and 100 lb. for automatic equipment and 50 lb. and 65 lb. for straight-air equipment.

6. The standing piston travel adjustment to be 4 in.

7. Total truck leverage to be 6 to 1 for long wheel-base trucks with inside hung motors and 9 to 1 for short wheel-base trucks with outside hung motors.

8. A 12 to 1 maximum total leverage is permissible when brake shoes are hung not more than 2 in. below the center of the wheel. If brake shoes are hung lower than this it will be necessary to reduce the maximum total leverage accordingly, and if brake shoes are hung 5 in. or 6 in. below the center of the wheel a total leverage of 10 to 1 should be the limit.

9. The standard M. C. B. recommendations for maximum stress in levers, rods and pins to be adopted as follows:

(a) Maximum stress in levers—23,000 lb. per square inch.

(b) Maximum stress in rods, except jaws—15,000 lb. per square inch, no rod to be less than ⅞ in. in diameter.

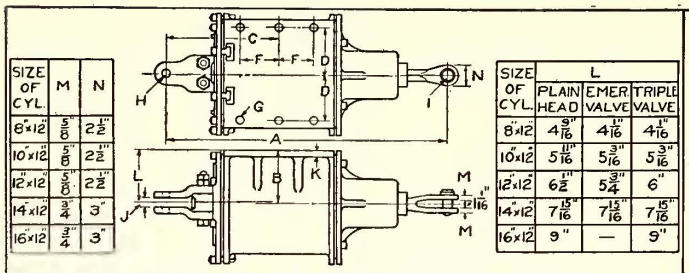
(c) Maximum stress in jaws to be 10,000 lb. per square inch.

(d) Maximum shear on pins—10,000 lb. per square inch single shear.

(e) Diameter of pins to provide a bearing value not to exceed 13,000 lb. per square inch of projected area.

10. Safety valve adjustment to be 10 lb. above maximum governor setting.

*Presented at the June meeting of the Central Electric Railway Association, St. Joseph, Mich., June 22, 1911.

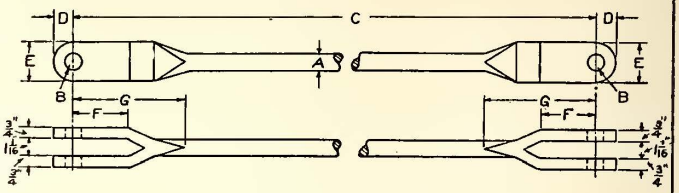


SIZE OF CYL.	M	N
8"×12"	5/8"	2 1/2"
10"×12"	5/8"	2 1/2"
12"×12"	5/8"	2 1/2"
14"×12"	3/4"	3"
16"×12"	3/4"	3"

SIZE OF CYL.	L		
	PLAIN HEAD	EMER. VALVE	TRIPLE VALVE
8"×12"	4 9/16"	4 1/16"	4 1/16"
10"×12"	5 11/16"	5 3/16"	5 3/16"
12"×12"	6 1/2"	5 3/4"	6"
14"×12"	7 15/16"	7 15/16"	7 15/16"
16"×12"	9"	—	9"

STANDARD DRILLING OF BRAKE CYLINDERS.

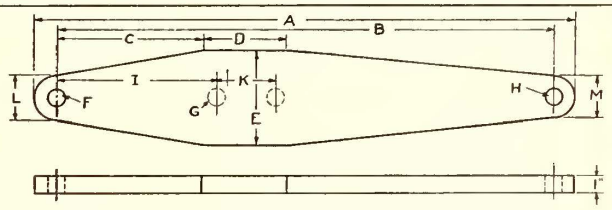
SIZE OF CYL.	A			B	C			D	E	F	G	H	I	J	K
	PLAIN HEAD	EMER. VALVE	TRIPLE VALVE		PLAIN HEAD	EMER. VALVE	TRIPLE VALVE								
8"×12"	34 1/2"	37 5/16"	37 11/16"	4 9/16"	14 1/8"	16 15/16"	17 5/16"	4 1/16"	4 1/2"	4 1/2"	11/16"	1 1/8"	1 1/8"	1 1/8"	11/16"
10"×12"	34 5/8"	37 7/16"	36 1/4"	5 11/16"	13 7/8"	16 11/16"	15 1/2"	4 11/16"	4 1/4"	4 1/4"	11/16"	1 1/8"	1 1/8"	1 1/8"	11/16"
12"×12"	35 1/8"	38 5/8"	38 1/8"	6 1/2"	14"	16 1/2"	17"	6 1/2"	4 3/8"	4 7/8"	15/16"	1 1/8"	1 1/8"	1 1/8"	13/16"
14"×12"	35 1/2"	—	38 1/2"	7 15/16"	14 1/4"	—	17 1/4"	6 5/8"	4 5/8"	4 5/8"	15/16"	1 1/4"	1 1/4"	1 1/4"	1"
16"×12"	35 5/8"	—	38 7/16"	9"	14 3/8"	—	17 3/16"	8 3/8"	4 5/8"	4 5/8"	1/16"	1 1/4"	1 1/4"	1 1/4"	7/8"



CYLINDER LEVER RODS.

SIZE OF CYL.	A	B	C			D	E	F	G
			PLAIN HEAD	EMER. VALVE	TRIPLE VALVE				
8"×12"	7/8"	1 1/8"	40 1/2"	43 1/2"	43 1/2"	1 1/2"	2 1/2"	3 1/2"	7"
10"×12"	1"	1 1/8"	40 5/8"	42 1/2"	42 1/2"	1 1/2"	2 1/2"	3 3/4"	7 1/4"
12"×12"	1 1/8"	1 1/8"	41 1/8"	44 1/8"	44 1/8"	1 1/2"	2 1/2"	3 7/8"	7 3/8"
14"×12"	1 3/8"	1 3/8"	41 1/2"	—	44 1/2"	1 3/4"	3 1/4"	5 1/4"	10 1/2"
16"×12"	1 5/8"	1 3/8"	41 5/8"	—	44 7/16"	1 3/4"	3 1/4"	6 3/16"	11 5/16"

ALL PINS TO BE 1/32" LESS IN DIAMETER THAN DRILLED HOLES.



CYLINDER LEVERS

SIZE OF CYL	A	B	C	D	E	F	G	H	I	K	L	M
8"×12"	29"	26"	6 1/4"	8 1/4"	3 1/2"	1 1/8"	1 1/8"	1 1/8"	7 3/4"	5 1/4"	3"	3"
10"×12"	31"	28"	7 1/4"	8 1/4"	4 1/2"	1 1/8"	1 1/8"	1 1/8"	8 3/4"	5 1/4"	3"	3"
12"×12"	34 1/2"	31 1/2"	8 9/16"	8 11/16"	6"	1 1/8"	1 1/8"	1 1/8"	10 1/16"	5 11/16"	3"	3"
14"×12"	39 5/16"	35"	9 1/2"	9 1/2"	7"	1 1/4"	1 3/8"	1 1/8"	11"	6 1/2"	3 5/8"	3"
16"×12"	39 5/16"	36"	10"	9 1/2"	8 1/2"	1 1/4"	1 3/8"	1 1/8"	11 1/2"	6 1/2"	3 5/8"	3"

ALL PINS TO BE 1/32" LESS IN DIAMETER THAN DRILLED HOLES.

STANDARD AIR BRAKE SCHEDULE.
MAXIMUM TOTAL LEVERAGE 12 TO 1.

SIZE OF CYL	LIGHT WEIGHT OF CARS. 50 LBS CYLINDER PRESSURE.			
	100 PER CENT B.P.	90 PER CENT B.P.	85 PER CENT B.P.	75 PER CENT B.P.
8"×12"	UP TO 30,000	UP TO 33,000	UP TO 35,000	UP TO 40,000
10"×12"	30,000 TO 47,000	33,000 TO 52,000	35,000 TO 55,000	40,000 TO 62,000
12"×12"	47,000 TO 67,000	52,000 TO 74,000	55,000 TO 79,000	62,000 TO 89,000
14"×12"	67,000 TO 92,000	74,000 TO 102,000	79,000 TO 108,000	89,000 TO 123,000
16"×12"	92,000 TO 120,000	102,000 TO 133,000	108,000 TO 141,000	123,000 TO 160,000

Fig. 2—Central Electric Standards—Air Brake Details

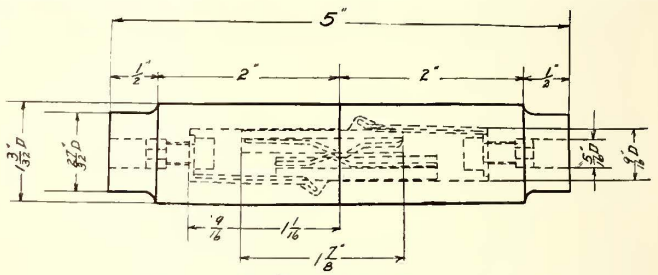


Fig. 3—Trailer Light Connector

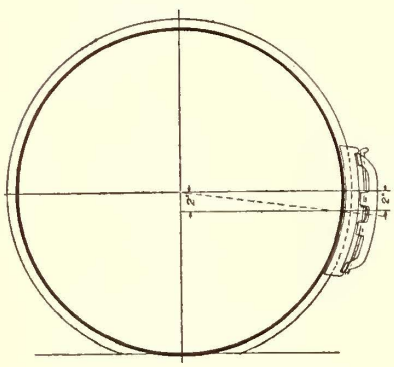


Fig 4—Location of Brake Shoes

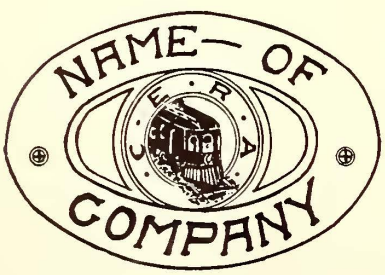


Fig. 5—Standard Insignia

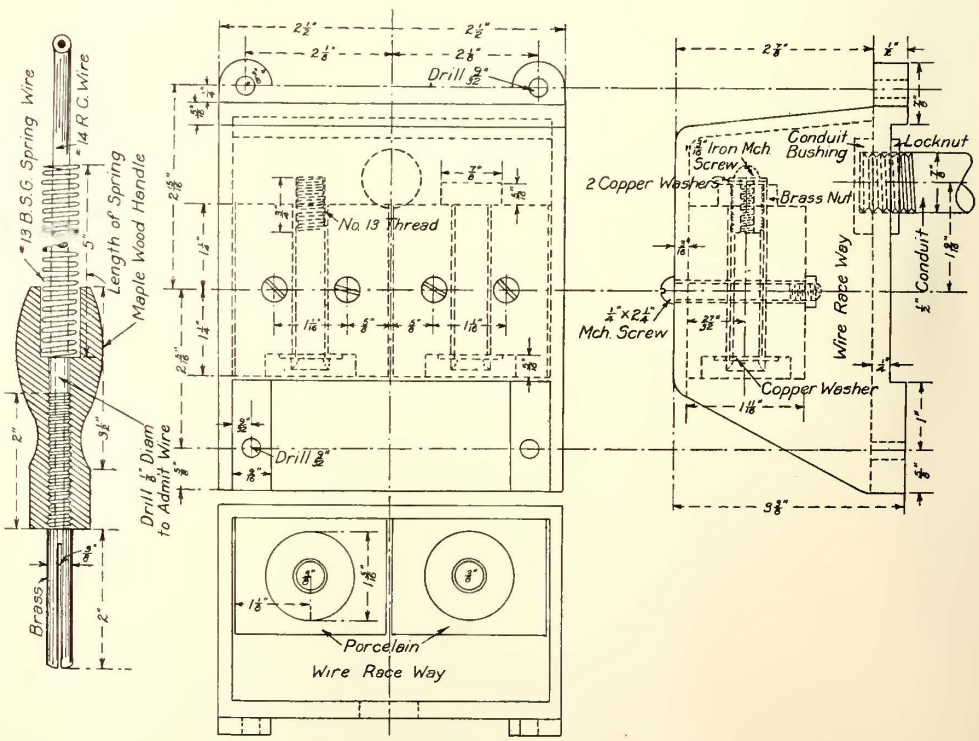


Fig. 6—Double Headlight Plug and Receptacle

CENTER OF BRAKE SHOE

Recommended that center of brake shoe be set 2 in. below center of wheel as shown in Fig. 4.

DESTINATION SIGNS

This subject was laid on the table on account of many other more important and pressing subjects.

TRAIN-LIGHTING CIRCUIT CONNECTOR

Recommended that trail car or train-lighting circuit connector, shown in Fig. 3, be placed 6 in. to the left of the center, as shown in Fig. 1, and concealed in the center of the platform hood apron.

HEADLIGHT PLUG RECEPTACLE

Recommended to use a double headlight connection, as shown in Fig. 6, and to be located as shown in Fig. 1.

STANDARD HEADLIGHT HOLDER

Recommended to use the standard headlight holder as adopted Sept. 22, 1910, and to be located as in Fig. 1.

NATIONAL INSIGNIA

Recommended that a national insignia, shown in Fig. 5, be adopted and that all material, as far as it is possible to mark, should be stamped with this insignia or this insignia should be cast in same with the name of the electric railway using the material also cast or stamped in the margin provided for that purpose.

TARIFFS*

BY ROBERT M. COLT, GENERAL PASSENGER AGENT FONDA, JOHNSTOWN & GLOVERSVILLE RAILROAD

I shall not attempt in this paper to outline fully the method of making tariffs, or the rules and regulations governing them, as this detail is well covered by the formal instructions issued by the Public Service and Interstate Commerce Commissions. In addition to this, the traffic committee will present to the association, for the use of its members, a complete set of "dummy" tariffs covering passenger traffic, showing the proper forms to be used for every tariff it is possible to issue under the rules and regulations of the two commissions, together with the recommendations of this committee as to the treatment of various conditions, with a view to greater uniformity.

What is a tariff? A tariff is a schedule or system of rates, charges, etc., which no man yet born has been able to compile perfectly. The science of tariff-making is one which requires a lifetime of study and experience. The tariff-maker must study his territory and be familiar with local conditions as they exist in different communities. He must bear in mind the kind and character of service rendered, the cost of providing such service, the possibilities for the future development of the business and whether or not the particular territory through which his line runs will prosper and grow under the schedule of rates contemplated, or whether the burden will be too heavy.

Where competition exists rates should be made low enough to get the business; where rates are made to a resort or park on the company's line, or where rates are made to a particular point temporarily for the purpose of inducing extra business on account of some special attraction, such rates should be as low as the property will stand, always, of course, with a fair margin of profit; and where rates are made locally—not in competition—to a resort or for the purpose of inducing special business the tariff-maker should bear in mind that his company must rely upon the net profit on local or regular business of this character to meet interest on its bonded indebtedness.

The question of the application of a rate made from a fare point located on a through or interurban line, as applying from a point on a purely local line, in connection with the through line, is one that is now and then agitated by persons residing on the purely local line, and is, I think, worthy of discussion.

The people residing on a purely local line, not understanding the proper application of the through rate, very often criticise a railroad company because they are obliged to pay a local fare to secure transportation to the through fare point from which the through fare is made. For example: A tariff is prepared for a railroad 100 miles in length, on the basis of 2 cents per mile. At a station half-way between the terminals of this line the fare is $1 in each direction from the through fare point, which in most instances, for the sake of convenience, is the ticket office or waiting room. Very often the cars operated on this through or interurban line, passing through this half-way point, take on passengers at certain regular stops within the city limits of the half-way point. These passengers, we hold, are entitled to the through rate of fare on the through line. We do not hold, however, that passengers who are transported on a purely local or city line car to the through fare point are entitled to the benefit of the through rate of fare. Thus it will occur that those persons who may reside on a purely local line, from which it is not possible to board a through or interurban car, will be obliged to pay the local fare to the through fare point before they are privileged to take advantage of the through fare. Should decisions be rendered to the contrary, the only remedy would be to base all through or interurban fares from the municipal limits of cities.

A great many companies, in order to take care of a certain condition which may exist in a particular locality, will extend the 5-cent fare zone beyond the line or fare limit prescribed by law. This is a bad precedent to establish, as any line or zone created or made by a railroad company outside of the municipal limits prescribed by the statutes governing fare limits in municipalities is an arbitrary line which will, as a rule, prove to be a bone of contention sooner or later. A precedent of this character once established is hard to combat, be the conditions what they may. We are all susceptible to example, and if one community is granted a special privilege other communities are bound, in time, to ask for the same privilege.

Conditions in certain localities are sometimes such that it may seem advisable and desirable for the railroad company to extend the 5-cent fare limit of a city, so as to give the residents of a small town or village just outside of the 5-cent fare limit the benefit of the 5-cent fare. In my opinion, this should never be done. A situation of this kind may be treated by a commutation ticket, with a liberal limit, at a rate per ride slightly in excess of the 5-cent fare, thus obviating the necessity of extending the 5-cent fare limit and at the same time providing an incentive for the development of the business by reason of the saving in fare for the regular or daily riders, the occasional riders paying the 10-cent fare. In this way no bad precedent is established by an exception to the prescribed 5-cent fare limit.

Just here I would like to quote the following saying: "Wise men are instructed by reason; men of less understanding by experience; the most ignorant by necessity." Do not, therefore, by the establishment of unwise precedents, place yourself in a position where it will be necessary to "instruct," because of a reason, an experience or through necessity.

Happily, the hostility toward railroads, which for some years made difficult the calm and wise discussion of rates and their application, is passing away. Nothing could be more conclusive on the point than the temper and tone of the hearings given before the Public Service and the Interstate Commerce Commissions.

In conclusion, I would say that the tariff-maker who can compile a tariff which meets with the universal approval of the public, the commissions and the railroad company itself is indeed worthy of distinction.

*Abstract of a paper read at the annual convention of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 27-28, 1911.

REDUCTION OF CAR FAILURES*

BY J. P. BARNES, ELECTRICAL ENGINEER SYRACUSE RAPID TRANSIT RAILWAY

The reduction of car failures is, if not the sole end and aim of the mechanical department, at least one of its most important functions. Moreover, the data on car failures may be so compiled as to become a most excellent barometer of the general condition and efficiency of the mechanical department and to indicate clearly the directions in which the quality of work must be improved to better that general condition and efficiency. For the improvement of efficiency and reduction of the number of car failures in service we must have first, last and always good and sufficient inspection. The problem reduces itself to two main questions:

First: How shall we improve the quality of the individual inspector? and,

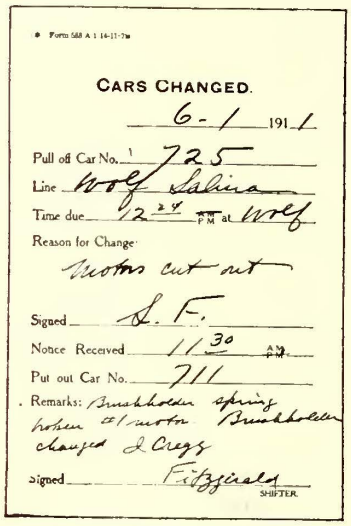
Second: How frequently shall we inspect the equipment?

The second question is the more easily answered, but, as it is largely affected by local conditions, must be answered differently for different systems. Clearly, for any mechanical or electrical device properly built, properly adjusted and properly inspected there is some minimum length of service either in terms of time or mileage below which we may expect assurance of satisfactory service. This minimum length of service will vary between different types of equipment, but may be determined with reasonable accuracy for any set of conditions. It is now fairly general practice to inspect all equipment on a mileage basis and we should invariably start with a mileage figure which we know to be well within the limits of safety. For example, at the outset we inspected and oiled motors on some types of double-truck cars of the Syracuse Rapid Transit Railway lines after 500 miles' service, but are now letting the same cars run 3000 miles between oilings with quite as good or even better results and with no additions or alterations of oil cups. To a very considerable extent the quality of inspection and the period of inspection are interdependent, as with better inspection the safe period between inspections may be increased and this increase will work toward better inspections, as fewer will need to be made during each working shift and, consequently, more time may be devoted to each one.

Having chosen a period of inspection, arbitrarily, if you will, but necessarily within the limits of safety and good operation, the record of the individual inspector and his operating efficiency must be first determined and then improved. For the proper and accurate determination of this efficiency it is essential to know, completely and correctly, the cause of each individual car failure. This known, the records and inspectors' reports must be in such form that the individual inspector who should have prevented the failure may be selected. With this information at hand the matter becomes simply one of following up the offenders and applying the proper discipline.

The form of report of the carhouse inspector must fulfil certain essential conditions. It must be simple and easily made out, it must show the condition in which the equipment was found and the condition in which it was left. If the inspector is to be held responsible for failures of equipment inspected by him, his report should be signed in his own handwriting and show that he considered the equipment O.K. when he left it. We use for this report a card about 7 in. x 10 in., which has printed on one side a list of car numbers, covering all cars on the system, with a blank square opposite each number. On this the inspector checks the numbers of all cars ordered inspected at the carhouse for his class of work. If he finds the equipment O. K. and makes no adjustments he marks the letter "O" in the square opposite the car number; if minor adjustments are made he marks the letter "A"; if replacements or renewals are made he marks the letter "X" and notes on the back of the card of what the replacements or renewals consisted. In case the car requires replacements or repair work beyond the carhouse facilities the inspector ties a tag on the car, noting on the card what trouble he has found and signing his initials. A car so tagged must be sent to the shop unless the carhouse foreman overrules the inspector's judgment, in which case the foreman is held responsible for possible failure of the car in service. Inspectors' reports are countersigned by the foremen and at the end of the shift are sent to the office of the mechanical department, where they are filed for reference.

The changing of cars which fail in service is handled by means of a car-change slip which serves four distinct purposes, and is the basis of fixing the responsibility for the failure. Any car failing in service is ordered changed by the dispatcher, who fills out the blanks on a printed car-change slip, giving the car number, time and place due, line, and reason for change. The slip is then handed to the carhouse foreman, who notes on it the time of its receipt by him and the number of the car to be put out, the slip being returned to him signed by the shifter after the change is made. He then turns the change slip over to an inspector, who notes on it the trouble found with the equipment. The car-change slips are sent daily to the office of the mechanical department, where two summaries are compiled from the information thus obtained.


CARS CHANGED.

6-1 191-1

Pull off Car No. 725

Line Wolf Salina

Time due 12 24 PM at Wolf

Reason for Change: Motors cut out

Signed L. F.

Notice Received 11 30 AM

Put out Car No. 711

Remarks: Brushholder spring broken on motor Brushholder changed L Cregg

Signed Fitzgerald SHIFTER.

Syracuse Record of Cars Changed

The first of these summaries shows the pull-ins classified according to causes. Individual car numbers are shown and cars running from different carhouses are shown in different colors. About the middle of the month the probable total failures for the month are forecast from the record of the first fifteen days. These figures are forecast for each carhouse and for the system as a whole. If the forecast indicates that the failures will exceed those of the previous month in number, the foremen concerned are called in for consultation as to means of reducing the number of failures. As long as the records indicate that the efficiency of carhouse inspection is on the increase the foremen are allowed to continue as they are doing. Each day the foremen are furnished with a list of the car failures of the day before, which are recorded against their inspectors. The list shows the car number, the cause of failure, the name of the inspector who last inspected the equipment and the date of the inspection. These lists are posted in the carhouses after the foremen have taken the action required by the individual cases. If a car has run its mileage and been ordered inspected and the inspection has been missed or neglected by the carhouse force, the failure of its equipment is recorded against the foreman individually.

From the data showing the inspector responsible for each failure another summary is made, showing the running record of each inspector. This summary shows, for each day, the number of failures recorded against the inspector and also the number of inspections made by him on that day. At the end of each month the figures are combined

*Abstract of a paper read at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 27-28, 1911.

to obtain an efficiency figure for the individual, which shows what per cent of the total inspections made by him were actually O. K. A list of names and efficiencies is posted monthly in the carhouses, the man having the highest efficiency appearing at the top of the list, and so on down.

A similar record of efficiency is kept for foremen, the figures in this case being total car failures and total cars inspected. A curve is plotted to show the efficiencies by weeks. It is interesting to note in connection with these figures the effect previously mentioned of interdependence of quality and frequency of inspection. In January 1096 cars were inspected with an efficiency of 59.5 per cent (that is, 652 of these cars ran without failure until full mileage was made and another inspection ordered). In May 983 cars were inspected (10.3 per cent less than in January) and the efficiency was 75.8 per cent, 745 cars making full mileage.

This increase in efficiency and reduction in number of inspections has been accompanied by a 10 per cent decrease in cost of inspection and a relative larger decrease in the number of inspectors.

Curves showing the car failures by months, the failures per 1000 car miles and car miles per failure are also kept up to date, but are not posted in the carhouses.

STEPS IN THE SOLUTION OF THE PROBLEM OF ADEQUATELY CONTROLLING ELECTRICALLY PROPELLED VEHICLES*

BY W. V. TURNER, CHIEF ENGINEER, WESTINGHOUSE AIR BRAKE COMPANY

Power brakes actuated by compressed air, as at present in general use throughout the country, may be broadly grouped as follows:

1. Straight-air brakes.
2. Straight-air brakes with automatic emergency features.
3. Automatic air brakes.
4. Electro-pneumatic brakes.

The relative merits of a straight-air type of brake as contrasted with the automatic principles of operation may be dismissed by the statement that outside of the item of expense any brake not embodying automatic principles is not worthy of serious consideration.

The reason for this is so plain that the only aspect of the proposition remaining for discussion is from the standpoint of the financial department. The simplest form of power brake for electric cars comprising an adequate automatic protection against a loss of the brake from causes unknown to the man running the car is the straight-air brake with automatic emergency features. This equipment was developed to meet the requirements of a strictly city or interurban service where the speeds are moderate and the stops frequent, and when the conditions require single car operation normally and trailer service or two-car trains intermittently. Conditions often arise in a single-car operation, especially where two or more cars occasionally are run together as a train, when it becomes necessary to provide some protection in the brake apparatus itself whereby it shall operate in case of a burst hose or ruptured pipe and apply the brakes and cause them to remain applied instead of permitting the entire loss of braking power on the vehicle. This protection is secured in the SME equipment without dispensing with any of the advantageous features of straight-air operation by the use of the emergency valve in connection with a brake pipe or emergency line in which pressure is normally maintained.

*Abstract of a paper read at the annual convention of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 27-28, 1911.

AUTOMATIC AIR BRAKE

The limits of the straight-air method of applying and releasing the brakes are exceeded when more than two cars come to be hauled in the same train. This is on account of the inherent physical limitations which render it impossible to move a sufficient quantity of air through the conduit provided within a sufficiently short time to apply and more especially to release the brakes with a degree of uniformity, promptness and accuracy necessary for a proper control.

For trains of more than two cars prompt and uniform service application and release action can be secured only by the use of a triple valve—that is to say, by the use of the automatic principle in service as well as emergency operations. A representative automatic brake equipment for electric train service is the type AMM. This equipment is designed to meet the requirements of interurban service where trains of from one to five cars are operated at slow speeds and with frequent stops in towns, but are subject to high speeds and more or less long-distance runs outside these centers. These conditions require a triple valve on each car of the "plain" type; that is, one which will operate in response to variations in brake pipe pressure and shall have no quick-action feature. Provision is made for quick recharging of the auxiliary reservoirs when a release is made in order to insure prompt and certain response of the brakes to a reduction in brake pipe pressure whenever circumstances may require rapid successive brake applications; for quick action of the brakes from car to car in service, to produce rapid and definite application of all the brakes in the train; for a graduated release as well as graduated application of the brakes, in order that the motorman may control the train smoothly and accurately and in the most efficient way, and for a materially higher emergency brake than the maximum possible in a full service application, so that a powerful reserve braking power may be available when the shortest possible stop becomes imperative.

COMBINED AUTOMATIC AND STRAIGHT-AIR TRACTION BRAKE EQUIPMENT

The next development was an equipment which combined all the advantageous features of the automatic and of the straight-air types of brakes without their objectionable features.

The combined automatic and straight-air form of traction brake equipment has now been in service more than three years with increasingly satisfactory results. While primarily intended for service where cars are operated singly most of the time, with occasional two or three-car trains, this equipment is equally adaptable to train service where the number of cars does not exceed the limitations of a direct exhaust brake valve and plain triple valve—in other words, does not exceed five cars. It is especially adaptable to service such as is required of light electric locomotives or motor cars used for handling freight cars, switching, etc.

QUICK-ACTION AUTOMATIC AIR-BRAKE EQUIPMENT

The elevated and subway service of large cities introduces requirements of an entirely different and still more exacting character. These may be classified, according to their origin, as arising from a constantly increasing insistence upon (1) higher schedule speeds, (2) longer trains, (3) shorter and quicker stops, (4) smoother and more accurate stops, and (5) highest possible protection against delays to traffic.

To meet these requirements there must be added to the operative features of the equipments previously mentioned (1) the ability to transmit quick-action rapidly through the train in emergency applications, (2) the attainment of as high a brake cylinder pressure in emergency as the equipment can be designed to give, and (3) obtaining the quick-action application of the brakes with maximum cylinder

pressure at whatever time occasion for same may arise, without regard to previous manipulation and also when the brake-pipe pressure has been depleted for any reason beyond a predetermined danger point. The quick-action automatic brake equipment, type AML, embodies all these features, and, therefore, stands as the highest development to date of the purely pneumatic brake for electric traction service. It corresponds to the type AMM equipment already referred to in its general arrangement, but with the additional features required for longer trains and the more exacting service which it is designed especially to meet, as outlined above.

THE ELECTRO-PNEUMATIC BRAKE EQUIPMENT

With the possibilities of a purely pneumatic brake system developed to the greatest extent, there still arise demands for increased safety, greater reliability, reduction in time to make service stops and instantaneous response and uniformity of application of brakes whereby the human factor in manipulation can be reduced to a minimum. The electro-pneumatic brake possesses superior advantages which make it as nearly an ideal system as has yet been evolved. All the improvements have been accomplished by the addition of electric control to the service and emergency functions of the quick-action automatic brake.

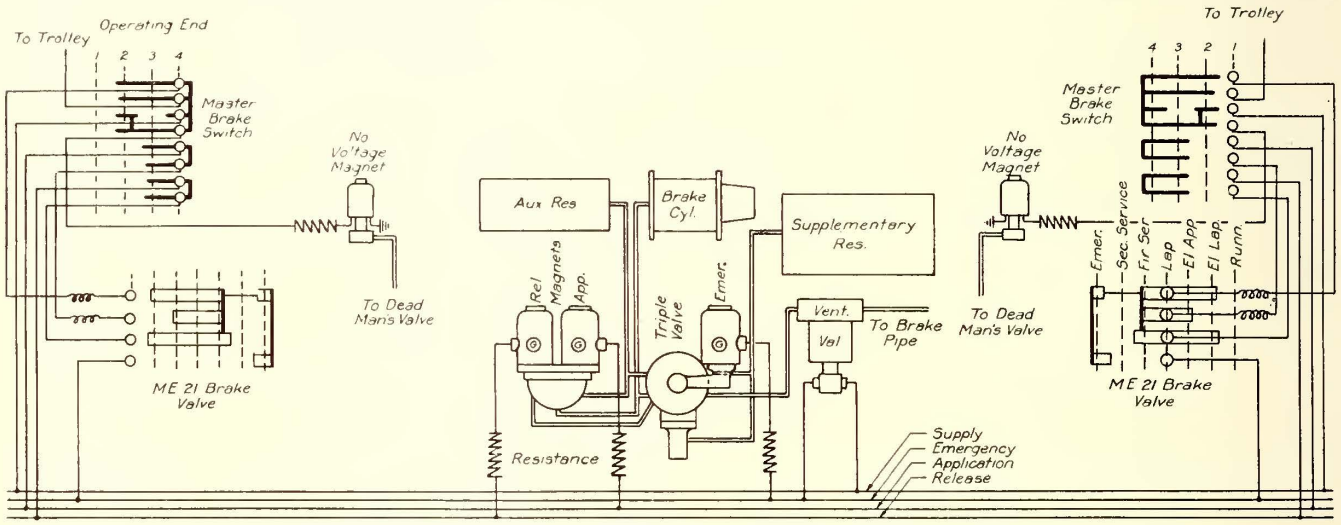


Diagram of Electro-Pneumatic Brake Equipment as Applied to New York Subway Cars

SERVICE STOPS

As illustrating the comparative power of the electro-pneumatic and the best automatic air brake it may be said that a ten-car train equipped with electro-pneumatic brakes can be brought to a full stop from an initial speed of 40 m.p.h. in the same time required to reduce the speed of an eight-car train equipped with the old-style quick-action brake to 25 m.p.h. This is 62½ per cent of its initial speed and about 39 per cent of the energy originally stored in the train at 40 m.p.h. still remains to be overcome before it can be brought to a standstill.

The electro-pneumatic brake has even greater advantages in completing the stop. With the electro-pneumatic brake a graduated release was made so as to prevent retardation becoming excessive toward the end of the stop. The same thing was tried on a train equipped with the high-speed brake, but could be only partially accomplished by making a release first and then a reapplication. The great difference in rate of obtaining braking power is important. With the ordinary manipulation characteristic of the two types of equipments there is a saving of twenty seconds' time in favor of the electro-pneumatic equipment. This shortening in time of stop means that power may be shut off sooner and the train allowed to drift for a considerably longer time before applying the brakes and making the stops at the same point.

For the same power consumption the electro-pneumatic brakes make it possible to maintain higher average speeds, shorter schedules and an increased traffic capacity with the same number of cars or the same traffic capacity with fewer cars, or it enables the same average speeds, schedules and capacity of road to be maintained as with a purely pneumatic brake, but at the expenditure of less power.

EMERGENCY STOPS

In an emergency a ten-car train with electro-pneumatic brakes can be stopped from a speed of 40 m.p.h. in 350 ft., or within two-thirds of its own length. A train with the old-style quick-action brake would pass this stopping point at a speed of 28.3 m.p.h. This is 71 per cent of its original speed and corresponds to 59 per cent of the energy originally stored up in the train which still remains to be overcome before the train can finally come to rest. It should be further noted that the train with the old-style quick-action electro-pneumatic brakes would reach the 350-ft. mark four seconds before the train with electro-pneumatic brakes comes to a standstill at this point. At the time that the train with electro-pneumatic equipment comes to a stop the train with old-style quick-action brakes would have run 140 ft. farther and would still be moving at a speed of 20.2 m.p.h., representing 25½ per cent of its original speed. The latter would not stop until it had run 650 ft., or 300 ft. farther than the train with electro-pneumatic brakes.

The electro-pneumatic brake system adds to the pneumatically operated brake of the highest type certain advantageous features otherwise impossible of attainment, namely: (1) Simultaneous and uniform response of all the brakes in the train. This practically eliminates the effect of the length of train and makes it as easy to handle the train, no matter how long, as it is to handle a single car. (2) Double protection against delays to traffic due to brake failure, since the pneumatic brake is always in reserve ready for use, if required. (3) Maximum efficiency and safety due to simultaneous operation of all the brakes in the train in both service and emergency applications and a perfect flexibility of manipulation. (4) Economy in air consumption, and (5) maintenance of brake cylinder pressure at will.

Briefly stated, this equipment consists of a quick-action, quick-recharge, quick-service, graduated release, automatic air brake with 20 per cent higher pressure in emergency application, combined with electrically controlled means of simultaneously admitting air directly to or releasing it directly from the brake cylinders without any movement of the triple valves. An absolutely simultaneous movement of the triple valves of the train to emergency position is obtained by the use of electricity.

Compressed air is supplied to the brake system through the brake valve at the operating end of the train from the main reservoir pipe, which extends throughout the length of the train. All of the reservoirs are directly connected to the main reservoir pipe.

PNEUMATIC CONTROL OF AUTOMATIC BRAKES

The motorman's brake valve, in so far as its pneumatic operations are concerned, is quite similar to the brake valve used at present with standard pneumatic equipments. The full release position is done away with and the motorman is thereby prevented from wilfully or carelessly overcharging the brake pipe in order to insure prompt and sensitive action on the part of the brake apparatus where brake applications are required in quick succession. The upper portion of the brake valve contains an electric switch portion controlling the operation of the electric portion of the brake system.

The feed valve attached to the base of the brake valve is adjusted to maintain the brake pipe pressure of 70 lb. per square inch while the brakes are not being operated. The quick-action portion of the triple valve is replaced by a somewhat similar combination of ports designed to vent air from the reserve supply carried for this purpose in the supplementary reservoir directly into the brake cylinder when the brake valve ports move to their emergency position. This produces a very quick rise in brake cylinder pressure to a maximum possible amount as determined by the pressure carried in the brake pipe. Provision is made for the quick recharge of both supplementary and auxiliary reservoirs to permit of quickly replacing any air used in pneumatic applications.

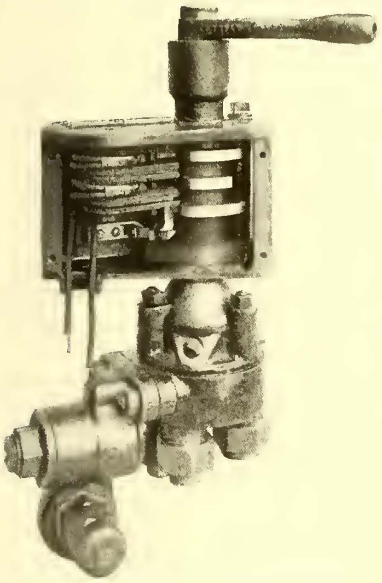
Since the quick-action feature of the brake is separated from the brake valve and since the supply of air for obtaining high emergency pressure is separate from that used during ordinary service manipulations of the brake it follows that both the propagation of quick-action through the train and high emergency pressure can be obtained without regard to what electric or pneumatic manipulation has previously been made.

The quick-action feature of this equipment is contained in a device separate from the triple valve and connected to the brake pipe. It consists essentially of a duplex piston with valve attached and a small reservoir and chamber suitably proportioned so that when the ports are in their normal positions, with reservoir and chamber charged, the pressure in the reservoir will fall with that of the brake pipe so long as the rate of fall of brake-pipe pressure does not exceed that required for the service application of the brakes. When the rate of brake pipe reduction exceeds that of the ordinary service application, the fall of brake pipe pressure and that in the upper chamber of the device is then more rapid than that at which the lower chamber can reduce.

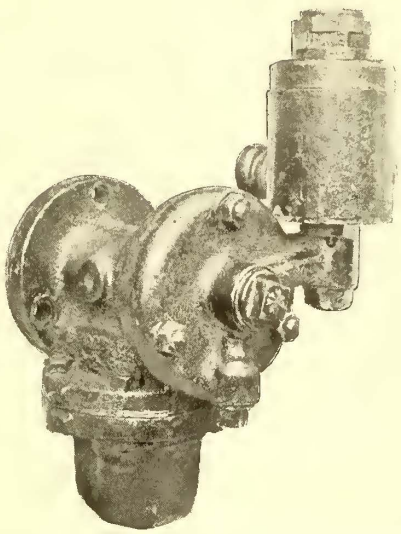
The difference of air pressure thus set up on the two sides of the duplex piston causes it to move over to a position which opens direct communication from the brake pipe to the atmosphere. This causes a local vent of air from the brake pipe, which propagates quick-action to the next car with great rapidity. Provision is made in the device to close the vent to the atmosphere after the quick-action has taken place, so as to permit the recharging of the brake pipe and release of the brakes following a quick-action application. The great advantage of this vent valve for propagating quick-action as compared with a similar action of the triple valve lies in the fact that the service and quick-action (emergency) operations of the brake system are entirely separate and independent. This practically eliminates the possibility of obtaining undesired quick-action, which it is difficult to prevent, with any degree of certainty, where the service and the quick-action operations of the apparatus are controlled from the same piston and slide valve.

In whatever way a rapid fall of brake pipe pressure is produced, be it by movement of the brake valve, the operation of trip cocks or the conductor's valve, the piston in the vent valve will instantly vent air from the brake pipe to the atmosphere through a very large opening, and this positively insures the propagation of quick-action throughout the train, however long it may be and regardless of the previous manipulation of the brakes.

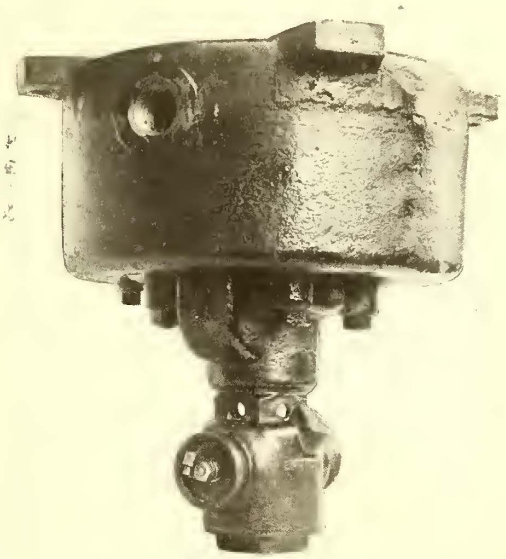
The only feature of the old brake equipment which has been sacrificed in this arrangement, which admits of propagating quick-action throughout the train irrespective of the pressure in the brake cylinder, is the venting of brake pipe pressure into the brake cylinder. With the large sizes of brake cylinders employed, i. e., 12 in. and 14 in., the gain in cylinder pressure over that of service application by venting the brake pipe into the cylinders is very small, but 2 lb. or 3 lb. at the most, and this is more than compensated for by venting the pressure of the supplementary reservoir into the brake cylinder in an emergency application whereby a brake cylinder pressure within 4 lb. or 5 lb. of the brake pipe pressure carried can be obtained in emergency applications.



Type ME-21 Electro-Pneumatic Brake Valve



Triple Valve with Emergency Magnet Valve

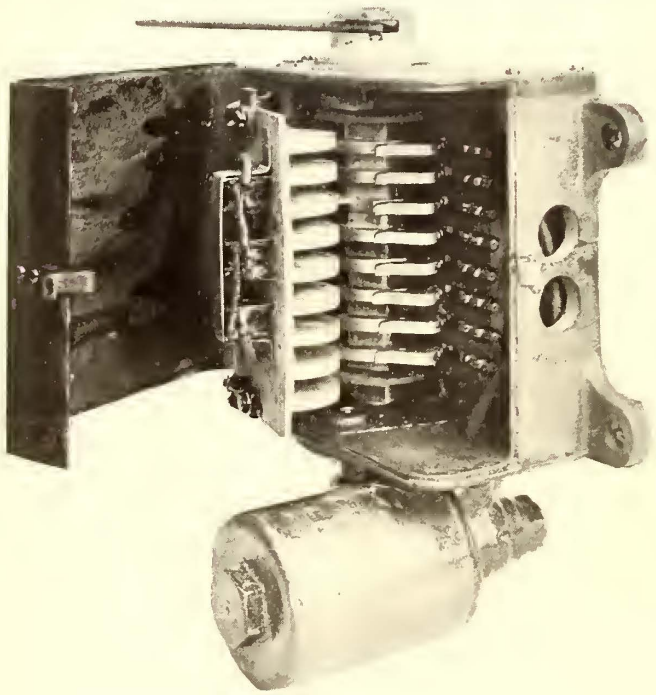


Brake Pipe Vent Valve for Propagating Quick-Action

ELECTRIC CONTROL OF BRAKES

For the operation of this portion of the electro-pneumatic brake system the source of current may be from the trolley or from a battery or other source of supply local to each car. The contacts in the electric operation of the brake, already referred to, are in reality nothing more than small controller points or switches, controlling the circuits to magnets governing the service application and release and emergency portion of the brakes. With the pneumatic portion of the brake in normal or running position the electric control of the brakes is accomplished by the aid of two magnets with poppet valves attached, governing the flow of air into and out of the brake cylinder direct or through the release port of the triple valve, according to the conditions of installation.

The release magnet is sometimes designed so that the release port is only open when the magnet is energized or vice versa—that is, requiring current in order to close the release magnet. Which method is to be preferred can only be determined by a study of the operating conditions which are to be met. In either case, while running over the road the exhaust magnet is holding the release valve open so that the brake cylinder is in direct communication with the



Master Brake Switch and No-Voltage Magnet

atmosphere. In making a service application of the brakes the exhaust valve is closed and the application magnet energized to open the application valve, thus closing the outlet from the brake cylinder to the atmosphere and opening the passage from the source of air supply to the brake cylinder. Various methods of accomplishing this feature have been used in different installations, but with the system in most general use the flow of air from the source of supply to the brake cylinder is controlled primarily by a relay valve of ample capacity, which is in turn caused to operate by the action of the application magnet valve. This does away with the necessity for the very powerful magnet which would be required to operate a valve of sufficient area to supply air to the large sizes of brake cylinders at a sufficiently rapid rate to give satisfactory service operation.

The relay valve referred to is acted upon by a spring so that when the brake cylinder pressure has been built up to within 20 lb. of that in the auxiliary reservoir the relay valve automatically closes. This valve, therefore, permits the additional functions of limiting the pressure obtainable in electric service application to approximately 20 lb. below the normal brake pipe pressure, thereby insuring the valuable feature of the increased braking power is emergency application over and above that obtainable in full service applications and this without the aid of any additional device, such as a safety valve.

The brake cylinder pressure can be raised to any amount up to the maximum contemplated in the design and held there as long as desired by moving the brake valve handle back to the electric lap position, which leaves the release magnet undisturbed, but de-energizes the application magnet, allowing it to close and prevent further flow of air into the brake cylinder. A further application of the brake or a release can then be made by moving the brake valve handle either to electric application or to release position, which either causes more air to flow to the brake cylinder, as described above, or operates the release magnet valve so as to permit the air in the brake cylinder to escape to the atmosphere. When making a release, if the brake valve handle is returned from release to electric lap position, the release magnet will again be actuated so as to close the brake cylinder exhaust. In this way the brake cylinder can be graduated off in any desired number of steps or graduations.

During the electric operation of the brake the release port of the brake valve is open and the communication between the feed valve and the brake valve is maintained. Consequently the air which is drawn from the auxiliary reservoir for use in the brake cylinders is continuously replaced from the brake pipe, which is in turn kept fully recharged through the feed valve. Should the motorman thoughtlessly continue the movement of the brake valve handle toward electric application position the brakes will continue to apply up to their predetermined maximum pressure. This will be the case until the handle is moved so far that a pneumatic application is begun. That is to say, the motorman cannot go beyond the point at which an electric application will cease to be made until after he has come into a position in which a pneumatic application is commenced. It will thus be seen that there is no possibility of a careless motorman failing to obtain an application of the brakes or losing an application already obtained electrically on account of moving the brake valve handle too far.

ELECTRIC EMERGENCY APPLICATION

Conditions on the New York Subway division of the Interborough Rapid Transit Company and on one or two other roads in the country have become so severe as to warrant extension of electric control to the quick-action and emergency operation of the brakes. In so doing an absolutely simultaneous and instantaneous application of the brakes is obtained throughout the train. This is accomplished by simply adding an emergency finger to the brake valve, an emergency wire running throughout the train and an emergency magnet with its valve controlling a port leading from the face of the triple-valve piston direct to the atmosphere. In order that an emergency application originating from a trip cock or conductor's valve, burst hose, etc., may be propagated electrically as well as when an emergency application is made by the motorman moving the brake valve handle, each brake pipe vent valve already referred to is provided with contacts whereby the operation of any vent valve in the train will energize the emergency magnets in the same manner as when the brake valve handle is moved to emergency position. The only advantage of the electrical transmission of quick-action lies in the saving of time as compared with the pneumatic propagation of quick-action throughout the length of the train, but where time is an important factor, as in subway or elevated service, this apparently slight saving of two seconds may have an immediate and important bearing on the economic operation of the road and its total carrying capacity.

There is little to be gained by coming to electric control

of the brakes for emergency applications until the best has been done that possibly can be accomplished by the pneumatic operation of the brakes. It is obvious that all that can possibly be gained by controlling the emergency application of the brakes electrically is in the time of transmission throughout the train. This does not hold, however, for the operation of brakes in service, since there is a marked gain in the ability to control trains, smoothly, safely and without shock, due to the simultaneous and uniform application of the brakes on each vehicle. Each vehicle thus does its proper share of the work of stopping the train, thereby reducing shocks and tendency to slide wheels and requiring much less skill in manipulation, while at the same time it affords the added safety of a double brake control system.

The characteristics of electric operation just mentioned make it possible to obtain initial brake cylinder pressure much more promptly and build this brake cylinder pressure up at a very much faster rate than can be permitted with a purely pneumatic control. This is because the application of the brakes pneumatically must necessarily be slow enough to avoid the shocks, uneven braking, sliding of wheels, etc., that are likely to follow where any considerable difference in rate of retardation can occur in different parts of the same train. When the brakes cannot be applied simultaneously and uniformly (as is inherently impossible with a purely pneumatic control) it is necessary to slow down the time and rate of brake application so as to avoid the troubles mentioned above. When the application of the brakes can be made both simultaneously in starting to apply and uniform in rate of building up brake cylinder pressure, a very much quicker rate of brake application can be utilized and still run no danger of troubles arising from non-uniformity of retardation on different vehicles. This explains why the electric service brake can be made so much more effective than a brake controlled only pneumatically and further explains why at this point it became imperative to add power to the emergency portion of the pneumatic brake. This follows logically from the fact that if the pneumatic emergency brake is less powerful than the maximum possible with the electro-pneumatic service brake the result would be a better service brake when operating the electric service control than could be obtained in pneumatic emergency, which must necessarily be the final resort in case of unforeseen failures or accidents.

The degree to which this increase in emergency braking power over service braking power can be carried is now limited only by main reservoir pressure. We are now able to obtain practically full main reservoir pressure in the brake cylinders when an emergency application is made, even though only 70-lb. brake pipe pressure is carried.

There is one other system which differs fundamentally from the one just described, and, therefore, warrants a brief reference. This fundamental difference lies rather in the means adopted for combining the electric control with the pneumatic portion of the brake system than in any difference in principle or manipulation. With the system above referred to the supply of air for operating the brakes electrically is drawn from the auxiliary reservoir, the triple-valve piston and ports remaining in their normal or release position. The brake pipe and therefore the auxiliary reservoirs are then being constantly recharged through the feed valve during electric service operation. In certain cases it has been found preferable to make the application magnet vent air from the brake pipe to the brake cylinder (the pneumatic portion of the brake valve then being in lap position), thus causing a brake pipe reduction and a movement of the triple valve piston and slide valve to their service positions, just as would be the case with any pneumatic service brake pipe reduction. In emergency applications the air is vented from the brake pipe to the atmosphere, thus causing all the triple valve pistons to move simultaneously and instantaneously to their emergency positions. The release magnet controls the release of air from the brake cylinder in the ordinary way, as already explained.

GOVERNOR SYNCHRONIZING SYSTEM

This system has been perfected during the last two years and is the most satisfactory and efficient apparatus for the purpose yet devised. Heretofore in the operation of electric trains consisting of two or more cars more or less difficulty has been experienced in securing an equitable division of the work of supplying the compressed air required for braking and other purposes among the different motor-driven air compresssors included in the train. The result has been that some compressors are overworked, while others are not working up to their full capacity. Such an inequality of compressor operation naturally results in increased wear and tear on the overworked compressors as well as an actual decrease in the available air supply under certain conditions, due to the attendant loss in efficiency of compressor operation.

Briefly stated, the characteristic features of the governor synchronizing system are as follows:

The current supply to the motor of each motor-driven air compressor in a train is controlled by a switch operated by air pressure substantially as in the ordinary form of electro-pneumatic governor previously used. The difference is that the cutting in and cutting out of this switch is controlled by the operation of a magnet valve instead of a pneumatic regulating portion connected to main reservoir pressure, as is the case with the ordinary compressor governor. In the governor synchronizing system this switch is called the compressor switch. In addition to the compressor switch a pneumatically controlled switch, called a master governor, is used on each motor car, similar in all respects to the previously used electro-pneumatic compressor governor, except that instead of controlling the current supplied to the motors of the motor-driven air compressors it acts simply as a pilot or master switch to control the magnets which operate the compressor switches. The magnets of the compressor switches are connected in parallel between the trolley (or positive battery terminal) and a wire, called the synchronizing wire, which runs the entire length of the train. The cutting in of any master governor connects the synchronizing wire to ground (or negative battery terminal) and thereby operates all the compressor switch magnets. All the main reservoirs in the train are connected by means of a main reservoir pipe line running the entire length of the train and connecting the pneumatic controlling portion of each master governor. With all the compressors cut out the pressure in this line becomes equalized. As soon as this pressure is decreased to the point at which any one of the master controlling mechanisms operates, the closing of this master governor switch supplies current to the magnets of each compressor switch in the train, causing them all to operate so as to cut in their switches and start all the compressors simultaneously. Whether one or more of the master governors cuts in at the same time is immaterial since the cutting in of a single master governor is sufficient to start all the compressors. They will then continue to operate and raise the pressure in the main reservoir on each vehicle and in the main reservoir line throughout the train, until such time as the controlling portion of the last master governor remaining cut in operates to open the circuit to the compressor switch magnets, which causes all the compressor switches to cut out and stop the operation of all the motor-driven compressors simultaneously. It will be seen that in this way all the compressors are forced to operate the same length of time, and since the main reservoir pressure is equalized on all vehicles, the stronger compressors help the weaker ones to the extent of insuring the necessary amount of compressed air being supplied at the expense of a minimum amount of energy, time, and wear and tear on the air-compressing apparatus.

THE VALUE OF BRAKES

Starting and stopping of trains are complementary factors in the problem of making time between stations; therefore it is evident that the best results can only be obtained where both factors are given due consideration. Generally, the starting factor is the only one fully considered, or, at least, the most adequately provided for. In a sense, however, the question of stopping is the most important, as the safety of the service and freedom from delays depend upon it to a great degree. The measure of the value of the brake is twofold: (1) the ability to stop in the shortest possible distance when necessary; and (2) to permit short, smooth and accurate stops being made in regular operation. Unfortunately, the brake is usually looked upon as a safety device only, and it is because of the prevalence of this idea that its installation and maintenance do not receive the consideration merited. Considering the investment, there is no part of the railway equipment that will give greater material returns than the brake when properly installed, operated and maintained. If the brake could to some extent be separated from the idea or impression that it is a safety device only and proof advanced to show that it makes possible hauling of heavier cars and faster and more frequent service, as much or more than do the motors, the block signals, and the good roadbed, its importance would be more fully appreciated. A safety device the brake is, par excellence; but it has other reasons for its existence.

PRESIDENT'S ADDRESS AT COOPERSTOWN*

By John H. Pardee

The Street Railway Association of the State of New York was organized in New York City on Dec. 20, 1883, by men representing street railways in New York, Brooklyn and Buffalo. Since that time regular conventions have been held each year, and to-day we are assembled in the twenty-ninth convention, and our member companies are operating railways in every city and large village in the State, with the exception of Greater New York.

At first, obviously all the railways were horse or cable street railways, but in 1890 the first general electrification and extensions began, and to-day, notwithstanding consolidations, we have in the association twenty companies, operating 580.89 miles of urban and 990.23 miles of suburban and interurban railways. This development beginning in the cities and extending into the country, and the connecting of the cities with the larger villages, continued rapidly and on an increasing scale until 1907, when two events of great importance took place: the financial panic and the passage of the Public Service Law.

The panic, caused by wild speculation and unscrupulous financing, has passed, but the Public Service Law is still with us with added drastic provisions, and in view of the fact that the building of railway lines has practically ceased since the passage of the law, it is quite pertinent to quote from the president's address in reference to it at your twenty-fifth convention in 1907:

"It was stated by several gentlemen who appeared in opposition to the bill at the public hearing that one effect would be to stop the building of interurban lines through sparsely settled territory. This statement was not controverted, and should it prove true, would cause a condition which could not be too quickly remedied, as even at present this State is far behind in the development of the rural communities by the interurban trolley systems."

There are three ways by which railways can be built: by the State with public funds, by private individuals for charitable purposes and by private individuals for profit. The first two of these methods are neither profitable nor practicable, and the third is not attractive under the provisions of the Public Service Law.

While this law has been most ably and justly interpreted and administered by the men chosen for that purpose, yet they are bound by its provisions and prevented from giving their sanction and approval to needed and legitimate enterprises.

The law, with its provisions permitting the reduction of rates, and the clamor of the people to place public utilities on approximately an investment basis, in effect say to men with the necessary funds who may wish to embark in a railway enterprises: "Gentlemen, the public will be delighted to have you build an electric railway through the country which may badly need transportation facilities. Put up your money; if your judgment is wrong and you fail, lose it and charge it up to profit and loss, but if perchance you should happen to win, we will permit you to obtain a return on your investment of 6 per cent or thereabouts." Theorists claim that this is right because we are operating public utilities. Why not apply the same reasoning to enterprises of bread-making and clothing? Surely these are public utilities.

The people of this State will in time see this matter in its true light and will so modify the statutes as to permit of a proper and adequate return to capital based on the risks incurred in investments in public utilities. However, the law in other respects in actual practice has proved of great benefit to both the public and the railways. It has protected both against unjust discrimination, and its administrators have demonstrated that it was passed for the benefit of the railways as well as the public.

Another most beneficial effect of the passage of the Public Service Law of this State and other States has been to bring forcibly to the minds of the railway men and also to the public that the profits of the railway enterprises have been much less than supposed, and that profits are dwindling on account of increased costs of material and labor and that remedies must be applied. One, which we are all trying to apply, is greater efficiency, and certainly this association has aided materially in that direction; another is an increase in rates, and surely those who deservedly need it should be permitted to apply it.

There is little doubt that the Public Service Law has come to stay, not only in this State, but in this country, and there is little doubt that we all believe that a proper law is beneficial to all—one that regulates not only public utilities but regulates the public in relation to such public utilities.

The pendulum of reform has been swung too far by the many specious arguments of bright and voluble, but too radical, reformers and by their mere imitators. However, the judgment of the people, after full information, is usually sound, and we already see the pendulum swinging backward, as evidenced by recent laws in other States, to its proper position.

For many years the electric railway associations in the various States in conventions and through committees have given much thought and attention to the formulation of a code of operating rules which might be made standard and put in force by all. This association has performed its share of the work, and during the past year a committee has spent much time and effort on a code which will be presented to this convention for adoption, and I trust that it will be carefully considered and put into effect by formal approval.

The character and thoroughness of the work done by this association through committees, at quarterly meetings and in conventions, have steadily improved from year to year, and this is evidenced by the quality of reports, papers and discussions. The education gained by individuals through the study and research necessary for the preparation of such committee reports and papers, and from discussions, has reflected itself in the more efficient operation of the

*Address presented at annual meeting of Street Railway Association of the State of New York, Cooperstown, June 27-28, 1911.

railways themselves, and has well repaid the individuals as well as the companies represented by them.

At a quarterly meeting held during the year the schedule of annual dues was revised downward, yet will provide sufficient funds to meet the running expenses of the association.

During the past year your executive committee has held numerous meetings and the usual quarterly meetings have been more largely attended than ever before. Your association is on a sound educational and financial basis and will take an increasingly important part in the future of the electric railway business of this State.

Since 1903 I have been honored by election to various offices in the association, and I take this oportunity to express my thanks and appreciation for the favors conferred, and especially to thank the various officers, members of the executive committee and individuals for their hearty cooperation and assistance.

GAS-ELECTRIC MOTOR CARS*

BY W. B. POTTER, CHIEF ENGINEER RAILWAY & TRACTION DEPARTMENT, GENERAL ELECTRIC COMPANY

The electric car meets certain transportation conditions where steam operation would be both unsatisfactory and uneconomical, and there are other conditions which, in the present state of the art, are undoubtedly better met by the steam locomotive. There are intermediate conditions where self-propelled cars are less expensive to operate than steam trains and where the investment for such cars would be considerably less than for complete electrification. In this latter class are many branch lines of steam roads and projected developments of new roads which might not at first justify electrical equipment. Recognizing this situation, efforts have been made to drive such a car with a self-contained boiler and engine, but without great success, as the performance is limited by restrictions imposed on the boiler capacity.

The development of the gasoline engine and its application to this class of work have resulted in marked success. The gasoline engine as a prime mover is essentially different from a steam engine in that it has no variable effective pressure in the cylinders such as may be secured by the variable cut-off of a steam engine. To secure the tractive force required for starting and to meet the changing requirements of speed and grade, it is necessary that some form of variable gear reduction be introduced between the engine and the driving wheels. To utilize the power of the gas engine to the best advantage it is essential to have a wide range of gearing. To a limited extent this can be secured by mechanical drives, with different sets of gears, as commonly used in automobiles. But the mechanical drive cannot, within practical limits, be provided with the desirable number of gear changes, and it also subjects the engines and driving mechanism to a severe strain by reason of the mechanical shock resulting from the use of a clutch.

The electric drive may seem a refinement, but its advantage will be appreciated when it is recognized that the engine may be driven at its most advantageous speed, independent of the speed of the car, and that the tractive force, without changing the speed of the engine, may be varied from what is required to accelerate the car to that required to drive it at 60 m.p.h. This change in tractive force and speed is accomplished smoothly, and without shock to the mechanism throughout the entire range. As an illustration, the electric drive makes it possible to develop a tractive force of 10,000 lb. at 1 m.p.h. and, without manipulating anything other than the electric controller, to propel the car at 60 m.p.h.

*Abstract of a paper read at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, June 27-28, 1911.

The gas-electric equipment referred to consists of an eight-cylinder, 8-in. x 10-in. gasoline engine, driving an electric generator. The forward truck underneath the engine is equipped with two 600-volt standard railway motors. The weight on the driving wheels effective for traction is about two-thirds the total weight of the car. The movement of the car is controlled by varying the voltage of the generator, combined with series-parallel connection of the motors. The engine control is provided with a combination air valve and gas throttle by which the engine is started on compressed air, and as soon as it begins running on gasoline the air is shut off. With this arrangement, the engine need be run only when propelling the car. Three or four seconds only elapse between the time at which air for starting is admitted to the engine and the movement of the car, so no perceptible delay is occasioned by stopping the main engine at the station.

The car is lighted by a small two-cylinder gasoline engine which drives a lighting machine. This small engine is also fitted with an air compressor cylinder to charge the air tanks for starting the main engine on its first run. The latter is provided with an air compressor, which maintains a pressure when the car is once in operation.

A demonstration car of this type has been operating for the past two years, carrying passengers on railroads in different parts of the country, and at the present time there are seven cars in regular service. A grade of gasoline satisfactory for the operation of these cars can be purchased for from 6 cents to 7 cents per gallon. The gasoline tanks will hold 150 gal., sufficient for at least 200 miles on one filling. The gasoline consumption, per car mile, for cars weighing from 40 tons to 50 tons will vary from 0.5 gal. to 0.7 gal., according to the service conditions. On this basis for fuel, an estimated cost of operation per car mile, based on experience, is as follows:

Gasoline	$0.05
Supplies	.01
Maintenance (car body and trucks)	.01
Maintenance (engine and electrical equipment)	.03
Engineer, conductor and cleaning	.07*
	$0.17

*This item, in particular, will vary with the mileage and wages paid.

The car bodies are similar in respect to the engine compartment, the remainder of the interior and the entrances being modified to meet different requirements.

It is preferable that the cars be operated as independent units rather than to haul trailers, but as they are fitted with automatic air brakes, as well as straight-air, and with M. C. B. couplers, they can be used for trailer work, though at reduced speed.

The seats are nearly 4 ft. long, and, not having arms, it is possible for three people comfortably to occupy one seat. The aisle is narrower than in steam practice, though wider than in many trolley cars. The largest cars at present under construction are 70 ft. long and 10 ft. 5 in. wide over all.

The width, inside measurement, is 9 ft. 6 in. This car, with a 6-ft. baggage compartment and allowing three passengers per seat, will seat ninety-eight passengers, and it is practically a complete train within itself. Such a car would have a maximum speed of about 50 m.p.h. on level track, and a scheduled speed of 25 m.p.h. with stops 2½ miles apart.

There are undoubtedly many lines now operated by steam which under existing conditions are unprofitable, on account of both high operating expense and small receipts, but on which the traffic could be very much increased by a more frequent service and a pleasanter mode of travel.

The self-propelled gas-electric car seems to fulfill these requirements at less cost than by steam and so accomplishes the double purpose of a better and cheaper mode of transportation.

MAINTENANCE OF WAY MATTERS*

BY C. A. ALDERMAN, CHIEF ENGINEER BUFFALO & LAKE ERIE TRACTION COMPANY

The subject assigned me, "maintenance of way," is so broad that I am assuming it will be agreeable to the association to make statements regarding any branch of it. The road with which I am connected consists of approximately 200 miles of line, which is kept up by a roadmaster who has about twelve section crews on the electric and five on the steam divisions, while city section crews have about double the amount of track to look after that suburban ones have. Bridges are inspected by the roadmaster and the writer periodically. All matters pertaining to the overhead line—trolley feeder, transmission, etc.—are in charge of the electrical engineering department, which also has the work ordinarily falling upon a master mechanic or superintendent of motive power.

The amount of new construction performed by the Buffalo & Lake Erie Traction Company during the past five years has been so great that maintenance of way is handled jointly by the construction and operating departments. Many details of maintenance are attended to by division superintendents, who are under the general superintendent, and he in turn reports to the vice-president of the road.

The engineering department has charge of all new work, such as the location and construction of extensions and the revision and rebuilding of old or improving located tracks. Last year, for instance, about Aug. 1 we began to locate and stake out a 3½-mile cut-off line, shortening the distance 1¼ miles between Buffalo and Erie, and the line was opened for traffic the fifteenth of this month. The work involved 60,000 cu. yd. of earth excavation, one steel viaduct 900 ft. long and 90 ft. above the water, all of which is located on a private right-of-way, wide enough for a double track and two 60,000-volt transmission lines. The viaduct was erected with a derrick mounted on an ordinary flat car. The tracks were ballasted with granulated slag, which is used almost exclusively for our new work. Bonding was done with a bonding car using a brazed bond, practically welding it to the rail.

This piece of track was built on substantially level grades with no curve of over 4 deg., and only three in all, so that we believe its cost of maintenance will be reduced to the minimum.

In 1909 a double-track line consisting of 4½ miles of roadbed was built into Buffalo, extending from Lafayette Square to the Lackawanna steel plant. This line was so constructed that its maintenance is a very simple and inexpensive matter, as steel ties were used with 9-in. heavy girder rails with 10 in. of concrete under them and 6 in. under the ties. Seven-inch Medina block stone was used for practically all the paving. The year previous to this work 24 miles of new track was built between Buffalo and Dunkirk, laying 80-lb. A.S.C.E. rails with Continuous joints, nearly all of which was on private right-of-way. Catenary construction was adopted for the trolley line and separate poles for the transmission system which conveys Niagara power.

We have endeavored to build all lines, not only the new, but reconstruct the old, so that maintenance costs will be a minimum. I believe it is good policy to put enough money into the original line so that the grades and alignment will cause small power bills, few accidents and reduce the platform time. Level, straight lines not only do this but they save rolling stock and electrical equipment, requiring fewer section men and trouble patrolmen. Private right-of-way is another asset that is worth considering, as most accident claims originate on highways or in the city streets. With a private right-of-way higher speed can be made, thereby getting more car mileage for the same expenditure in power and labor. The character of construction is not subject to the approval of municipal authorities and the up-keep is easier to maintain.

Light grades and easy curves reduce the cost of operation and increase the gross receipts by causing more people to patronize the lines. The tractive effort on private right-of-way is less than in a public highway or city street where dirt accumulates on the rails.

CITY TRACK RECONSTRUCTION

During the past three years we have given the subject of track reconstruction in city streets our most serious consideration. We have built most of this track with a T-rail on a concrete base. About one-half of the Buffalo entrance was constructed with a low T-rail, open construction and stone ballast, and, while it is within the city limits, the city and the public are well pleased with it and the noiseless way in which the cars pass over this track, to say nothing of the fact that they can get into the city quicker and more comfortably during bad weather. In the latest type of street construction used by our company, a 100-lb. T-rail is laid with a 6-in. concrete base, the brick pavement going under the rail on the gage side of the track, thereby doing away with any special brick or troublesome groove. On the outside of the rail a brick with a slight offset is laid to insure the pavement remaining below the rail far enough so that the wheel tread will not injure it. While we have used a large number of steel ties in our construction we are not very strongly in favor of them excepting on new lines where no cars are operating. In rebuilding old track, the use of steel ties not only increases the cost of construction, but it is doubtful whether solid track is obtained, and we think it interferes with successful operation.

Maintenance of way is being constantly improved by the use of portable crossovers, hose bridges, track-grinding machines and a liberal supply of small tools for keeping cars in operation during repair and new work. I believe that a company can do all its track laying, ballasting and emergency work on roadbed cheaper, quicker and better than to let it by contract. Our train dispatchers give work trains all possible assistance, allowing them to work extra for several hours at a time, thus accomplishing much without interfering with the operating timetables. We endeavor to have as few switches as possible in streets, thereby using inexpensive switch and frog material and giving safer and faster track for cars to pass over; for example, where we have a double track through the streets we make all connection of the double track with single track on the private right-of-way located outside of the city or village.

DISTRIBUTION SYSTEM

Owing to the high pressure of our transmission system (60,000 volts) separate poles are set 160 ft. apart carrying three No. 2 copper wires on porcelain insulators, steel towers being used at all railroad crossings.

The trolley lines are of the catenary type of construction on about one-half of the system, in which poles are set 125 ft. apart, using three hangers between the trolley and messenger wire; the balance of the line is constructed of ordinary span construction in city streets and brackets on a single line of poles where the lines are on the sides of highways. Our electrical department is paying a great deal of attention to the subject of good bonding and proper ground return from the track to power houses and substations. Bonding is carried on pretty largely at night on operating lines so as to interfere as little as possible with the regular car operation.

In paved city streets two bonds at the joints on 100-lb. T-rail construction are used. Cross bonds are placed about 500 ft. apart.

*Abstract of a paper read at annual meeting of Street Railway Association of the State of New York, Cooperstown, June 27-28, 1911.

STEAM RAILROAD CROSSINGS

While it is very desirable to eliminate grade crossings of foreign roads, there are cases where this is not practicable, as in city streets or where the country is level and water lies close to the surface in large quantities. In localities of this kind I think it best to use solid manganese work, for although this type of crossing is much more expensive than the ordinary bolted one, it will last several times as long. We have constructed a large number of subways or under crossings of steam roads, all of concrete, of either the arch or box type. Where overways were required steel viaduct and trestle construction has been resorted to as being the best proposition from a maintenance of way as well as a construction standpoint. The grades of approaches were lightened.

DETAIL WORK NECESSARY TO ECONOMICAL AND EFFICIENT MAINTENANCE OF WAY

The traction line, urban or interurban, that gives careful and constant attention to the small matters such as compromise splice bars, renewing switch tongues when worn out or broken, is the one which is most likely to succeed.

Too much care and pains cannot be exercised in shimming loose joints in city and open track, thus keeping the surface of abutting rails level, also promptly renewing offset splice bars that join different sections of rail and special work. Neglect of these inexpensive joints may greatly damage costly special track work and rolling stock beyond repair in an incredibly short time.

RIGHT-OF-WAY RECORDS

Hopeless confusion of a company's real estate and franchise rights is only averted by giving its records careful attention. All right-of-way deeds should be filed in a cabinet in a vault or other safe place where they can be got at by the executive, legal, accounting or engineering departments at a moment's notice.

Each department should be furnished with a blue print index sheet giving the file number, name and station of each piece of property the deeds refer to. These index sheets should accompany right-of-way books (maps) drawn to a scale of about 100 ft. to the inch, which should also be a part of the records in the principal offices of the company.

SWING AND DRAWBRIDGES

The subject of protection of trains from going into the stream or becoming derailed at movable bridges is one that we have gone into at some length owing to the fact that in the city of Buffalo several bridges of this type are crossed.

Solid manganese terminals of rails widening out two or three times the width of the running rail, thereby allowing cars to pass smoothly from fixed to movable parts, are quite desirable both for safety of travel and saving of wear and tear on cars.

A derailing switch at approaches to drawbridges we believe to be productive of more harm than good in the majority of cases. We have a location where one was installed and taken out after remaining in the track a few months. The great trouble with these derailing devices is the same as at railroad crossings, viz., to operate them in winter weather and to be sure they are not gong to get out of order.

CONCLUSION

In conclusion let me say that maintenance of way is a very important part of successful traction management. It seems to me that too much attention cannot be given to the little and many details that will invariably come up day by day on the track and the line. If the roadbed is well maintained power bills are minimized, the life of rolling stock and equipment is prolonged and the public is kept in good humor, to say nothing of larger gross receipts and smaller operating expenses that will inevitably result from good track.

THE EDISON-BEACH STORAGE BATTERY CAR*

BY R. H. BEACH, FEDERAL STORAGE BATTERY COMPANY, NEW YORK

Probably it is not clear to many electric railway men how a storage battery can perform the very difficult task of supplying the large amount of electrical energy necessary to propel a heavy car, to accelerate it at frequent intervals and cause it to climb grades. Experience with batteries composed of lead compounds immersed in acid-electrolyte has been such as to lead many to think that all secondary batteries are delicate and have a short life, and therefore are to be avoided for use on vehicles. The Edison secondary battery, which is the source of energy in the Edison-Beach storage battery car, is neither delicate nor short-lived. The principle of the Edison storage battery is that metallic iron tends to combine with oxygen. When oxygen is combined with iron energy is developed either in the form of heat or electric energy. Conversely the oxygen may be removed from iron oxide, but to do this requires the expenditure of energy. The Edison battery consists essentially of plates of iron oxide and plates of nickel oxide immersed in water, to which potash is added. If an electric current is caused to pass through the electrolyte from the iron plate to the nickel plate the oxygen present in the iron oxide passes to and remains with the nickel oxide. When all of the oxygen has been removed from the iron oxide and is taken up by the nickel oxide then the battery is fully charged. In this condition the negative plate is composed of metallic iron, while the positive or nickel plate is composed of oxide of nickel and also a super-oxide of nickel. The finely divided metallic iron has an affinity for the oxygen in the positive plate and it will receive this oxygen if permitted to do so. It cannot receive the oxygen, however, without giving off energy in some form. If an electrical circuit be completed between the two plates an electro-chemical action takes place and the oxygen in the positive plate is transferred to the metallic iron in the negative plate. This process is accompanied by the generation of electricity.

MECHANICAL AND ELECTRICAL CHARACTERISTICS OF BATTERY

The Edison battery is analogous to but quite different from the older forms of lead batteries. Combinations of iron and nickel oxides and water are not self-destructive. Neither are they destroyed by the transfer of the oxygen back and forth. In a word, the distinctive feature of the Edison secondary battery is its stability. The battery is not liable to injury from use, and it suffers nothing from neglect. It may be charged at a rate as high as ten times the ordinary rate, or it may be discharged on short circuit. The electrolyte may be boiled or frozen without damage to the cell. With ordinary treatment the battery can be relied upon to do its work, providing it is kept reasonably clean. From experience extending over several years, it is known that the battery will not fall off in capacity during the first six years of its life. It is guaranteed for three years and it is believed that it will last for a much longer time, especially if distilled water is used.

With the older types of storage batteries it has been necessary to allow almost as long for charging the battery as for discharging it under service conditions. The older types of batteries require about eleven hours for a complete charge and in car operation this would mean that the car would be out of service at least half of the time. Because of the fact that the Edison battery is not injured by high rates of charging, a car equipped with this type of battery need be out of service practically none of the time. In Washington, D. C., a car is operated over a line 4 miles long. The running time is sixteen minutes and the layover time at the terminal is three minutes. The bat-

*Abstract of a paper read at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 27-28, 1911.

tery is charged at five times its normal rate during the three-minute layover and the car then runs to the other terminal, where the operation of charging is repeated. The battery is not charged at any other time and the car runs 204 miles each day. The three-minute layover at each terminal is required for changing the fender and giving the conductor an opportunity to reset the fare register. Advantage is merely taken of this time to charge the battery. Another car, operated in Concord, N. C., makes 99 miles a day and is charged twenty times for ten minutes at each terminal. The total charging time is three hours and twenty minutes during the day.

Mr. Edison has said of this battery that it is the most useful of all of the devices that he has invented. As the field of its application becomes better known it will be the means of supplementing and, to a large extent, supplanting many of the present means of electrical transmission. It makes not only possible but almost certain the removal from the streets of all overhead trolley wires, and makes unnecessary and uneconomical the third rail and the conduit.

WEIGHT PER SEAT

In designing the cars on which these batteries are used the writer has aimed to reduce the dead weight and to eliminate, as far as possible, friction losses. The average Pullman car weighs 3000 lb. per seated passenger. The ordinary wooden day coach used by steam railroads weighs about 1500 lb. per seated passenger. A steel suburban coach weighs 1100 lb. per seated passenger. An ordinary single-truck trolley car weighs about 800 lb. per seated passenger and an ordinary double-truck car about 1000 lb. per seated passenger. The average current consumption of a trolley car is approximately 125 watt-hours per ton mile. The Edison-Beach double-truck storage battery car weighs only 600 lb. per seated passenger, while the small single-truck car weighs 380 lb. per passenger. The latest type of long wheel-base, single-truck car weighs 360 lb. per seated passenger. The weight of the battery required on each of these cars is about 60 lb. per seat.

This reduction in weight has been accomplished by making a number of departures from the usual practice in body and truck construction. All of the joints in the truck frame are welded instead of being riveted or bolted. No difficulty has been experienced from broken welds. In longitudinal seat cars an electrically welded latticed steel girder forms a rest for the seat and extends the length of the car body. It is bolted to the side and cross sills and side posts. In an 18-ft. car these girders weigh about 300 lb. and they so stiffen the body that a reduction of nearly 3000 lb. can be made in the weight of the other parts. A very light roof is used because it is not necessary to support a trolley base. The body of an 18-ft. car with 5-ft. platforms and folding doors, but no bulkheads or interior doors, weighs about 3700 lb. A standard monitor-deck car body of the same length weighs about 6700 lb. and the light bodies with the steel girders are much stronger than the heavy bodies.

RECORDS OF PERFORMANCE

After extensive experiments had been made it was found that there was a considerable saving in friction losses if the wheels were permitted to rotate on the axles instead of having the axles fixed in the wheels and rotate in the journal bearings. Exactly how much saving in current consumption has been effected by this change is not known. A silent chain drive is used between the motors and the wheels. There is some gain in efficiency with this type of drive over the gear drive, but it is difficult to say exactly the amount. When new the gear drive is probably very nearly as efficient as the chain, but as it wears it loses its efficiency, whereas the chain does not. The chain drive possesses a great advantage over the gear drive while the car is coasting. On a test run between Athena and North Newark on the Erie Railroad, a distance of about 7 miles, a chain-driven car accelerated from 0 to 35 m.p.h. and maintained that speed on a practically constant grade of from ½ to 1 per cent without the use of any current. An ordinary journal-bearing car will scarcely move on this grade without the application of power. The average current consumption of the Edison-Beach storage battery car is very low, in no case exceeding 60 watt-hours per ton mile. In a test made at Atlantic City at the time of the American Electric Railway Association convention in October, 1910, one of these cars made thirty-six trips, aggregating 14.4 miles, with an average of six stops per mile and an average speed of 9 m.p.h. The average number of passengers carried was eighteen and the average consumption of current per ton mile was 54.2 watt-hours.

A double-truck car which was tested on the Greenwood Lake Division of the Erie Railroad between Forest Hill and Sterling Forest ran a total distance of 70.2 miles. The weight of the car, including passengers, was 16.53 tons and the maximum speed was 25 m.p.h., the schedule speed being 18 m.p.h. This line has a number of heavy grades, but the current consumption per ton mile averaged only 49.63 watt-hours. Another test made on the Erie Railroad between West Orange and Forest Hill at the same rate of speed showed a current consumption of 46.1 watt-hours per ton mile.

The Washington, Spa Springs & Gretta Railroad has had an Edison-Beach car in service for a number of months on a line which has grades as steep as 8 per cent. The battery car has averaged about 355 watt-hours per car mile and it has been found that one of these cars consumes only about one-fourth the current required for an ordinary trolley car.

It is of interest to note the long-distance runs which may be made by these cars on a single charge of the battery. The double-truck car previously mentioned has been run on a single charge from West Orange, N. J., via Jersey City to Middletown, N. Y., over the Erie Railroad as the second section of an express train. The same car was run on a single charge from Jersey City to Atlantic City, N. J., over the Central Railroad of New Jersey and the Reading Railroad, a total distance of 135 miles. Sufficient current was left in the battery upon arrival at Atlantic City to run about 40 miles more. This car can attain a speed of 25 m.p.h. on a level with full load and a speed of 16 m.p.h. on a 6 per cent grade. It is equipped with four motors rated at 15 amp and 200 volts and an Edison battery weighing 4800 lb. On the single-truck cars carrying twenty-six passengers two motors rated at 30 amp and 110 volts are used and the battery weighs 1800 lb. The lower voltage used on the single-truck cars lessens motor and controller troubles.

As showing what can be done with one of these cars on a small road, the results of operation on the Salisbury & Spencer Railway, Concord, N. C., are of interest. The total cost of this road, which is 1½ miles long, was $20,000 and the net earnings of a single car are at the rate of $7,670, which is equivalent to more than 33 per cent on the investment. The current for charging the battery of this car is purchased from the Southern Power Company at a price of 1¾ cents per kilowatt hour, measured on the alternating-current busbar. The car is operated by one man, passengers entering and departing by the front door. The following is a record of thirty days' operation:

Number cash fares	19,733
Number ticket fares	243
Total	19,976
Total car miles	2687.5
Total kw	5268
Kw. per mile	1.95
Total moneys received	$986.65
Operating expenses:	
Power at $1.75 per kw	92.19
Conductors and motormen	232.94
Miscellaneous	22.39
Total expenses	$347.52
Net profit	$639.13

Summing up, the advantages of the storage-battery car are: It eliminates the trolley wire and its supports; costs less for power; does away with electrolytic action of the return circuit; cars are silent running; there is no danger from lightning; the peak-load conditions on the power house are eliminated and each car is a separate, self-propelled unit which is less liable to delays than on a system where each car derives its current from a central station through an intricate distribution system. Storage battery cars also afford an excellent opportunity for existing trolley lines to be put on as trippers during the rush hours and late at night when it may be desirable to shut down the power house.

SINGLE-END VS. DOUBLE-END CAR OPERATION*

BY HERMAN E. HICKS, SUPERVISOR OF SCHEDULES NEW YORK STATE RAILWAYS

In the city of Rochester, from the time of the operation of the first electric car until April 1, 1910, there had never been operated any other than double-end cars. To facilitate this operation cross-overs were placed at each terminal and at various intermediate points, usually separated by about six minutes' running time, for the purpose of turning and spacing late cars.

On April 1, 1910, a new line was put into operation, formed by re-routing and combining two sections of an old line in such a manner as to obtain a line traversing the entire length of the main or principal business streets of the city. Upon portions of this line are operated ten other city lines, and in the center of the business section there is track common to seven other lines. The combined operation of these lines over this common track consists of 156 cars per hour in each direction during the peak load, or so-called rush hours. Two loops and two wyes were substituted for four cross-overs; two loops and one wye were placed at the terminals and one wye at the canal lift bridge; five intermediate cross-overs were left in for the use of cars operating on the other lines, but, of course, they could not be used by the single-end pay-as-you-enter cars placed upon this new line.

For the purpose of comparison I have taken a line of double-end cars whose operating conditions are very nearly identical with those of the new line. It is double-tracked from end to end, crosses the canal lift bridge and operates a considerable distance on the main street. In making these comparisons, which show the results of one year's operation, I will refer to the two lines as the "double-end" and "single-end" line.

The following table shows a comparison of operation for one year:

Items Compared.	Double-End Line.	Single-End Line.	Single-End Line. % Inc.	Single-End Line. % Dec.
1 No. of regular cars operated daily..	23	25	8.6%	
2 Av'ge No. p's'g'rs carried daily..	17,346	23,446	35.1%	
3 Av'ge No. p's'grs per car mile....	8.1	9.3	14.8%	
4 Average speed, miles per hour..	8.42	8.60	2.1%	
5 Total No. traffic interruptions....	149	144		3.4%
6 Total No. turn backs.....	493	186		62.2%
7 No. accidents per 10,000 miles operated	8.0	6.9		13.7%

The comparison of the first three items showing an increase in the number of cars operated and of passengers carried on the single-end line cannot be credited to the type of equipment used, but to the difference in density of population within the territory covered by each line.

ITEM NO. 4—AVERAGE SPEEDS

The 2.1 per cent increase in speed shown by the single-end line is due principally to the more expeditious method of turning cars at the terminals. Under ordinary conditions the actual time taken to turn (exclusive of the layover which the crew may take) is thirty seconds at the loop or wye and sixty seconds at the cross-over terminal, showing a saving of sixty seconds per trip. It is, however, at the heavy loading terminals, such as park resorts or factory districts, that the loop operation shows its greatest superiority, the cars there taking very little additional time to load, with no delay to the cars following. On the other hand, at the cross-section, with the necessary transfer of controller handle and switch iron, the turning of trolley and adjusting fenders and the crowding on of passengers, it is practically impossible to operate on a closer headway than two minutes unless two or more cars are turned at the same time. If this is done the cars have to be sent back in twos or threes and the schedule spacing is disarranged.

ITEM NO. 5—TRAFFIC INTERRUPTION AND TURNBACKS

While the traffic interruptions show a decrease of 3.4 per cent on the single-end line the turnbacks show a decrease of 62.2 per cent.

These turnbacks are caused by cars running late, due principally to traffic interruptions or abnormally heavy travel. The usual method of turning cars is as follows: When double-end cars are operating on a six-minute headway and a car becomes five minutes late or more the late car and its follower arrive at the cross-over at the same time, as the cross-over is located about four minutes' running time from the line terminal. The passengers are then transferred to the second car and the first car is turned and proceeds on its return trip.

This operation, however, is productive of two classes of complaints:

First: The transfer of passengers to the car following is always annoying to them and is particularly so in bad weather.

Second: Passengers between this cross-over and the end of the line see the first car turned back after they have waited for it twelve minutes instead of six, and have sometimes waited fourteen minutes on account of the time taken to transfer passengers and turn the first car.

This does not happen on the single-end cars, as their last turning places are located at much greater distances from terminals and are not used except in the case of extraordinary interruptions, such as fires, etc. This might lead one to think that the single-end line is not operated as closely to schedule as the double-end line, but the line is actually running closer to the schedule and giving a continuity of service not obtained on the other line. This shows that when there is no opportunity to turn back cars a greater effort is made to maintain the schedule.

ITEM NO. 7—ACCIDENTS

While many of the different classes of accidents, such as collisions with cars, vehicles, persons, etc., are common to both single-end and double-end equipment, and the decrease of 13.7 per cent in number of accidents per 10,000 miles operated is to a great extent due to the prepayment car, still there are accidents in the double-end car caused by passengers coming in contact with the controller, brake handle and other equipment located on the rear platform. The number of these classes of accident on the double-end line was twenty-nine, or 4.5 per cent of the total, and the aggregate sum for the whole system paid out in damages for these classes of accident was 3.3 per cent of the total amount paid. There are also the accidents caused by passengers riding on the left-hand rear step or fenders and falling in front of passing cars. A fatality of this kind recently happened in our city. These accidents do not occur in the single-end car.

ITEM NO. 8—EQUIPMENT

In the construction of single-end equipment there are many points which favor good operation. Two of the most important are as follows:

First: The removal of the heater from the interior of the car to the front platform, thereby eliminating the possi-

*Abstract of a paper read at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 27-28, 1911.

ble annoyance of coal gas and increasing the seating capacity of the car. This is very acceptable to the public, and from the company's standpoint is one of the few remaining opportunities of increasing the earning capacity per car.

Second: From a mechanical standpoint there is a reduction in weight of about 2200 lb. per car, thus effecting a saving in rolling stock investment and maintenance cost.

ITEM NO 9—TRACK AND ROADWAY

As previously stated, the construction of two loops and two wyes were found necessary for the single-end operation, intermediate wyes being formed by intersecting lines, while for the double-end operation there were nine cross-overs. The comparative cost of installation (exclusive of right-of-way cost) shows a reduction of 12.5 per cent in cost of special work. In addition, there is undoubtedly a considerable saving in maintenance cost from using the loop operation. We have also found that the single-end cars make less noise when traveling around their loop track than do the double-end cars in passing over the frogs and switches at terminal and intermediate cross-overs. Hence the number of complaints on this point is less.

REPORT OF COMMITTEE ON JOINT USE OF POLES*

The committee on the joint use of poles presents for consideration a proposed standard agreement, developed along the lines of the outline approved by the Street Railway Association of the State of New York at its last quarterly meeting. The committee has endeavored to make this agreement broad enough to warrant its adoption as a standard by this association.

In accordance with the instructions given the committee the matter was taken up with the Public Service Commission and also with the chairman of the overhead lines construction committee of the National Electric Light Association, as well as with the New York Telephone Company, which had previously asked for representation on this committee. The work to be taken up was outlined to these bodies and their representation was asked at the meetings, for the stated reason that it was desired to develop an agreement which would be broad enough to be universally applicable and suitable for use under the various conditions which exist in the different companies throughout this State.

Three meetings were held, at one or more of which there were present besides the committee experts from three departments of the Public Service Commission—the railway, the power and lighting, and the telephone and telegraph departments; two representatives from the New York Telephone Company and a representative from the overhead line construction committee of the National Electric Light Association.

The committee thus was well equipped in an advisory capacity and this was of very material service to the committee in preparing the agreement which is submitted.

It is not assumed by the committee that the agreement as submitted will be acceptable to all interests—in fact, the discussions at committee meetings developed a great diversity of opinion from the various representatives in regard to a number of points.

Attention is called to the following features of the agreement, which the committee believed should be borne in mind:

1. It should protect thoroughly the railway interests and at the same time not work any hardship on the other interests concerned. It must not permit hazardous or careless construction.

2. The agreement and specifications should be extremely simple and clear, unincumbered with unnecessary words.

3. It should be broad enough to admit of use by several companies jointly, under whatever conditions they operate.

4. It should cover any form of occupancy, whether by ownership or lease, whether covering one entire property or a single pole location.

With reference to the drawings referred to in Appendix "C" the committee has modified only those plates showing construction in which by virtue of joint occupancy electric railways would be interested, it being the opinion of the committee that in any matters involving only the telephone and electric light companies the use of the National Electric Light Association's standard specifications was permissible as representing the accepted engineering of these interests.

It was brought to the attention of the committee that the agreement submitted differs in many ways from work which has been done previously by the American Telephone & Telegraph Company and the National Electric Light Association and that in following this outline the tendency might be away from rather than toward a standard agreement which might be suitable for other interests. The committee, however, felt that it was not in error in its premises and that it should continue as nearly as possible along the lines which were approved at the last quarterly meeting.

If in the opinion of the association the proposed agreement is leading away from what might be termed "a universal standard," no time should be lost in instituting an investigation jointly with other companies and associations interested in producing a standard form of agreement and specification and developing an instrument which would be a composite of this one and others now in use. If, on the other hand, the committee has been proceeding in the right direction for the railway interests, it would recommend that the agreement as submitted be revised in such minor points as may be necessary and be presented to the Public Service Commission for its approval in order that it may be put into practical use at the earliest possible moment.

PROPOSED STANDARD AGREEMENT FOR THE JOINT USE OF POLES

This agreement, made and entered into this.....day of .....19...., by and between the..... Company, a corporation organized under and by virtue of the Laws of the State of.....; the..... Company, a corporation organized under and by virtue of the Laws of the State of.....; and the..... Company, a corporation organized under and by virtue of the Laws of the State of.....etc., etc., etc..... for and in consideration of one dollar by each to the other paid, receipt whereof is hereby acknowledged, and in further consideration of the covenants and agreements herein contained,

WITNESSETH THAT:

ARTICLE ONE

The term JOINT USE refers to the use of poles by two or more parties.

The term POLE refers to any form of abutment or support to which any attachments may be fixed.

The term ATTACHMENTS refers to all wires, cables, apparatus, fixtures or appurtenances which may be used by any party hereto in the conduct of its business.

(Give here, if desired, the reasons for entering into this agreement.)

(Describe here the territory covered by this agreement.)

ARTICLE TWO

Each party to this agreement must have such legal rights as will entitle it to enter into this agreement without prejudicing any of the other parties hereto, in their rights, in any way whatsoever.

It is understood that no legal or franchise rights of any of the parties to this agreement shall be invalidated by its execution.

ARTICLE THREE

Each of the parties hereto has the right to install and operate the attachments necessary to carry on its proper business.

ARTICLE FOUR

The right to the use of the poles covered by this agreement shall be according to the *Schedule of Poles Jointly Used,* in Appendix "B," which shall state, for each pole or group of poles, the proportion of ownership held by each party hereto.

This schedule may be amended from time to time by written fliers inserted in Appendix "B" and signed by designated officers of all parties hereto without invalidating this agreement.

The cost of a new joint pole for the mutual convenience of all the parties hereto shall be proportioned in accordance with the ownership designated in Appendix "B."

ARTICLE FIVE

Where rearrangement of attachments or replacement of poles is necessary for the sole convenience of one or more parties, that party or parties shall pay the entire expense of replacement or rearrangement.

Each party shall install its own attachments and bill the petitioning party or parties in accordance with Par. 1 of this article.

Space on poles shall be apportioned in accordance with the specifications and drawings in Appendix "C."

All work shall be performed in accordance with outline shown in specifications and drawings in Appendix "C."

*Abstract of report presented at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, N. Y., June 27-28, 1911, by a committee consisting of W. J. Harvie, chairman; C. L. Cadle, W. B. Fenoyer, R. P. Leavitt and C. S. Stanton.

ARTICLE SIX

The systems of the parties hereto shall be operated in a proper and safe manner, and operating conditions shall not be materially changed without due notice to the other parties hereto.

Each party hereto shall keep its own attachments in safe condition, without disturbing the attachments of the other party or parties to this agreement.

The employees or agents of each party hereto shall have the right of access, in the performance of their duties, to any part of the poles, whether or not specifically set aside for the use of the other parties hereto.

Any party hereto placing any attachments on any joint pole shall, in every case, make provision to maintain proper alignment of the pole at its own expense.

Any change in pole location or attachments other than referred to in Article 5, Par. 1, shall be made by mutual agreement between the parties hereto, and such agreement must designate the party who shall do the work and the method of handling the cost.

The cost in cases covered by the above paragraph shall be apportioned in accordance with the ownership shown in Appendix "B," and each party shall handle its own attachments unless otherwise arranged when the mutual agreement referred to in this paragraph is entered into.

ARTICLE SEVEN

The maintenance and renewal of poles jointly owned and the methods to be followed shall be agreed upon by all parties hereto and outlined in Appendix "A." Neither party hereto shall at any time change the location of, or remove any pole jointly owned without the written consent of the other parties hereto.

Maintenance expense shall be apportioned in accordance with ownership shown in Appendix "B."

ARTICLE EIGHT

This agreement shall continue in force from date of its execution to January 1, 19...., unless terminated as provided in Par. 2 of this article, and may be renewed under the same conditions by mutual agreement of the parties hereto.

In case all parties to this agreement desire to abandon any joint pole all attachments of each of the parties hereto shall be removed by it and the joint pole shall be removed in such careful manner and within such time as the conditions may require. The party who shall do the work and the methods to be employed shall be as the parties hereto may mutually agree in writing. The cost of removal of joint pole shall be divided in accordance with the ownership as shown in Appendix "B," after any salvage value has been properly credited.

If any of the parties hereto shall at any time desire to abandon its proportion of ownership or to permanently discontinue the use of any of the said poles, it shall notify the other party or parties hereto in writing to that effect and shall remove its attachments therefrom within sixty (60) days. The party giving such notice shall, after removal of its attachments, and at the end of said sixty (60) days from the date of such notice, cease to be liable for any obligation or other charges incurred thereafter in connection with such pole or poles.

In case of abandonment by one or more of the parties hereto of the use of any pole, a flier, signifying such abandonment, properly executed by an official of the abandoning party, shall be made and posted under *Schedule of Poles Jointly Used* in Appendix "B." The interest of the abandoning party or parties shall be divided among the remaining party or parties to this agreement in proportion to their respective interests in the pole.

No party to this agreement shall sell, assign, lease or in any way dispose of any portion of any of the poles or attachments without the written consent of all parties to this agreement, but this shall not be construed to limit the right of any party to make a general lease or assignment of all of its rights, property and franchises, or to enter into any combination authorized by law; and in case of such lease, assignment or combination, the rights acquired hereunder shall pass to lessee, assignee or combination.

ARTICLE NINE.

Invoices shall be rendered monthly for work done on jointly used poles in such proportion as the parties hereto are interested, as shown in Appendix "B," amounts for which shall be paid within sixty (60) days after receiving invoice. Any party doing work under this agreement shall present, if desired, report showing detailed cost of work.

Invoices for attachments on a rental basis shall be rendered by the owner on or about the first of each year, payments for which are to be made by the tenant within sixty (60) days after receiving each invoice.

The count of attachments which are to be covered under the invoices shall be made once each year, during the month of July, and each company interested shall delegate a representative for such purpose. These representatives must agree with each other, and the count shown by them shall be final and binding on all parties hereto.

ARTICLE TEN

During construction, operation or maintenance each party to this agreement shall be responsible for the effect of its own attachments and the acts of its employees and agents.

ARTICLE ELEVEN

In case any of the parties to this agreement disagree as to any questions arising thereunder, such questions shall be settled by arbitration in the following manner: Upon the written request of any one of the parties failing to agree, each of the parties to the agreement shall, within ten (10) days, appoint one arbitrator. If this results in an odd number of arbitrators, the arbitrators thus appointed shall, within sixty (60) days from their appointment, decide the controversy and render a decision in writing thereon. If the original appointments result in an even number of arbitrators, these arbitrators shall, within ten (10) days, appoint an additional arbitrator and proceed with the questions in hand as above. Upon failure to agree upon the additional arbitrator within the specified time the parties to this agreement shall apply to the Public Service Commission for the appointment of an additional arbitrator, and the arbitrator appointed by the Public Service Commission shall serve as if elected by the arbitrators.

A majority report shall be final and binding upon all the parties represented, and the expense of such arbitration shall be borne equally by the parties represented by the arbitrators.

ARTICLE TWELVE

This agreement shall supersede any existing agreement between the parties hereto for the joint use of poles, in so far as the provisions of such existing agreement conflict with those of the agreement.

IN WITNESS WHEREOF each party has caused this agreement to be executed in its name and its corporate seal to be affixed thereto by its officer duly authorized thereunto, the day and year first above written.

(Seal) .....

By.....

(Seal) .....

By.....

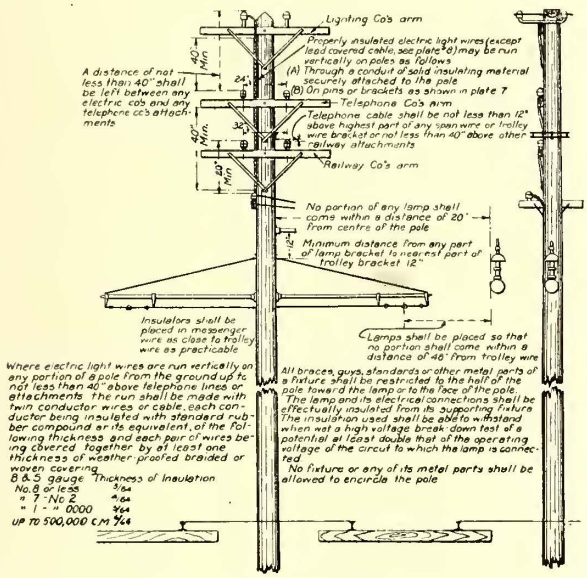


Plate 6—Electric Light Wires Run Vertically on Poles and Installation of Arc Lamps

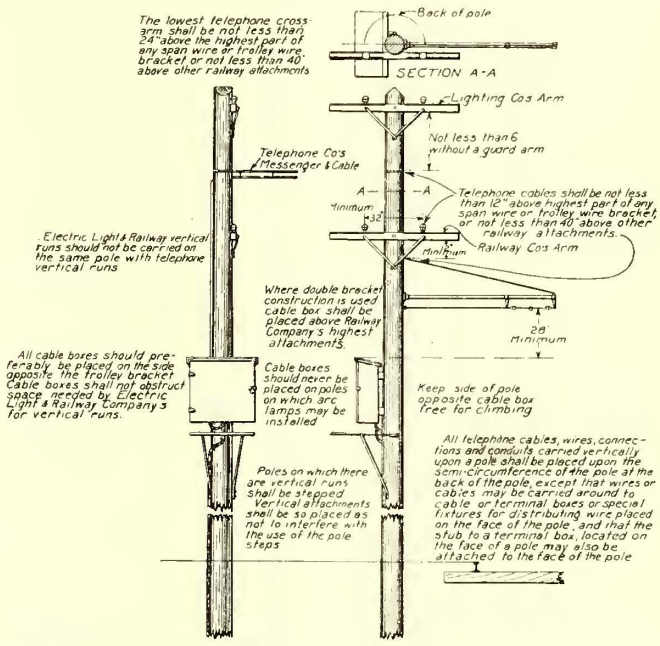


Plate 9—Location of Telephone Cable Boxes and Attachments

APPENDIX "A"

(Local conditions may be enumerated here. Please refer to article and paragraph to which each refers.)

APPENDIX "B"

(Show here the ownership of any or all poles or groups of poles which this agreement is intended to cover.—The rates agreed upon for rental privileges may be shown here.)

APPENDIX "C"

These specifications shall apply to poles jointly used by the parties to this agreement and are a part of the agreement.

For convenience the following definitions will be used:

The term *Class "A" Attachments,* where used in these specifications, shall include:

All attachments of a character or operating voltage other than those specified in classes "B," "C" and "D."

The term *Class "B" Attachments,* where used in these specifications, shall include all attachments of a character or operating voltage as follows:

Constant potential metallic circuits.....5000 volts or less
Alternating-current series, metallic circuits.....5000 volts or less
Direct-current series, metallic circuits.....7500 volts or less

The term *Class "C" Attachments,* where used in these specifications, shall include:

Telephone attachments.
Telegraph attachments.
District messenger service attachments.
Burglar, fire, police alarm and similar attachments.

The term *Class "D" Attachments,* where used in these specifications, shall include:

All railway attachments operating at 1500 volts or less.

Class "A" and Class "C" attachments shall not be placed upon the same pole.

The relative positions of the attachments of the parties hereto, on each pole, shall be as follows:

Class "A" Attachments shall occupy the top portion of the pole.

Class "B" Attachments shall occupy the next lower portion of the pole.

Class "C" Attachments shall occupy the next lower portion of the pole.

Class "D" Attachments shall occupy the lowest portion of the pole, except where different arrangements are agreed upon in writing by the parties hereto. In specific cases class "A" attachments may be placed below class "B" attachments, in which case special construction shall be agreed upon.

Where two parties operate class "A" attachments the class "A" attachments of each of the parties shall occupy the top portion of the pole, each one occupying opposite sides of the pole, with a climbing space of not less than sixty (60) inches between all attachments except those on the top cross-arm.

Not more than two class "A" circuits shall be allowed on any joint pole.

(Following is a descriptive list of the drawings which are a part of this appendix.)

Plate No. 1.—National Electric Light Association standard, showing relative position of class "B" and class "C" attachments, etc. (Not reproduced.)

Plate No. 2.—National Electric Light Association standard, showing climbing space. Class "C" attachments. (Not reproduced.)

Plate No. 3.—National Electric Light Association standard. Side view, showing location of class "B" and class "C" attachments. (Not reproduced.)

Plate No. 4.—National Electric Light Association standard, showing detail construction, class "B" and class "C" attachments. (Not reproduced.)

Plate No. 5.—National Electric Light Association standard, showing distribution methods and clearances, class "B" and class "C" attachments. (Not reproduced.)

Plate No. 6.—Modification of National Electric Light Association standard plate No. 6, showing class "B" and class "C" attachments, including arc lamp, with class "D" attachments added, giving clearances.

Plate No. 7.—National Electric Light Association, standard plate No. 7, showing class "B" and class "C" attachments, including incandescent lamp fixture, with following notations added showing railway clearance required:

Clearance from lamp to top of rail, not less than 14 ft.

Clearance from lamp to trolley wire, not less than 3 ft.

(Not reproduced.)

Plate No. 8.—National Electric Light Association standard, showing class "B" and class "C" attachments. Showing vertical runs, etc. (Not reproduced.)

Plate No. 9.—Modification of National Electric Light Association, standard plate No. 9, showing location of class "B" and class "C" attachments, including cable boxes and vertical runs, with railway attachments added.

Plate No. 10.—National Electric Light Association standard, showing methods of guying, with following note added covering minimum clearance of guy wire over trolley wire:

"Where guy wires cross trolley wires they shall have a clearance of not less than 5 ft. from the trolley wire."

(Not reproduced.)

Plate No. 11.—National Electric Light Association standard, showing method of guying. (Not reproduced.)

Plate No. 12.—National Electric Light Association standard, showing class "B," class "C" and class "D" attachments, with following alterations in notes to show railway requirements:

Para. No. 1, which reads "All line wires shall be carried on pins on wooden cross-arms, etc.," to read as follows:

"All line wires shall be carried on pins on cross-arms, etc."

Para. No. 1, in upper right-hand corner, the latter part of which reads, "* * * unless approved by the chief engineer," changed to read as follows:

"* * * unless approved by all parties to this agreement."

Para. No. 2 from top of plate on right-hand side of plate, which reads, "The lowest telephone cross-arm shall not be less than 24 in. above the highest part, etc.," changed to read as follows:

"The lowest telephone cross-arm shall not be less than 36 in. above the highest part, etc."

Para. No. 4 from top of plate, on right-hand side of plate, which reads, "Trolley wires shall be effectually insulated from span, etc.," that portion in regard to brackets changed to read as follows:

"Where brackets are used the trolley shall be double insulated and the insulators shall be placed as close as practicable to the trolley wire."

Para. No. 10 from top of plate, on right-hand side of plate, which reads, "Negative feeder connections from a point, etc.," to be omitted.

The last two paragraphs on the right-hand side of plate to be omitted.

Change spacing of railway pole pins from 24 in. to 32 in.

ENTERTAINMENTS AT COOPERSTOWN

Many of the delegates to the Cooperstown convention reached Cooperstown early Monday morning in order to enjoy the entertainments which had been arranged by the committee and play golf at the links of the Country Club. In the evening there was a trip by boat on Otesaga Lake.

During the session on Tuesday morning the ladies had a clock golf tournament on putting greens on the hotel lawn and in the afternoon they played bridge whist. About 4:30 the annual ball game took place between the railway men and the supply men. The teams lined up as follows: Railway Men—Callaghan, Barnes, Cherry, Duffy, J. C. Collins, Hamilton, Badger, Moore and Holmes. Supply Men—Ransom, Slimp, Berry, Chapin, Whipple. Smith, Hegeman, Garland and Miller.

The Supply Men soon showed their superiority at the game and would undoubtedly have won, despite the umpire, if a disappointed and chagrined supporter of the Railway Men's nine had not seized the bat and ball, during an intermission, and thrown them into the lake. This ended the contest.

On Tuesday evening the banquet was held and was followed by dancing in the ballroom. On Wednesday morning the ladies enjoyed an automobile ride and afterward partook of lunch at the Golf Club.

THE BANQUET

The annual banquet was held on Tuesday night, June 27, and was a most enjoyable affair in accordance with the best traditions of the association. A novel feature was the presentation of verses and large cartoons of prominent members. Those who were honored in this way were Past-presidents J. N. Shannahan, Edgar S. Fassett and R. E. Danforth, President J. H. Pardee, Treasurer H. M. Beardsley, of Elmira; E. J. Cook, of Rochester, and J. H. Stedman, the well-known transfer ticket inventor and raconteur. Topical verses were also sung in honor of two of the speakers, the Rev. Ralph Birdsall and Oscar T. Crosby.

After reading congratulatory messages on the work of the association from Arthur W. Brady, president American Electric Railway Association, and F. W. Stevens, chairman Public Service Commission, Second District, President Pardee introduced Rev. Ralph Birdsall as the first speaker.

Dr. Birdsall, who had addressed the association at the Cooperstown meeting in 1910, expressed his pleasure at having been adopted into the electric railway family. In a happily worded address he asked his hearers to remember that they owed something more to the world than the faithful discharge of their routine, professional duties. It was not the burden but rather the opportunity of every man to take an active part in uplifting his fellow-men. The responsibility for such great public matters as sanitation, civic beauty and morality must not rest entirely on the physician, architect and clergyman respectively, but must be shared by all men who wanted to be good citizens.

Randall J. LeBoeuf, counsel Albany & Southern Railroad, the second speaker, first discussed the humorous side of electric railway accident litigation, such as contributory negligence and preponderance of evidence. Following this, he referred to the work of public utilities commissions which he said had placed the public utilities corporation in a better position than ever before. The public utilities corporation now had the great advantage that a public service commission would not permit competition if the corporation was giving satisfactory service to the communities which it served. Never before were the securities of public service corporations on a firmer basis. Every new security issued in New York State since the public utilities law went into effect on July 1, 1907, had behind it practically the guarantee of the people of the State that there had been an honest investigation to ascertain whether the issues were warranted and whether the corporation would be able to pay the fixed charges.

The third speaker was Oscar T. Crosby, president Wilmington & Philadelphia Traction Company and one of the pioneers in electric railway construction and operation. He said the great problems before electric railways now were far different from those which confronted them in the past. Then it was a question of meshing gears, keeping the trolley wheel on the wire, or preventing commutators from burning up, now it was the question of what constituted a reasonable return on the investment. Modern conditions made it imperative to recognize that there was a partnership between the public utilities corporation and the public itself. The problem was how to adjust this partnership relation wisely. At present there was still much confustion in the public's mind on this subject, because the people could not discriminate between a new enterprise whose financial standing was still in peril and an old, established enterprise. He thoroughly believed that the right of repudiating past agreements was one which no government could afford to

lay aside. Every reform in government had been a repudiation of ancient privileges. However, the public must exercise this right with the greatest patience, otherwise we would be thrust from the Scylla of Bourbonism to the Charybdis of anarchy. The partnership between the public and the corporation should be expressed by some understanding as to what reasonable limitation of dividends should be allowed. This limitation should not be such as to hinder the projects of progressive, ambitious men who were willing to risk their all in opening up territory of doubtful profit. Such men were entitled to a special reward in case of success.

He wanted to say a word about watered stock, which seemed to him an excellent invention. Many people were completely confused by the practice of capitalizing earning capacity. Now if a promoter went to a bond buyer with bonds limited to 6 per cent, he could not sell them without offering some stock as a bonus while keeping the rest of the stock for himself. This arrangement expressed the relative seniority of the claims to the profits—first, capital, and second, brains. Thus the stock represented the possibility of getting a higher dividend than the interest charges, which in themselves would not attract a man who was asked to invest in a new undertaking of doubtful profit. Yet to-day the government asked, What investment do the stock issues represent? A narrow limitation of earnings would make it possible only for strong established companies to do new work, and thus the doors of opportunity would be closed to ambitious men of limited means. The misunderstanding about the propriety of watered stock might disappear if all stock in an enterprise should be issued in the form of profit-sharing certificates instead of having a nominal par value. Thus in an undertaking requiring a cash investment of $1,000,000, against which in the past $1,000,000 in 6 per cent bonds and $1,000,000 in stock might have been issued, Mr. Crosby said that the bonds might be issued for the cash required and that each stock certificate would represent simply the right to participate in the profits after the interest was paid on the bonds. If the State should decide that these profits should be limited this could be done in any way which might seem desirable after the stock had received a return equal, say, to that paid on the bonds. Unless all new enterprises are to be abandoned some arrangement should be made for the reward of that much blackguarded individual the promoter, who assumes so many financial perils in launching his undertaking. Mr. Crosby defined an old enterprise as one which could raise money at, say, 5 per cent for any extension desired. With such companies also some arrangement should be made to permit them a minimum dividend plus a share of any net earnings which exceeded the figure so fixed.

In returning to the subject of watered stock, Mr. Crosby said that there should be no concealment as to its functions. It should be issued under a kind of pure food act which would attest the make-up and purpose of the article offered for sale. In conclusion, the speaker said that the railways should never enter into any arrangement which would not allow them to pay the good wages essential to hire and keep good men for their service.

The banquet was concluded with a witty speech by Walter B. Reed, secretary Schenectady Chamber of Commerce.

In connection with the building of a new central railway station at Copenhagen, Denmark, a line is to be constructed to connect it with the old Oesterbro station. It is proposed that this shall be operated electrically and a commission has been appointed to study the project. It is proposed to include other suburban lines in the scheme, and the single-phase system is advocated. In the provinces also electrification is under consideration, and steps in this direction are being taken. Thus in Jutland the new line from Aarhuus to Randers is to be electrically operated.

ANNUAL MEETING OF THE AMERICAN INSTITUTE OF ELECTRICIAL ENGINEERS.

The twenty-eighth annual convention of the American Institute of Electrical Engineers was held in Chicago, Ill., June 26-30. The headquarters were at the Hotel Sherman and all of the meetings were held there. On Tuesday evening papers were read by Henry Floy on "Depreciation as Related to Electrical Properties" and by H. M. Byllesby on "The Responsibilities of Electrical Engineers in Making Appraisals." Abstracts of these two papers are printed elsewhere in this issue.

DISCUSSIONS OF PAPERS OF MESSRS. FLOY AND BYLLESBY

Bion J. Arnold agreed with the authors that engineers could perform no higher service than to assist in making clear in the minds of the public just what were fair, equitable decisions in controversies between public service corporations and the public. The strained relations of the past had been due to oversight of the duties of corporations with respect to the public, which had brought about a general feeling of distrust. When the public, through city councils and National and State legislatures, found itself in a position to exact unjust demands, it in turn overstepped the bounds. The public was now treating the corporations more fairly because the American people fundamentally are inclined toward right and justice and because good work had been done by engineers in showing the true value of public utility properties and the true cost of rendering the service.

Referring to franchise values Mr. Arnold said that in the early days some companies held franchises that were very valuable, and they asked the public to pay rates that would produce earnings on these franchises which had been capitalized as well as on capital representing obsolete plant and equipment which had been replaced. He felt that public service corporations were justly entitled to more than a limited return on capital honestly invested in the early hazardous times. The fundamental principle of rate regulation was that the public should pay rates such as would pay for the service given plus the interest on the capital necessary to carry on the operations of the companies. If the early losses had been great the company should be allowed to recoup the actual money put into the property in the beginning and the cost of obsolete plant since replaced. This assumed that the company from now on was to have rate regulation. Conversely those properties which made large earnings in the early days were not entitled to retain in their capitalization the value of such losses as might have been sustained in the beginning but which should have been made up out of earnings when the increase in earnings justified such action. One Chicago property had paid dividends of 30 per cent at one time, so that now it suffered no hardship in having to accept rates which allowed a fair return on the present value only. The pioneer days had gone by and investment values were now fairly stable, so that those who had made large profits in the past should now be satisfied with an ordinary rate of return on their investment.

In the matter of valuations Mr. Arnold thought the proper method was first to determine the cost of reproduction new and then make additional allowances for development expenses, which might be from 20 to 25 per cent.

HEAVY ELECTRIC TRACTION

At the railway session on Wednesday morning three papers were presented in abstract. These were: "Analysis of Electrification," by W. S. Murray, New York, New Haven & Hartford Railroad; "Electrical Operation of the West Jersey & Seashore Railroad," by B. F. Wood, and "Induction Machines for Heavy Single-Phase Motors," by E. F. W. Alexanderson. Mr. Murray's paper was the same as he presented at the Toronto meeting of the Institute in April, 1911, and was abstracted in the Electric Railway

Journal of April 15, page 667. Mr. Wood's paper is printed in abstract on another page in this issue.

Mr. Murray said that the object of his paper was to represent fairly the present status of the single-phase system of trunk-line operation after an experience of five years. He was convinced that the single-phase system was the best to use for heavy electric traction. Engineers should begin to get together on questions of standardization of principles for trunk-line installations. No road was a true trunk line unless it had important terminals, from which it followed that it should give suburban passenger service in and out of those terminals. Handling freight was a most important consideration. The railroads on the Atlantic Coast had a ratio of yard track mileage to main track mileage of nearly 50 per cent, hence it was necessary to consider yard electrification as well as main-line operation. The Harlem River yards of the New York, New Haven & Hartford Railroad, with 100 miles of track and in some places fifty-three tracks wide, were being equipped for operation with the single-phase system at a cost of one-third that of any other system. The cost and weight of single-phase locomotives and multiple-unit motor cars were being reduced steadily. The latest single-phase locomotives weighed only 116 tons and were doing the same work as was performed by earlier locomotives weighing 150 tons. The designers had made the weight more nearly in correct proportion to the power and a reduction in cost per horsepower necessarily followed.

Frank Sprague quoted from his presidential address to the Institute in 1892, in which he forecast electric operation of railroads. He now understood that improved designs of split-phase transformers were making possible the use of polyphase induction motors on single-phase roads. He regretted that the railroads feared to give out the actual results of electric operation and complimented Mr. Woods on the data relating to the West Jersey & Seashore Railroad which he had made public. The time had not yet come, in his opinion, when engineers could agree that any one system of electric traction was the best for all roads and all conditions. Mr. Sprague next referred to the load factor of power stations for railway work and said that the time would come when very large central stations at favorable locations would supply power not only for railways but for lighting and commercial purposes throughout wide areas. Such stations could furnish power cheaply on account of the diversified load which they would carry. Finally he gave as his opinion that the battle should be between the steam and electrical engineers as to whether electrification was advisable rather than between electrical engineers as to what system should be used.

E. B. Katte, chief engineer of electric traction, New York Central & Hudson River Railroad, said that he regretted that Mr. Wood had omitted all comparisons of steam and electric operation. The New York Central figures were not now available because steam and electric operations were still mixed. He did not think that any one system of electric traction had yet been developed which would meet all conditions in a satisfactory manner. The speaker then presented comparative figures of current consumption in watt-hours per ton mile for typical runs of New York Central direct-current trains and New Haven alternating-current trains, which in all cases, he said, showed less energy required for the direct-current system. The New York Central recently operated 212,000 train miles in two months without a single detention due to failure of any part of the electric equipment. The cost of electric locomotive inspection and maintenance during the past three years had been about 3¼ cents per locomotive mile.

L. C. Fritch, chief engineer Chicago Great Western Railway, spoke from the standpoint of the steam railroad engineer. Steam locomotives had their limitations, but electric locomotives could perform any and all services more efficiently. He thought the railroads were making a mistake in delaying electrification. The Mallet compound steam locomotive was the dying gasp in the effort to retain steam power. In his opinion, the steam railroads had spent millions of dollars in terminal and grade improvements that would have brought better results if the money had been spent for electrification. A number of the roads entering Chicago could electrify certain parts of their lines profitably, but before electrification was begun the general scheme of the Chicago terminals should be entirely changed. He thought Mr. Murray's investigation of the cost of switching service was of great value and he believed that yard tracks could be equipped with overhead wires at a cost of less than $2,000 per mile.

N. W. Storer, Westinghouse Electric & Manufacturing Company, called attention to the advantage of increasing the coasting of electric trains and thus reducing the speed before applying the brakes so as to reduce the power demand. He referred to the apparently high cost of trolley wire maintenance on the West Jersey & Seashore as compared with third-rail maintenance. The trolley wire maintenance was high because of the use of small trolley wheels on heavy trains. It could be reduced by using the roller type trolley such as is used on the Southern Pacific and Key Route cars. Mr. Storer advocated a standard system of electrification. If a third-rail system was used on cross-country roads a high voltage would be needed and the hazard would be increased. He then described the latest type of New Haven locomotive weighing 116 tons complete with heating boiler and direct-current control apparatus. The tractive effort was nearly 40,000 lb. and the guaranteed speed was 50 m.p.h. It had four pairs of driving wheels, each driving axle being geared to two motors. Paradoxical as it might seen, it had been found that the locomotive could be made lighter by driving each axle with two small motors instead of one large one. The pairs of motors were permanently connected in series, thus giving the advantage of high voltage. The two motors were connected to a single gear on the axle while a large motor required two gears on each axle. The number of moving parts, such as commutator segments, brushes, etc., was practically the same and the small motors with their control apparatus were much easier to handle and maintain.

J. W. Lieb, New York Edison Company, urged standardization on one kind of transmission current interchangeable with that of the lighting and power companies because of the great economy of a diversified load. He said that storage batteries were indispensable for continuity of the Edison service, but the method of using them recently had been changed. Instead of discharging them every week, it was now found satisfactory to utilize them only as a reserve. He praised the Commonwealth Edison Company for taking the lead and showing that central stations could profitably assume railway loads.

Charles F. Scott, Westinghouse Electric & Manufacturing Company, pointed out that manufacturers had spent vast sums to demonstrate that both alternating-current and direct-current systems would fulfil railroad requirements. Now the final decision rested with the operating officials of the steam roads. He made a plea for standardization along lines that would permit future developments, such as the possible use of mercury arc rectifiers and induction motors on single-phase locomotives.

B. F. Wood said that undoubtedly the West Jersey & Seashore Railroad would have purchased its power if it could have obtained the low rates given in Chicago. The power plant, which cost $750,000, had a load factor of only 16 per cent, while the Commonwealth Edison Company had a factor of 45 per cent.

Mr. Murray, in closing, said that the experience of the New Haven road showed that the economy of electric operation would cover the interest on the investment in electrical equipment.

Annual Meeting of New York State Association

A Report of the Discussions on the Committee Reports and Papers Which Were Presented and Are Printed in Abstract Elsewhere in This Issue.

With a well-diversified program of papers on important business subjects, a successful banquet and other entertainments the members of the Street Railway Association of the State of New York held their twenty-ninth annual convention at the Hotel O-te-sa-ga, Cooperstown, N. Y., on June 27 and 28.

FIRST BUSINESS SESSION

President John H. Pardee called the first business session to order at 10:30 a. m. on Tuesday, June 27. The opening session was attended by about eighty members.

The association was welcomed to Cooperstown by Judge Nathaniel P. Willis.

Mr. Pardee then spoke of the recent death of Capt. J. W. Hinkley and said that he had appointed a committee to take appropriate action. The committee was composed of J. K. Choate, Otsego & Herkimer Railroad; E. S. Fassett, United Traction Company of Albany, and W. H. Collins, Fonda, Johnstown & Gloversville Railroad. Its report, presented by Mr. Choate, and unanimously adopted, recommended that the following tribute be placed upon the minutes:

"The members of the Street Railway Association of the State of New York desire to place on record some expression of their sense of loss in the recent death of Capt. James W. Hinkley, second vice-president of the association and president of the Poughkeepsie City & Wappinger's Falls Electric Railway. Although preceded by a long illness, the death of such a man as Captain Hinkley, in the prime of life, with the promise of many years of usefulness, finds his friends quite unprepared to realize that his earthly career is ended. A valuable factor in the life of his own community, he was also highly esteemed throughout the State by members of this association. His judgment was of so sound a quality that whatever he had to say always commanded interest and attention. While his service to this association was of a most effective character, it is nevertheless chiefly in a personal sense that his death is felt by its members. He possessed in a rare degree the gift of friendship. He enjoyed among us a popularity which belonged not merely to personal charm, but to personal integrity and sterling worth. The association extends its condolences to Captain Hinkley's bereaved family with the assurance that the memory of one who set so high a standard in its membership will ever be held in deep regard."

Secretary C. Gordon Reel then read letters of regret from invited guests who were unable to attend the convention.

President Pardee read the annual address of the president, which is published elsewhere in this issue.

H. M. Beardsley, the treasurer, was detained in Elmira and in his absence his annual report was read by Secretary Reel.

The report of Secretary Reel showed an increase of members over the preceding year.

President Pardee called attention to the fact that the association was fortunate in having present railway officials of other states, as well as representatives of the Public Service Commission and others interested in railway affairs. He extended a very cordial invitation to all to participate in the discussion on the important subjects before the association.

REPORT OF COMMITTEE ON INTERURBAN RULES

Mr. Choate then presented the report of the committee on interurban rules, which consisted of resolutions based upon the report which the committee on interurban rules of the American Electric Railway Transportation & Traffic Association has prepared for submission at the convention to be held in Atlantic City in October. The report of this committee was distributed in pamphlet form to the members present. The resolutions offered by Mr. Choate provided for the approval and adoption by the association of the code recommended by the American Association committee.

In asking the adoption of the resolutions Mr. Choate said that the committee considered that the report represented the combined best ideas of the operating officials of high-speed interurban lines in all sections of the country. The committee believed that the revised American code constituted the best report that it could make. All the credit for the rules was due to the committee of the American Association, headed by J. W. Brown, Public Service Railway of Newark. The committee felt that its real success would lie in the adoption by the association of a code that had the general approval of experienced operating officials. It was not the purpose of the committee to prevent discussion on the rules, which were prepared in the most thorough manner, but it believed that the code should be adopted without delay, with the proviso, of course, that amendments might be made from time to time.

Mr. Choate suggested that Mr. Brown, chairman of the American Association committee, be asked to comment on the code.

Mr. Brown stated that any action taken by the New York Association would be either a very great help or a very great drawback to the American Association committee in its plan to secure the adoption of the code by the national association in October. The committee represented widely separated sections of the country, and after the completion of its work had the satisfaction of knowing that some of those who did not favor the code adopted at Denver in 1909 had already expressed approval of the present revision. If the New York Association would place itself on record as approving the revised code it would do a great deal toward the accomplishment of a national success. The approval of the New York committee was greatly appreciated by the American Association committee.

J. N. Shannahan, Washington, Baltimore & Annapolis Electric Railroad, said he thought he had never seen a committee report as full and as nearly perfect as that of the American committee. The form of compilation of the report made it very easy to analyze and discuss the points of change. He believed in the elimination of all rules that it was possible to do without and of all unnecessary signals, but thought that it was unadvisable to eliminate Section k of Rule 99 in the old code, which read as follows: "Answer to signal of train displaying signals for a following section." The committee in its revision eliminated this section as superfluous. This signal appeared to be a very simple safeguard, and it should not be neglected. Mr. Shannahan was prepared to adopt the code, but would continue the use of this signal.

Reference was then made by Mr. Shannahan to the last paragraph of old Rule 203 and to old Rule 203a, which were eliminated by the committee as opposed to good practice. These related to the operation of trains protected by flag. They were adopted because of a partial tie-up of one system as the result of damage to telephone wires by a sleet storm. If the same conditions should develop again the complete abandonment of service could not be enforced if the tracks were safe for operation. Mr. Shannahan had grave doubts as to the inclusion of this rule at the time of adoption of the Denver code, and still had grave doubts regarding it,

but some rule should be outlined as a guidance to trainmen under such circumstances. He was prepared to vote for the change, but thought that some instructions should be placed on record to show the men the course which they should follow.

In regard to old Rule 211, which was revised, and 212, which was eliminated, Mr. Shannahan said that probably they should be withdrawn, but it was necessary to make some provision so that the line car could pass over the road when telephone wires were out of service for any cause.

Mr. Choate, in referring to a conference which the committee had with F. W. Stevens, chairman of the New York Public Service Commission, Second District, said that Mr. Stevens had asked for copies of the code in order that it might be inspected by representatives of the commission who are familiar with train operation.

Mr. Brown, in speaking of the suggestions of Mr. Shannahan, said that Section k of old Rule 99 was eliminated because it was thought that it caused a complexity of signals. In old Rule 203 and 203a the committee thought that the fundamental principle involved was that of safety and that any rule which allowed a train to proceed protected by flag should not be retained. Old Rule 212 provided that all extra trains lost their rights when the telephone became defective. It was not thought wise to allow this rule to remain because trainmen on extra trains would not always know when the telephone became defective.

Mr. Shannahan said that the code provided for two whistles as the answer to the signal of a train displaying signals for a following section and this might be confused with the answer to the bell-cord signal. If this created a dangerous condition it should be eliminated. He recognized the risk of having trains proceed protected by flag, but said that some way must be provided for getting trains over the road.

Mr. Pardee asked W. H. Collins to take the chair. Mr. Pardee then stated that it appeared to him that the code was more satisfactory than any that had been adopted heretofore. It was shorter and some rules that were undoubtedly essential and were always adapted to varying conditions on the roads had been eliminated. It would be a mistake to try to obtain in one code a preventive for every condition or possible happening on all roads. Many of these matters could be adjusted by the individual roads.

J. P. Maloney, superintendent Albany & Southern Railroad, believed that under Rule 231, as it now reads, the road might be tied up.

On motion of E. S. Fassett the vote on Mr. Choate's resolution approving the rules was postponed until the afternoon to allow the members more time to consider the subject.

Report of Committee on Amendment of Section 192 of the Railroad Law

W. H. Collins, general manager Fonda, Johnstown & Gloversville Railroad, presented the report of this committee, as follows:

"Your committee appointed at the annual meeting of the association held at Cooperstown on June 27 and 28, 1910, for the purpose of conferring with the Public Service Commission as to the proper interpretation of Section 192, formerly Section 109, of the Railroad Law of this State, relating to the use of center-bearing rails, submitted a report at the quarterly meeting held in Syracuse on Dec. 6, 1910.

"The report was accepted and the committee continued with instructions to confer further with the Public Service Commission and draft a bill to be presented to the Legislature. A bill was drafted and submitted to the members of the Public Service Commission, but they declined to approve it, Chairman Stevens stating that he did not think it would be wise for the commission either to approve or to disapprove same at that time. He said, however, that, if the bill should be introduced into the Legislature and the committee having the bill in charge should ask the opinion of the commission regarding its merits, of course such opinion would be freely given. He further stated that if the commission had any objection to the bill it would state it to the committee at that time.

"The position taken by the commission in this matter we understood to amount practically to an approval of the bill as drafted, and it was, therefore, presented to the Legislature, being introduced into the Assembly by Mr. Myers as Assembly Bill No. 1770, and into the Senate by Senator White as Senate Bill No. 1083. Neither of these bills has thus far been reported by the committees, and they have, therefore, received no progress this year."

Upon motion the report was accepted and the committee was continued.

Report of Committee on Joint Use of Poles

W. J, Harvie, chief engineer Utica & Mohawk Valley Railroad, read the report of the committee. It is published elsewhere in this issue. Commenting on the report, Mr. Harvie said that it was made up of two parts. The first part contained the standard agreement, which was of interest to all companies. A blank Appendix "A" was added in which local conditions might be enumerated. A blank Appendix "B" was left to give a schedule of the ownership of the poles and of the rentals. Appendix "C" was the specifications. In Appendix "C" there were references to twelve plates. Of these ten corresponded with the standard of the National Electric Light Association, but the committee recommended changes in two plates, namely, plates 6 and 9.

The secretary then read a communication from R. M. Ferris, chief engineer New York Telephone Company, commenting on the report. Mr. Ferris stated that he realized that the committee had done a great deal of work on the report, but that it really represented the position of only one party among those interested. He believed, however, that there would be comparatively little difficulty in harmonizing the recommendations in this code, and in that of the National Electric Light Association, and in that desired by the writer's company, and in conclusion he suggested further conferences between representatives of the three interests concerned.

Charles R. Barnes, electric railroad inspector, Public Service Commission, upon being called upon, said that he had been present at two meetings of the committee and, as he realized the amount of work that had been done on the report, hesitated about making any suggestions, but mentioned a few slight changes that he thought might be incorporated. In Art. 3, Par. 1, he thought a reference might be made to the classes of attachments mentioned in Appendix "C," part 2. Art. 6, Par. 3, could be expanded by the addition of the words "all legally authorized persons." Again, as the joint occupancy of poles was of interest to the Public Service Commission, it would be advisable to provide under Art. 8, Par. 5, that the commission be notified of any changes made under that paragraph. He also suggested the addition of the word "solely" after the words "shall be" and before the word "responsible" in Art. 10, Par. 1.

E. F. Peck, general manager Schenectady Railway, referred to the importance of the subject treated by the committee and the desirability of a joint use of poles by the several corporations interested, and said that he believed it was very necessary for the interests to get together on this subject.

C. Loomis Allen, general manager Syracuse Rapid Transit Railway, asked if the committee had any recommendations to make as to the disposition of its report. As Mr. Harvie said that he would like some action on it, Mr. Allen moved that the agreement be adopted as the standard of the association and be referred back to the committee for such further amendments as it might wish to make, and that the committee should make another report at the next quarterly meeting.

REPORT ON FRANCHISES

C. Loomis Allen, of Syracuse, stated on behalf of the commitee on standard franchises that the committee had taken up the subject with Commissioner Carlisle, who subsequently had retired from the Public Service Commission. He asked that the committee on this subject be continued. This was done.

STORAGE BATTERY CARS

The next order of business was the presentation of a paper entitled "The Edison-Beach Storage Battery Car," by Ralph H. Beach, president Federal Storage Battery Car Company, New York. An abstract of Mr. Beach's paper will be found elsewhere in this issue.

R. A. Dyer, Jr., assistant general manager Auburn & Syracuse Electric Railroad, asked what the efficiency of the battery was. Mr. Beach replied that the efficiency varied greatly according to conditions. At the normal rates of charging and discharging it was 61.2 per cent. In practical daily operation, however, 85 per cent efficiency in watt-hour output can be secured when the battery is discharged to only three-fifths of its total capacity. The battery is much more efficient in the earlier part of its discharge than in the latter part. Three-fifths of the discharging capacity should not be exceeded when the highest efficiency is desired. Continuing, in reply to James P. Barnes, electrical engineer Syracuse Rapid Transit Railway, Mr. Beach said that the initial difference of potential was 1.5 volts per cell. This would soon drop to 1.2 volts, but it would fall only very slowly thereafter until the battery was discharged to about 0.8 of its rated capacity. In conclusion, Mr. Beach said that numerous experiments in the Edison laboratory appeared to show that no further chemical improvement was possible in the battery, such as the oxidation feature. Nevertheless, an important electrical improvement had been effected by reducing from ¼ in. to ⅛ in. the diameter of the tubes of the positive plate. This change has greatly reduced the internal resistance of the battery so that the voltage drop on grades is much lower.

After a vote of thanks had been tendered Mr. Beach for his paper the meeting adjourned for luncheon.

TUESDAY AFTERNOON SESSION

The first order of business was the continuation of the discussion on interurban rules. C. Loomis Allen, vice-president and general manager Utica & Mohawk Valley Railway, submitted the following resolution:

"WHEREAS, This association did, at the 1910 meeting at Cooperstown, adopt a standard code of rules for interurban operation; and,

"WHEREAS, The association through the standing committee of rules has reported certain amendments and changes at this meeting, which by proper resolution have been approved by this association, now, therefore, be it

"Resolved, That these rules as amended be adopted and ratified by this association and that the committee be continued, to report at the next meeting of the association such proposed changes or amendments as may be wise or necessary."

Mr. Choate then withdrew his resolution and seconded that of Mr. Allen, which was unanimously adopted.

W. B. Potter, chief engineer railway and traction department General Electric Company, then presented a paper entitled "The Gas-Electric Car." An abstract of this paper is published elsewhere in this issue.

Mr. Allen asked Mr. Potter about maintenance costs. The latter replied that in one series of tests a car had run 35,000 miles for an apparatus maintenance cost of 2 cents per car mile. This charge covered the same items which in his paper were estimated at 3 cents per car mile.

Robert M. Colt, general passenger agent Fonda, Johnstown & Gloversville Railroad, then read his paper on "Tariffs," which is abstracted elsewhere in this issue.

W. V. Turner, chief engineer Westinghouse Air Brake Company, then presented a paper entitled "Steps in the Solution of the Problem of Adequately Controlling Electricaly Propelled Vehicles." An abstract of Mr. Turner's paper, on which there was no discussion, appears elsewhere in this issue.

The meeting was then adjourned after the appointment of a nominating committee consisting of Past-presidents Peck, Shannahan, Fassett and Allen.

WEDNESDAY MORNING SESSION

In opening the Wednesday morning session President Pardee announced that, owing to a delay in printing, the report of the committee on tariffs would have to be mailed to the members after the meeting.

The first paper of the session was "Reduction of Car Failures," by J. P. Barnes, electrical engineer Syracuse Rapid Transit Company. An abstract of Mr. Barnes' paper is presented elsewhere in this issue. In concluding his paper, Mr. Barnes added that his car-failure forecast for June showed an improvement of 12 per cent over May.

W. H. Collins, general manager Fonda, Johnstown & Gloversville Railroad, asked whether the 3000-mile lubrication standard applied to all cars. Mr. Barnes replied that it applied only to the Westinghouse No. 101 and the General Electric No. 216 equipments, which have oil wells and waste feed. A 300-mile lubrication period was used for the other equipments, which employed grease originally, but which were now oiled by means of felt and waste. In reply to a question by E. F. Peck, general manager Schenectady Railway, Mr. Barnes said he could not give the exact number of pull-ins, but he thought that the daily average of failures was about 8 per cent.

The next paper was on "Single-End versus Double-End Cars," by Herman Hicks, supervisor of schedules New York State Railways. An abstract of Mr. Hicks' paper appears elsewhere in this issue.

R. A. Dyer, Jr., assistant general manager Auburn & Syracuse Electric Railroad, asked for the difference in the maintenance cost of single-end and double-end cars. Mr. Hicks said that the difference was $79.70 per car in favor of the single-end car.

Mr. Peck asked if the cost of loops and special work was not a deterrent to changing over from single-end to double-end cars, especially in view of later extensions. Mr. Hicks admitted that there were heavy change-over costs, but he believed that they were justified because of the economies of single-end operation.

In support of Mr. Hicks, E. J. Cook, general manager New York State Railways, said that the single-end line had proved so successful after one year's service that another line would be equipped with single-end cars on July 1. It will be operated with fifteen entirely new cars and twelve converted cars, making a total installation of fifty-two single-end cars in Rochester. He expected that the company would continue this course. Referring to Mr. Peck's inquiry, he said that he had had considerable trouble sometimes in getting the necessary terminals for loops. Under certain conditions it might not be possible to get proper accommodations. However, he did not figure the purchase of real estate as a charge against the change because the land could be sold at a profit whenever the extension of the line required the abandonment of the loop.

In reply to Mr. Barnes, Mr. Hicks admitted that the difference in favor of single-end car maintenance costs might be due in part to the newness of the single-end equipments.

The last paper was "Maintenance of Way Matters," by C. A. Alderman, chief engineer Buffalo & Lake Erie Traction Company. An abstract of this paper appears elsewhere in this issue.

In reply to Mr. Barnes, Mr. Alderman said that owing to difficulties in high-speed operation on their three-point catenary suspension line, where 150-ft. spans are used, all future work would be of standard span or bracket construction.

Mr. Dyer expressed his astonishment at this change and said that the 300-ft. spans with five points of suspension were giving excellent service on the Syracuse, Lake Shore & Northern and the Rochester, Syracuse & Eastern Railways, where cars were operated up to 60 m.p.h. He had gradually lengthened his suspension points to 60 ft. Lesser distances than that had proved troublesome. Mr. Peck also expressed satisfaction with the behavior of catenary construction on the Ballston Spa high-speed line of his company.

M. J. French, engineer maintenance of way Utica & Mohawk Valley Railway, said he was glad to see that 100-lb. T-rail was giving such good service in paved streets, thus justifying the assertions of the association in favor of the T-rail.

In reply to a query by Mr. French, Mr. Alderman said that wooden ties had been used in preference to steel ties because the conditions of frequent car service favored that construction which would cause the least delay to car operation.

Mr. French asked if anyone had experienced trouble with slag ballast. Some kinds of slag generated a weak sulphuric acid which was injurious to the ties. He had had trouble of this kind on a small section of slag-ballasted track in Utica. Mr. Alderman said he had used a finely granulated slag ballast in open track for the past three years without injurious results.

Upon motion of W. H. Collins, a resolution of thanks was tendered to the entertainment committee, to Mr. Choate and to the management of the O-te-sa-ga Hotel.

The final business was the election of officers, which resulted as follows: President, Joseph K. Choate, Cooperstown; first vice-president, W. H. Collins, Gloversville; second vice-president, E. J. Cook, Rochester; secretary, J. C. Collins, Rochester; treasurer, H. M. Beardsley, Elmira; executive committee, J. C. Calisch, John E. Duffy, J. Stanley Moore and Charles H. Smith. After President-elect Choate had expressed his thanks for the honor of election, the convention was adjourned.

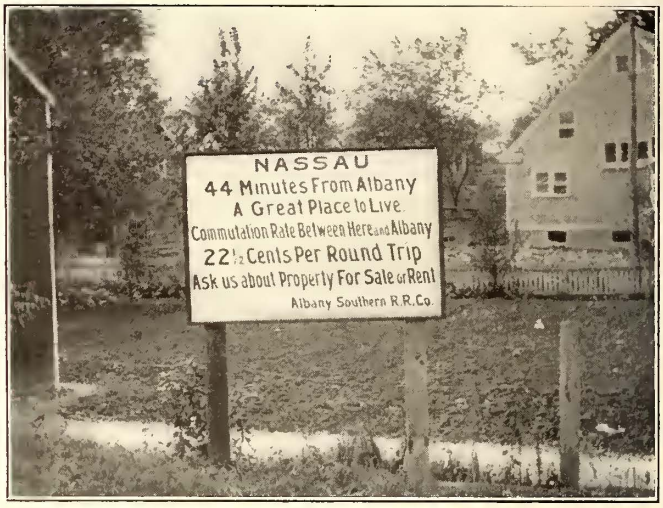
PROMOTING COMMUTATION TRAFFIC ON THE ALBANY SOUTHERN RAILROAD

The traffic department of the Albany Southern Railroad during the past two years has paid special attention to the development of commutation traffic. It has solicited information regarding property for sale or rent, summer hotels, camps and boarding houses along its line, and has

Portable Houses at Kinderhook Lake

furnished this information to anyone interested in country life. A list of the most desirable of these places has been published in the summer timetable pamphlet to attract, if possible, some of the many visitors to Electric Park, which is 18 miles south of Albany, N. Y., and is owned and operated by the railroad company. This year the railroad has purchased and erected at Electric Park, on the shore of Kinderhook Lake, a number of portable houses of different sizes which it has rented for the summer or sold with a ground lease. One of the accompanying illustrations shows a row of three of these houses of large and small size.

Another method of attracting residents to the towns reached by the Albany Southern has been tried this year for the first time. Large signboards have been erected



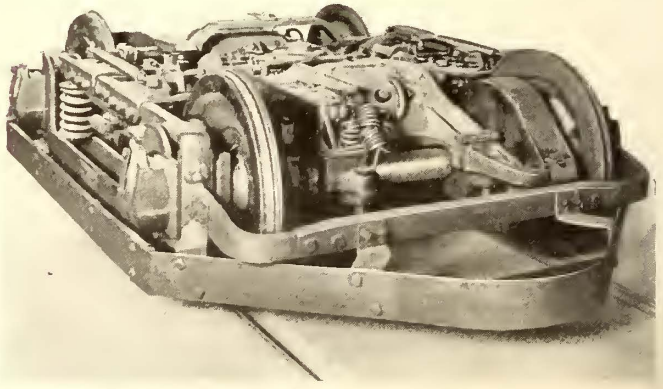
Sign at Station Stop

near the stations in each town, where they can be read by passengers sitting in the cars stopped at the stations. These signs give the name of the town, the running time and the round-trip commutation fare to Albany. One of the signs at Nassau is reproduced.

ELECTRICAL EQUIPMENT OF BOSTON PAY-WITHIN CARS

The Boston Elevated Railway is just putting into service fifty semi-convertible pay-within cars for surface operation. The new cars were made by the Laconia Car Company and embody several notable improvements, including an all-steel underframe, steel bulkheads, steel roof trusses and manually operated folding steps and doors, as described in the Electric Railway Journal for April 1, 1911.

The motor and control equipments were supplied by the Westinghouse Electric & Manufacturing Company.

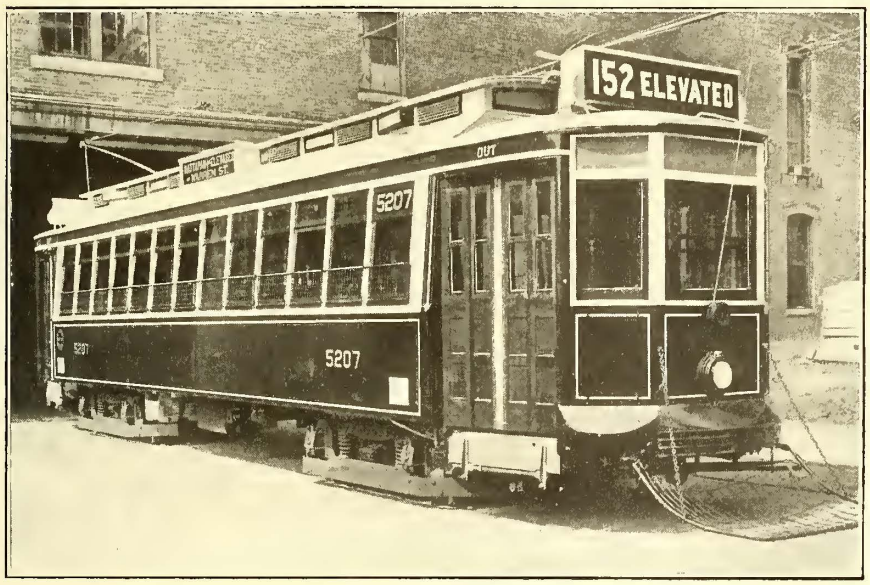


Equipped Motor Truck for Boston Pay-Within Car

Each car will have a quadruple equipment of No. 306 motors, particularly adapted for high-speed schedules. The No. 306 motor has a nominal one-hour rating of 50-hp at 500 volts and 60-hp at 600 volts. Lugs are provided on the corners of the upper half of the cast-steel motor frame for bolting the motor to the suspension crossbar. The axle caps are bolted to brackets extending from this upper frame. The suspension is designed so that, with the motor

in place, removal of the retaining bolts allows the lower half-frame to swing downward. The bearing housings are so fitted that the lower half of the frame may be dropped free of the armature and bearings, or the armature and bearings dropped with the lower frame for inspection of the upper field.

The main poles are four in number, and are centered



Boston Pay-Within Car

at 45 degrees from the horizontal plane through the axis of the motor. The main pole pieces are built up of soft steel punchings. The interpole coils are wound with copper strap and insulated, constructed and finished in substantially the same manner as the field coils. Each is supported and protected against injury by a bronze casting pressed into a groove around the tip of the interpole, and the coils are held firmly in position to prevent vibration.

The accompanying illustration, made from a photograph taken in the railway company's shop, Boston, shows one of the trucks equipped with the No. 306 motors. The trucks for the new cars were supplied half by the Standard Motor Truck Company and half by The J. G. Brill Company.

The motors are to be controlled by the Westinghouse unit switch control system, type HL, with no jumper provision for train operation. In type HL control the various main circuit connections between trolley, starting resistors and motors are made by pneumatically operated switches assembled in a common frame or switch group underneath the car. The reversing connections ordinarily made by the reverse drum of the plaform controller are made by a reverse drum similar to that of the controller, but of more substantial construction, pneumatically operated and mounted in a separate case underneath the car. The admission or release of compressed air to the pistons for operation of the switches and reverser is regulated by means of electrically operated magnet valves, one of which is attached to each piston cylinder. The switch group and reversers are hung from 2½-in. x 2½-in. angle irons by means of insulated bolts. The control resistors and fuse box are hung by means of wooden hangers, and the junction box by means of sharp iron hangers.

The circuits from the various magnet valves are controlled by a master controller on either car platform through a control train line which extends the entire length of the car and terminates at each end in a twelve-conductor train line receptacle. When the motorman's platform is in use as a rear end the doors are folded against the dash, thus making available the entire platform for loading or discharging passengers.

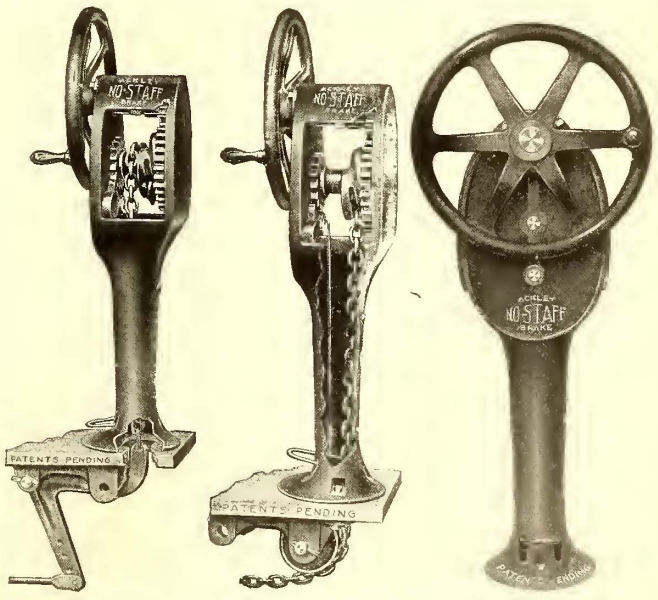
A STAFFLESS HAND BRAKE

To reduce the space occupied on the platform by the controlling devices a new hand brake has been designed by G. S. Ackley, the inventor of the Ackley adjustable brake. This brake combines the space-saving features of the vertical wheel with the advantages of the spur-geared eccentric winding drum. It has been named the Ackley No-Staff Brake because the customary brake staff is omitted.

The first engraving shows a full front view of the new brake. The pedestal and gear housing is a one-piece casting with doors on both sides for assembly and inspection purposes. In the second view these doors are shown removed and the pedestal broken open, disclosing the interior mechanism.

As will be seen, the brake chain is attached to the eccentric or cam of the drum, and by means of a spur gear cast to this drum and the pinion actuated by the hand wheel, is wound along the smooth spiral course to the drum's smallest diameter. This drum revolves on a roller bearing, and with its axis in a horizontal position there is no difficulty in the release, as the tension and weight of the unwound portion of the chain serve toward this purpose. In the center illustration the chain is shown as fully unwound.

A new arrangement is used in holding the brakes when applied. A pawl ratchet is mounted on the end of the drum and a pawl or dog mounted on the housing by a stud bolt directly under. The pawl is weighted on the spur end so that it is kept normally free of the ratchet. A vertical rod connects the pawl with the foot lever, the exposed part of which is normally raised. When the brakes are set and the motorman desires to hold the car he locks the



Side and Front Views of Staffless Brake

gears by pressing upon the foot lever, which throws the pawl into engagement with the ratchet. A slight turn of the hand wheel in the winding direction allows the weighted spur end of the pawl to drop free of the ratchet, permitting the brake to release but only when the motorman is prepared for it and has hold of the hand wheel. This feature eliminates the dangers of the old staff floor ratchet pawl and, with which, if the pawl was inadvertently kicked loose, the brake handle would revolve with great rapidity.

The third cut shows the chain wound in, the ratchet pawl which holds the brake from releasing and the goose-neck lever connection between the brake chain and the brake levers. This goose-neck connection provides for variable leverages by a series of holes so that the draw rod may be attached at different distances from the fulcrum. Different combinations of gear ratios are provided for, but those of 14:34 and 12:36 (the gears are four pitch) have been found to give the most satisfactory results; these combinations are interchangeable in the same housing. The Ackley no-staff brake will be handled for export by the Ackley Brake Company, New York City, and its many agents abroad.

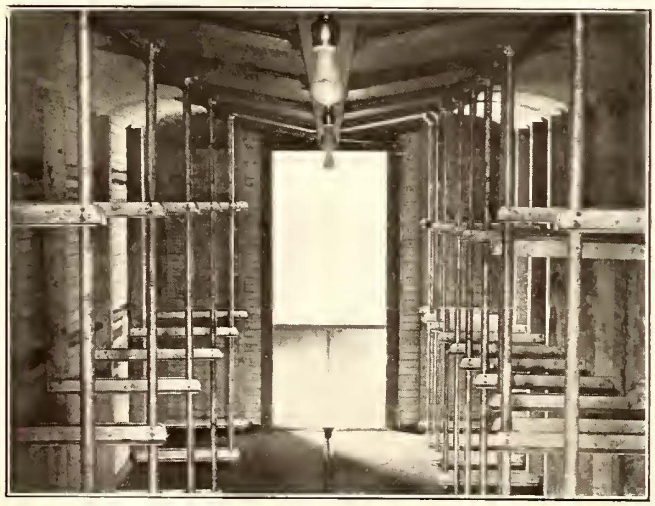
COMBINATION BAGGAGE AND REFRIGERATOR CAR

J. B. Haggin, one of the wealthy owners of farms in the Bluegrass section of Kentucky, has very largely given up the breeding of thoroughbred race horses since the decadence of racing. At Elmendorf, his beautiful property near Lexington, dairy cattle have succeeded the horse as

Baggage and Refrigerator Car Used on the Lexington & Interurban Railway

the chief interest of the owner, and he has become so interested in the possibilities of dairy products that he has purchased a combination baggage and refrigerator car in which to handle the products of his farm over the Lexington & Interurban Railway.

The car was built by the American Car Company, St. Louis, Mo. The body is made up principally of wood and the underframe of semi-steel construction. The trucks are Brill No. 27 M.C.B.-2. The principal dimensions are as follows: Length of the body, 50 ft.; length over the vesti-

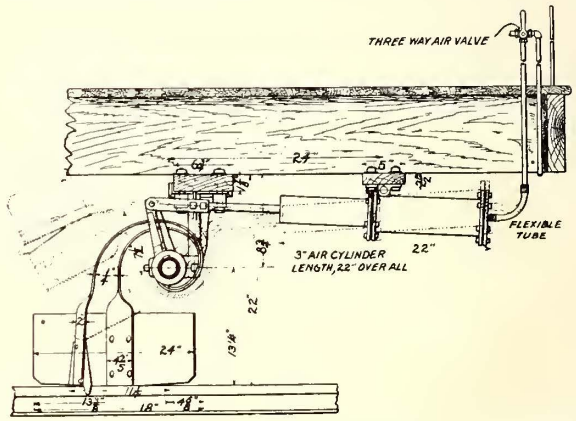


Interior of Refrigerator Car Used on the Lexington & Interurban Railway

bules, 48 ft.; width over the sills and over the posts at the belt, 8 ft. 6 in.; height from the sill to the trolley base, 9 ft. 6 11/16 in.; height from the top of the rail to the sills, 42½ in.; length of bolster centers, 32 ft. 6 in. The two trucks carry four Westinghouse No. 112 motors. Among the specialties on this car are the following: Ohio Brass couplers and sanders, National Brake Company's hand brakes, General Electric Company's headlights and Electric Service Supplies Company's gongs. The wheels, axles, bolsters, brake shoes and journal boxes were furnished by the J. G. Brill Company, and the body bolsters, bumpers and ventilators by the American Car Company.

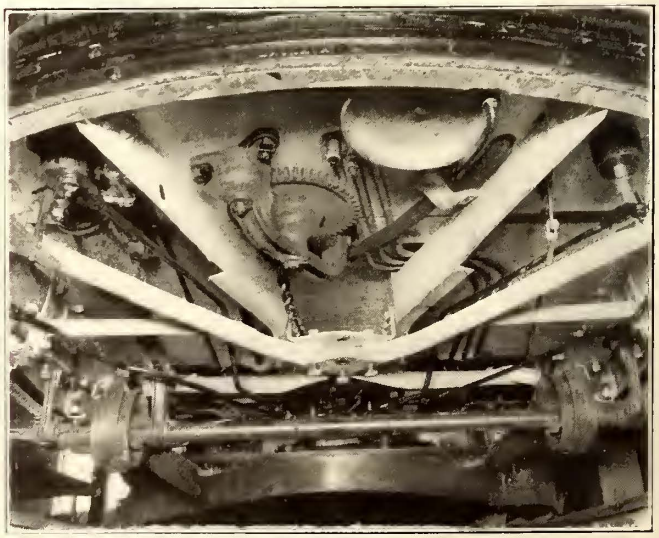
PNEUMATIC TRACK SCRAPERS IN BOSTON

The Boston Elevated Railway has recently applied to 100 cars the Root pneumatic track scraper shown in the accompanying halftone and drawing. The two most important features of this air-operated scraper are that it eliminates an extra wheel and staff from the platform and that it cannot fall at either end of the car when it is



Side Elevation of Pneumatic Track Scraper for Boston Pay-Within Cars

not in service. The scraper can be adjusted for any desirable pressure. It operates instantly when the motorman turns on the three-way air valve which is located on the platform. When the air is released, the spring inside the air cylinder pulls the scraper out of the way. This type of scraper was especially designed for the new Boston cars in order to avoid the use of windlass rods. With the exception of the pipe from the air cylinder to the three-



Pneumatic Scraper Applied to the Pay-Within Cars of the Boston Elevated Railway

way valve, the complete scraper equipment was furnished by the Root Spring Scraper Company, Kalamazoo, Mich. These pneumatic scrapers are furnished in several styles for application to either the car body or the truck, as conditions require.

LONDON LETTER

(*From Our Regular Correspondent.*)

As a result of the decision of the Prussian State Railways to electrify at least two of their lines as an experiment, questions on the electrification of railways in Great Britain have been asked the president of the Board of Trade recently in the House of Commons. The German Minister for Railways declared recently that electrification was an experiment at present on account of the military problems involved, which dominate all other matters in Germany. On this account, the substitution of electricity for steam as motive power must necessarily proceed slowly in Germany as the military authorities have to settle the question of danger to the whole railway system of the country in time of war. Mr. Buxton, the president of the Board of Trade, replied to the question in the House of Commons by saying that he was aware of the experiment being made by the Prussian State Railways, but that he did not think there was any reason to be disappointed with the progress of electric traction in England. The Railways Act of 1903 provided ample facilities for the introduction of electricity on railways when desired. Mr. Buxton also stated that he would apply for a copy of the report on the electrification of railways made to the Prussian Diet by the State Railway Administration.

In 1910 the British Electric Traction Company carried 324,750,000 passengers against 302,750,000 in 1909. The receipts were £1,690,327 in 1910 against £1,561,657 in 1909. The net profit for 1910 was £139,512 as compared with £130,564 in 1909. This, however, is not sufficient to pay dividends on all the various classes of stock. The dividend on the preferred shares has been paid to September, 1908, but no dividend has been paid on the ordinary shares since 1906. The report states that the board is evolving a plan to readjust the capital. The dividends which have accumulated on the preferred shares amount to £242,000.

The report of the Glasgow Corporation tramways for the year ended May 31, 1911, and the official list of statistics show traffic receipts, £946,021, an increase of £52,430 over last year's returns. There was an increase of 15,236,736 in the number of passengers carried, the total being 237,967,307, against 222,730,571. There was a decrease of 2,409,941 in the total of penny fares, but this is attributed to a large extent to the fact that for the four months ended May 31 two-stage fares were in operation in Glasgow. Since the beginning of the year on June 1, 1910, 6 route miles of extensions were opened for traffic. The average single-track mileage open during the year was 194¼ miles; the car mileage was 21,704,237 miles, an increase of 730,237 miles; the traffic receipts per car mile, 10.416d., an increase of 0.236d.; the traffic receipts per passenger, 0.954d., a decrease of 0.009d.

Sheriff Gardner Millar has delivered judgment in an appeal brought at the instance of the Glasgow Corporation Tramways committee against the city assessors to secure a reduction of assessments which are payable by the tramways. His Lordship has decided that the tramways committee is not entitled to have the undertaking assessed as a railway and has dismissed the appeal. His Lordship stated that there was no doubt that the appellants' undertaking, so far as it consisted of the lines upon the street, fell under the description of "lands or heritages," but the question was whether it was a railway within the meaning of the statute, so that its yearly rent or value should be deemed to be one-fourth of the amount entered upon the valuation roll of the city. So far as the physical appearance was concerned, the appellants' counsel maintained that the essential features of the two systems were identical. Like a railway the tramway ran upon a rail fixed to ties in the ground. Counsel for the respondents admitted there was no feature in the one system which would differentiate it from the other, but the tranmways were constructed and managed under different statutes from those which apply to a railway. A tramway as a rule consisted of lines in the public streets, whereas a railway was usually constructed on land acquired by its promoters. A railroad was not intended to be traversed by ordinary traffic.

The third reading of the bill to empower the City of London to build a new bridge across the Thames near St. Paul's Churchyard resulted in a vigorous debate in the House of Commons, and the bill has been referred back to the committee. No one doubts that a new bridge is necessary, but there is difference of opinion as to how the bridge should be constructed. As it was intended that the bridge should carry tramways it was expected that a scheme would be evolved by which the tramways would be brought across the river and continue in a subway underneath Cheapside, joining the northern system in Aldersgate. After the City of London had consented to the construction of the bridge an effort was made to change the site of the structure so as to open up a vista of St. Paul's Cathedral. The original idea was to bring the approach of the bridge to the end of the Cathedral, which would have carried traffic in a straight line from the bridge past the east end of St. Paul's to Aldersgate. Many influential people and architects, however, thought that it would be inadvisable to spend such a large sum of money on a bridge in the vicinity of St. Paul's without endeavoring to open up a vista of the Cathedral from the bridge approaches and they therefore desired to direct the bridge toward the center of the Cathedral. The police claim that the proposed change would quadruple the difficulty of handling the traffic at that point.

The tramway estimates of the London County Council for the current financial year show that the total expenditure on capital account up to March 31, 1911, amounted to £11,060,000, and that a further sum of £2,400,000 would be required to complete the work of electrification and the construction of authorized lines. This total of £14,000,000, however, does not include the cost of tramways for which powers are now being sought in Parliament. Reporting on the estimates, both the finance committee and the highway committee draw attention to the motor omnibus companies, which it is claimed occupy an exceptionally favorable position owing to the fact that they are liable, as is the Council, for rates for occupying the roads over which its omnibuses run. In addition, these companies are not required to contribute to the upkeep of the roads. The electric railways are placed at a great disadvantage by having to contribute towards the upkeep of the road. It is estimated that this relief for the local authorities amounts to £118,000 a year, exclusive of the cost of street cleaning. This amount is likely to increase in the future. The operation of all-night and workmen's cars were also criticised as they involve a loss to the Council estimated at £70,000 a year. The omnibus companies, on the contrary, do not give special workmen's fares, nor do they run their vehicles all night. The estimated surplus for the coming year is more than £900,000, but after the charges have been deducted the net surplus will be about £187,844, of which it is proposed to apply £138,270 to renewals fund, worked out on the agreed basis of ¾d. per car mile, and £49,574 to the general reserve fund. In 1905 the number of persons killed per 1000 licensed vehicles was 12 by motor 'buses and 12 by municipal tramcars; in 1906 it was 32 by motor 'buses and 9 by tramcars; in 1907, 29 by motor 'buses and 12 by tramcars; in 1908, 55 by motor 'buses and 13 by tramcars, and in 1909, 44 by motor 'buses and 12 by tramcars. The highways committee reports that the scheme for a tramway from Marble Arch to Cricklewood was withdrawn in committee, and that there is no doubt as to the value this line would be to the public. It has therefore decided to submit at an early date a recommendation to the Council with a view to the reintroduction into Parliament in the session of 1912 of a scheme for constructing tramways along this route.

The tramways committee of the Birmingham City Council has obtained permission to borrow £99,806 for rolling stock and to reconstruct the tramways. Sixty new cars are to be purchased, and top covers are to be added to 130 others which are at present uncovered. The cost of the new cars and covers will be £61,379. About £31,928 will be spent on the reconstruction of the track between Colmore Row and Hockley Brook, £2,714 is required for the overhead equipment of the tramways in place of the present cable system, £2,585 for cables and switch pillars for the Hockley route, and £1,200 for additional machinery and plant. During the year just ended more car miles were run than in the previous year. The equipment of the cars with meters has enabled the company to reduce the consumption of current.

A. C. S.

News of Electric Railways

Right to Compel Electrification at Chicago

In response to the request of the local transportation committee of the Common Council of Chicago, Corporation Counsel Sexton, of Chicago, on June 19, 1911, rendered an opinion to the effect that the city of Chicago through its police power is vested with authority to compel the electrification of the steam railroads which operate into the city. An opinion in regard to this matter was sought on account of the ordinance presented to the Council by Alderman Britten, which, if passed, would compel the railroads which operate into the city to adopt some power other than steam and to install the new power so as not to emit smoke. In his opinion Mr. Sexton said:

"Any ordinance should, of course, provide that the time within which the railroads should comply with the duties imposed upon them should be commensurate with the magnitude of the task which the ordinance requires them to perform. The contention will no doubt be made that the railroads have certain rights under their respective charters, whether special or granted under the general law providing for the incorporation of railroads, which are protected by the constitution.

"This argument will probably be advanced upon the theory that the railroads have built their lines over certain rights of way before certain numerous streets were opened up across such rights of way, and upon the further theory that at the time most of their charters were granted steam was the only adequate motive power then adaptable, and that on account of the imperfect development of smoke consumers in locomotives at that time the Legislature contemplated that it was necessary in the operation of locomotives to emit dense clouds of smoke and other noxious gases, and that their right so to operate locomotives is, therefore, protected by their charters.

"This position is not tenable. All corporations must accept their charters subject to the police powers of the State. Any ordinance passed should direct what should be done or omitted and should leave the railroads free to adopt their own methods to accomplish the desired result."

Replies of Companies Filed in New York Rapid Transit Negotiations

On June 27, 1911, the Interborough Rapid Transit Company rejected the terms fixed by the Board of Estimate of New York for the construction, equipment and operation of rapid transit lines in New York in accordance with the recommendations of the special committee of the Board of Estimate and the Public Service Commission which proposed a division of territory between the Interborough Rapid Transit Company and the Brooklyn Rapid Transit Company. The Brooklyn Rapid Transit Company, however, on the same day expressed a desire to accept the terms of the city, but in its reply cited certain modifications which it declared were conditions precedent to its acceptance. In its letter the Interborough Rapid Transit Company said substantially:

"We regret for the reasons set forth in the accompanying memorandum that we are unable to accept the terms proposed, or, under the new conditions that have arisen, to continue in force our subway offer of Dec. 5, 1910, and May 9, 1911.

"We regret that we are forced to take a position which, together with the declared policy of the city authorities, necessarily leaves the city divided into two rapid transit districts, requiring a double fare to travel from one to the other; renders impossible of fulfilment the wise policy of the old Rapid Transit Commission, repeatedly declared, of developing the present subway lines so as to afford at the least possible cost through trunk lines upon the east and west sides of Manhattan, with normal feeders to the outlying boroughs; deprives the greater city as a whole of the benefit of a unified rapid transit system with a single 5-cent fare; substitutes for a 5-cent access to Coney Island from all parts of the city a plan under which the greater portion of the citizens can reach the seaside only upon the payment of a double fare, and in many cases a triple fare; cuts out the heart of the business center of Manhattan, separates it from its own residential districts, attaches it as a terminal to the Brooklyn system alone, and necessarily unsettles and perhaps revolutionizes real estate values throughout the boroughs of Manhattan and the Bronx; applies the credit released through the successful operation of the present subway system on the island of Manhattan and a great portion of the additional credit hereafter available to the development of the rapid transit system of one borough; entails upon the city, under the guarantee provision to the Brooklyn Rapid Transit Company above referred to, a large continuing deficit, of which Manhattan and the Bronx will bear the larger proportion; gives absolutely no rapid transit relief to the great residential district of the upper west side of New York; furnishes no transit facilities to the public using the new Pennsylvania station or to the lower west side; leaves congestion upon the east side for many years substantially where it stands to-day; only in the distant future, if the triborough route should be built, promises to extend a limited service to the Bronx, and postpones such relief as it does propose to confer upon a limited section of New York through a period of many years.

"In justice, however, to the holders of our stock and of our bonds, no other course is open to the company than to decline. If the city desires the co-operation of the Interborough Company, and through it the co-operation of private capital, in the execution of its general rapid transit plans, it will be necessary for the city to propose terms which will justify this company, with respect to both its old and new investment, in embarking in the project.

"We are likewise compelled to decline the terms tendered for third-tracking the elevated lines. We nevertheless stand prepared, within the reasonable limits of our resources, to relieve at an early date the unfortunate condition of travel congestion in this city. Our offer of June 10, 1910, with respect to elevated improvements and the operation of the Belmont tunnel, connecting Queens with Manhattan, upon which an agreement had been almost reached with the Public Service Commission, we still leave open for your further consideration."

The memorandum which accompanied the letter begins with a review of the subway negotiations and then discusses the company's fears concerning the losses likely to be experienced in the first five years of operating the extended system, assuming the terms as set forth in its offer amended down to May 9, and the traffic growth as estimated in the report of the special committee of the Board of Estimate and the Public Service Commission. The memorandum then remarks that if the actual rate of travel increase on the elevated and subway lines in the past year were used as determining the growth of the first ten years of operation the net result might be disastrous. In the memorandum the company declares:

"The margin of safety in our offer of May 9 was so narrow that the introduction of the Broadway competitive route reducing our estimated revenues by not less than $5,000,000 a year would have made it impossible for us to carry the offer into effect. If, therefore, our own offer went to the limits of conservatism it must be manifest how utterly impossible it is for us to accept the city's present offer, which makes certain a severe competition and imposes many additional hardships on the company."

The reply of the Brooklyn Rapid Transit Company points out in detail the modification of the terms which the company desires. That part of the reply, however, in which the company signifies its general willingness to accept follows:

"We beg to say that generally we are prepared to accept the recommendations of said report as applicable to the proposals made by this company and, upon the terms therein laid down, to pledge the entering into contracts for the carrying out of such recommendations, through the

instrumentality of a new company to be organized for that purpose and of the existing railroad companies the operation of whose lines is to be merged with that of new rapid transit lines.

"In making this response, however, we ask, as a condition of our acceptance, that certain matters not explicitly or fully covered in the report be made clear according to our understanding of the intentions of the conferees, and that certain modifications of the proposed operating terms be made in the light of a better appreciation of their effect or a fuller understanding of the facts upon which they were based. While there are several features of the report as applicable to us which we regard as unnecessarily severe and one in particular which we believe to be unwise from the point of view of the city, nevertheless our disposition has been from the beginning, and is now, to co-operate with the city to the extent of our ability for the solution of the transit problem. So much does our plan offer in the way of transit relief and for the best development of New York that it would, in our judgment, be a public calamity if by insistence upon terms which are unreasonable either as against the city or as against the company, the negotiations which have progressed during three months should now fail of accomplishment.

"The modifications which we have requested merely offer some protection against possible loss and assist in our financing of this great project. We do not ask that the city, because adopting the absolutely uneconomic proposition of a 5-cent fare to Coney Island, should bear the burden of such a policy. We do not even ask that this unreasonable condition should be eliminated from the proposed terms, but we do suggest that the city, even more than the company, has a vital interest in this matter and that before enforcing such a rate of fare for purely pleasure traffic it should await for a reasonable period the result of operation under the present rate of fare."

Initiative Measures in Portland, Ore.

At the recent election in Portland, Ore., several initiative measures were voted upon which affect the Portland Railway, Light & Power Company. The three measures of greatest moment to the company were the bill to create a local public service commission, a no-seat-no-ride ordinance and a proposal to place a license tax of 3 per cent on the gross earnings of the electric companies in Portland. The measure to create a public service commission and the no-seat-no-ride ordinance were defeated, but the tax measure was passed.

The Portland Railway, Light & Power Company conducted a campaign of publicity which lasted two weeks to meet the issues which were raised by the proposed measures. During the first week the campaign was entirely educational, being designed to bring the public to realize the immense amount of work done by the company in Portland and the significance of this work in respect to the prosperity of the city and the comfort of its inhabitants. Practically every organization in the city condemned the no-seat-no-ride ordinance, many of them condemned the tax measure, and the principal newspapers and a large number of prominent individuals condemned all three. The first week of the campaign of the company paved the way for arguments and the second week of the campaign, which was the week preceding the election, was given over to discussions of the questions and principles involved in the measures which were to come before the voters.

The Portland Ad Club was one of the prominent organizations of the city which opposed the no-seat-no-ride ordinance and the tax measure. F. W. Hild, general manager of the Portland Railway, Light & Power Company, addressed this club. He said that the company paid out last year in various forms of taxation about $658,000, or approximately 12¼ per cent of its gross earnings. This was made up as follows: $318,000 in direct taxes, $30,000 in bridge rentals and $300,000 in paving assessments, which are a survival from the horse-car days. In the five years which end this year, Mr. Hild said, the gross earnings of the company will approximate $24,900,000, while during the same period expenditures for all purposes will amount to about $44,000,000, the difference representing the amount expended for extensions and general improvements.

Arbitrator Selected in Toledo

The City Council of Toledo, Ohio, and Mayor Whitlock have decided to accept the proposal of the Toledo Railways & Light Company to select an arbitrator to decide differences between the two expert appraisers of the property. Mayor Whitlock has asked the company to name its appraiser so that the work may proceed.

In a letter to Mayor Whitlock, Albion E. Lang, president of the Toledo Railways & Light Company, stated that the question of an arbitrator to settle the differences between the experts chosen to fix a valuation on the railway property for franchise purposes would be decided at the regular meeting of the board of directors on June 29, 1911. The letter was written by Mr. Lang while he was in New York consulting with the bondholders of the company.

Attorney W. W. Miller, of Hornblower, Miller & Potter, is quoted as follows in regard to the affairs of the company:

"The committee representing the bondh lders is satisfied with the negotiations now being carried on for an adjustment of the franchise question with the city of Toledo, and confidently expects that the matter will be adjusted within a comparatively short time. An attempt to throw the company into the hands of a receiver at this time would be unwise.

"A meeting of the bondholders and creditors was held in Toledo recently to arrange to pay off the semi-annual interest on the company's bonds due July 1, 1911, and discuss the question of improvements to the property for the coming six months.

"Since the creditors and bondholders' protective committee was organized more than two years ago it has expended more than $1,000,000 for improvements and has arranged to expend still further sums in raising the standard of efficiency of the property to meet the requirements of the traveling public.

"No steps will be taken toward reorganizing the property until the franchise question has been settled. As soon as that matter is out of the way a plan will be presented, and it is expected that little trouble will be experienced in putting it through to the satisfaction of all parties concerned without throwing the company into the hands of a receiver, which would be expensive."

A petition signed by 200 members of the Toilers' League was presented to the City Council recently asking that the company be required to operate at a rate of eight tickets for 25 cents and that a charge of $500 a day be made for the use of streets upon which the franchises are said to have expired.

New Haven Protests Against Compulsory Electrification at Boston

The New York, New Haven & Hartford Railroad has sent to every member of the Legislature of Massachusetts a circular protesting against compulsory electrification of its lines out of Boston, in which it says in part:

"Except where use of tunnels is rendered less dangerous by use of electricity there has been no compulsory electrification of railroads. All the New York, New Haven & Hartford Railroad's electrification has been without compulsory legislation. The company has repeatedly stated its desire and willingness to electrify. This year it proposes to electrify from Readville, on the Boston & Providence Railroad, to Beverly, on the Boston & Maine Railroad.

"Electrification of short distances, say 10 miles, has never been found at all economical, and compulsory electrification within a 10-mile limit will be unusually uneconomical. Money required for electrification must be raised by the issue of new securities, and, unless the money for electrification is wisely and economically expended, there will be placed upon railroad transportation a very serious charge which can only be met by increased passenger and freight rates. The best business interests of New England require these rates to be kept as low as possible consistent with safety.

"It is proposed to discriminate against every other city and town in Massachusetts in favor of the district within 10 miles of Boston. Estimated cost of electrification of this district will amount to approximately $40,000,000. If the railroads are called upon to make this expenditure in the

city of Boston and vicinity, if the proceeds of the securities which the railroad corporations can find the public willing to purchase must be expended in this electrification, then other railroad improvements must necessarily wait. Electrification in other parts of Massachusetts must wait because there is a limit to the amount of money which the public will invest in railroad securities."

New Detroit Municipal Ownership Amendment

Corporation Counsel Hally, of Detroit, Mich., has prepared a new draft of a municipal ownership charter amendment which he believes corrects the legal defects of the former amendment. Mr. Hally said that Council cannot take action on the amendment until Aug. 1, 1911, as the law under which it is drawn does not take effect until that time. Two elections will then be required, one to ascertain whether the people favor municipal ownership and the other to authorize bonds to purchase the street railway property.

Alderman Thomas Glinnan, of Detroit, Mich., has introduced in the Council of Detroit a resolution to submit the question of the city taking over the Detroit United Railway to the voters of Detroit at an election to be held some time after Aug. 1, 1911. The resolution directs the committee of the Council on charter and city legislation and Corporation Counsel Hally to prepare the bill for submission to the voters, and requests the committee on charter and city legislation to select a day for a special election to be held as soon as possible after Aug. 1, 1911, to determine the question. Mr. Glinnan's bill, which provides for an amendment to the charter so as to permit the city to own and operate the street railway system, was referred to the committee on charter and city legislation.

Amendments to Cleveland Grant

At a meeting of the committee of the whole of the City Council of Cleveland on June 20, 1911, the Kramer amendments to the Tayler franchise were approved and they will come before Council at the next regular meeting. On June 19 and 20 G. M. Dahl, street railway commissioner, and Mr. Baker, the city solicitor, expressed their views openly, and Mr. Baker finally refused to vote upon the amendments. At the previous meetings Mr. Baker supported the amendment to require the property to be maintained at 100 per cent of its renewal value, but at the meeting on June 20 he said that he thought this was impractical. Mr. Dahl also objected to the amendment. He contended that under it the people would be taxed unnecessarily to protect capital.

On the question of extending the low fare to the suburbs as they are annexed Mr. Baker argued that each car rider should pay approximately what it cost to carry him. Mr. Dahl said that each rider should pay a flat fare and Mr. Baker finally agreed that this was the correct system. The Hanratty amendment to provide for the extension of low fare to all annexed territory after Dec. 18, 1909, failed, but the Kramer amendment, which gives Council the right to extend the fare to any suburb, was adopted.

Mr. Baker asked whether the company would have the right to raise the fare to the suburbs during the last fifteen years of the life of the ordinance. Councilman Morgan and others pointed out that ordinances extending the fare would be subject to a referendum vote. Mr. Baker opposed the amendment to give the city power to dictate extensions and betterments up to the last five years of the life of the franchise, subject to arbitration on the propriety of making such betterments and the company's ability to finance them. He asserted that the acts of Council should not be subject to arbitration as to their propriety, but should be absolute. Mr. Dahl stated that it might not be possible for the company to comply with arbitrary demands of the Council and thought that some means should be provided to meet such a crisis. The amendment was approved in its original form. The Burke amendment to permit conductors and motormen to ride free when not in uniform by exhibiting their badges was approved.

The City Council did not act upon the proposed amendments to the Tayler franchise at its regular meeting on the evening of June 26, 1911.

National Civic Federation Conference on Uniform Public Utility Legislation

The national committee on the regulation of railroads and public utilities, which was appointed some time ago by President Seth Low of the National Civic Federation, New York, held its first meeting in New York on June 23, 1911, to consider the question of drafting a bill for a model law for the regulation of railroads and other public utilities. Mr. Low, who presided, was authorized by the committee to appoint a sub-committee of seven to make an investigation and report on a plan for the proposed bill, and he named the following sub-committee before the meeting adjourned: Emerson McMillin, American Light & Traction Company, chairman; Franklin K. Lane of the Interstate Commerce Commission, Martin S. Decker of the Public Service Commission of the Second District of New York, Milo R. Maltbie of the Public Service Commission of the First District of New York, Prof. John H. Gray of the University of Minnesota, P. H. Morrissey, former grand chief of the Brotherhood of Railroad Trainmen, and Franklin Q. Brown.

During the meeting President Low called attention to the fact that the Civic Federation a few years ago sent a commission abroad to investigate the status of public and private ownership and operation of public utilities in England as compared with similar enterprises in the United States. He said that the report of that committee was probably the best compendium of facts on the subject yet produced. Lack of uniformity in State legislation on the subject was liable to injure railroads and other corporations. The sub-committee expects to meet soon.

Among the speakers at the meeting on June 23, 1910, were: Prof. John H. Gray of the University of Minnesota, who was a member of the federation commission which went abroad to study government and private operation of public utilities; Blewitt Lee, general solicitor of the Illinois Central Railroad; P. H. Morrissey, former grand chief of the Brotherhood of Railroad Trainmen, and Emerson McMillin, president of the American Light & Traction Company. Some others in attendance, or invited to be present at the meeting, were: Arthur W. Brady, president American Electric Railway Association; James Campbell, president North American Company; Theodore N. Vail, president American Telephone & Telegraph Company; George W. Perkins, railway director and banker; Samuel Insull, president Commonwealth Electric Company; Robert Winsor, banker and director in public utilities companies; August Belmont, chairman board of directors Interborough Railroad Company; Timothy S. Williams, president Brooklyn Rapid Transit Company; Robert Mather, president Westinghouse Electric & Manufacturing Company; W. W. Freeman, president National Electric Light Association; Charles L. Edgar, chairman committee on public policy National Electric Light Association; George F. Swain, professor political economy Harvard University; W. J. Clark, General Electric Company, and James H. McGraw, president McGraw Publishing Company.

Extension of Time for Terminal Improvement in New York.—The New York Central & Hudson River Railroad has been granted an extension of time until Dec. 31, 1912, by the city authorities of New York in which to complete the improvements to the Grand Central station.

Mono-Rail Line Ordered to Be Removed.—The Board of Estimate of New York has decided that the Pelham Park & City Island Railroad, New York, N. Y., must remove its mono-rail line from Pelham Bay Park and has refused to grant the company an extension of time in which to build the line through City Island.

Suit Proposed to Compel Returns in Regard to Bond Sales.—The Public Service Commission of the Second District of New York has issued an order to require the Rockland Railroad to show cause before it on July 10, 1911, at Albany, why an action should not be commenced to recover penalties for the failure of the company to file reports covering the issuance of bonds previously authorized by the commission. On Jan. 26, 1910, the commission authorized the company to execute a mortgage for $3,000,000 and issue thereunder a

like amount of fifty-year gold bonds. The company, which proposes to build an electric railway in Rockland County, has failed to file reports covering the sale of these bonds in the form required by the commission.

Suburban Municipal Line at Toronto Desires Entrance Over City Lines.—Corporation Counsel Drayton, of Toronto, Ont., has asked the Ontario Railway & Municipal Board for an order to require the Toronto Railway to approve of the city's plans for the proposed municipal street car lines in the remote sections of the city. H. S. Osler objected that the application for running rights over the company's lines was premature because the city had not built any lines. Mr. Drayton replied that without an understanding beforehand the city might be put to unnecessary expense for carhouses, etc., if the Toronto Railway should object to the equipment as unsuitable after the city had built the proposed lines. The board reserved judgment.

Physical Value of Seattle, Renton & Southern Railway Fixed.—R. H. Thompson, city engineer of Seattle, Wash., has completed the work of valuing the physical property of the Seattle, Renton & Southern Railway. The appraisal was made in accordance with a resolution to authorize the city to issue $800,000 of bonds to take over the property, the purchase of which was approved by the voters of Seattle some time ago. Mr. Thompson has fixed the value of the property at upward of $500,000, and his report to the Board of Public Works has been referred to a committee composed of Mr. Thompson, A. L. Valentine, superintendent of public utilities, and J. D. Ross, superintendent of lights.

Arguments Concluded in Milwaukee Fare Case.—The arguments before the Railroad Commission of Wisconsin in connection with the petition of the city of Milwaukee for a 3-cent fare on the lines of the Milwaukee Electric Railway & Light Company were concluded at Milwaukee on June 16, 1911. At the concluding hearings Lester C. Manson, former assistant city attorney, appeared for the city and E. S. Mack, George P. Miller and W. J. Curtis appeared for the company. A summary of the contentions in the brief of the company, which bears the names of Miller, Mack & Fairchild, attorneys, and Sullivan & Cromwell, counsel for the company, was published in the ELECTRIC RAILWAY JOURNAL of June 10, 1911, page 1025.

Columbus Dynamiting Cases.—The indictment against David A. Davis on the charge of aiding and abetting in the dynamiting of cars during the strike of the employees of the Columbus Railway & Light Company, Columbus, Ohio, a year ago, has been nolled, as sufficient evidence for conviction could not be secured by the prosecuting attorney. Davis claimed that union street car men gave him money to be handed to Alfred N. Strader, now serving a fifteen-year term in the penitentiary on the charge of dynamiting cars. He asserted that he did not know that Strader was charged with dynamiting cars when he gave him the money and helped him to escape. Morris V. Cranmer, financial secretary of the local organization of street railway men at Columbus, is yet to be tried on the charge of aiding and abetting in the dynamiting.

Boston & Eastern Railroad Granted Certificate of Necessity.—Governor Foss of Massachusetts has signed the bill granting to the Boston & Eastern Railroad a certificate of exigency for the right to build a high-speed interurban electric railway over a private right-of-way from Boston to Danvers and certain intermediate points. The original application for a certificate of necessity was made on Aug. 23, 1906. On Sept. 18, 1907, the Railroad Commission declared the route faulty and suggested an independent entrance to Boston. On Nov. 17, 1908, the commission witheld the certificate of necessity for lack of authority to build the tunnel. An April 6, 1909, the Legislature instructed the railroad and transit commissioners to report jointly on the desirability of the tunnel. On June 15, 1910, the Governor signed the tunnel bill. Hearings were then ordered on question of exigency, and on Aug. 22, 1910, the commission deferred issuing a certificate until the Legislature had acted on other reports relating to metropolitan affairs at Boston. On Aug. 23, 1911, the company applied for a rehearing with the result that it has now obtained the necessary certificate.

Financial and Corporate

New York Stock and Money Markets

June 27, 1911.

Aside from activity on Saturday and Monday following the decision of the government case against the Harriman lines in favor of the railroads, business on the New York Stock Exchange has been quiet throughout the week and trading has been light with few price changes. Brooklyn Rapid Transit advanced 1⅛ points, the rise being attributed to developments in the subway question. Interest in the money market is increasing owing to financing of the Panama Canal bonds and the volume of July disbursements. Quotations to-day were: Call, 2¼@2½ per cent; ninety days, 2¾@3 per cent.

Other Markets

The Philadelphia market, while active, has not been greatly concerned with traction interests.

Elevated railway issues have been leaders in the Chicago market for the week, prices advancing on Saturday last, followed by slight declines in Monday's market.

Narrow trading and minor price changes form the record of the Boston Exchange, with American Telephone and the coppers constituting the only shares of interest in to-day's market.

United Railways issues were strong and active in Baltimore early last week and Augusta & Aiken Electric & Railway preferred gained a point last Monday.

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

	June 20.	June 27.
American Light & Traction Company (common)	a295	a295
American Light & Traction Company (preferred)	a108	a108
American Railways Company	a44	a44
Aurora, Elgin & Chicago Railroad (common)	a43	40¾
Aurora, Elgin & Chicago Railroad (preferred)	a88	a85¾
Boston Elevated Railway	129½	a128½
Boston Suburban Electric Companies (common)	a16	a14½
Boston Suburban Electric Companies (preferred)	75	a75
Boston & Worcester Electric Companies (common)	10	a12
Boston & Worcester Electric Companies (preferred)	a51	a57
Brooklyn Rapid Transit Company	80¼	81⅝
Brooklyn Rapid Transit Company, 1st ref. conv. 4s	85	86
Capital Traction Company, Washington	127¼	127⅜
Chicago City Railway	a195	a195
Chicago & Oak Park Elevated Railroad (common)	2	2
Chicago & Oak Park Elevated Railroad (preferred)	6	6
Chicago Railways, ptcptg., ctf. 1	a84	a85
Chicago Railways, ptcptg., ctf. 2	a22	a24
Chicago Railways, ptcptg., ctf. 3	a9½	a9½
Chicago Railways, ptcptg.	a5½	a5½
Cincinnati Street Railway	*133	130½
Cleveland Railway	a96	a96
Columbus Railway (common)	96	*96
Columbus Railway (preferred)	101	*101
Consolidated Traction of New Jersey	a76	a76
Consolidated Traction of N. J., 5 per cent bonds	a105½	a105½
Dayton Street Railway (common)	a30	a30
Dayton Street Railway (preferred)	a100	a100
Detroit United Railway	a74	a74
General Electric Company	163¼	162¼
Georgia Railway & Electric Company (common)	151	a155
Georgia Railway & Electric Company (preferred)	93	a93
Interborough Metropolitan Company (common)	18⅛	18
Interborough Metropolitan Company (preferred)	51⅜	50
Interborough Metropolitan Company (4½s)	77⅜	78½
Kansas City Railway & Light Company (common)	a19	a19
Kansas City Railway & Light Company (preferred)	a44	a44
Manhattan Railway	137⅛	a137½
Massachusetts Electric Companies (common)	a23	a22¾
Massachusetts Electric Companies (preferred)	a92¾	a91½
Metropolitan West Side, Chicago (common)	a26¼	a26
Metropolitan West Side, Chicago (preferred)	a72	a74¼
Metropolitan Street Railway, New York	15	15
Milwaukee Electric Railway & Light (preferred)	*110	110
North American Company	74½	74⅜
Northern Ohio Light & Traction Company	*48	48
Northwestern Elevated Railroad (common)	a27¾	a28½
Northwestern Elevated Railroad (preferred)	a67	a69
Philadelphia Company, Pittsburgh (common)	a56½	a56
Philadelphia Company, Pittsburgh (preferred)	a44½	a43⅞
Philadelphia Rapid Transit Company	19½	a19⅛
Philadelphia Traction Company	a87¼	a86½
Public Service Corporation, 5% col. notes (1913)	101	101
Public Service Corporation, ctfs.	a107	a107½
Seattle Electric Company (common)	a111	a112
Seattle Electric Company (preferred)	a103	a102½
South Side Elevated Railroad (Chicago)	77	a80
Third Avenue Railroad, New York	11	10½
Toledo Railways & Light Company	8	8
Twin City Rapid Transit, Minneapolis (common)	a108¼	a108½
Union Traction Company, Philadelphia	a49½	a49¼
United Rys. & Electric Company, Baltimore	18¾	a19½
United Rys. Inv. Co. (common)	37⅜	a39
United Rys. Inv. Co. (preferred)	68½	69⅞
Washington Ry. & Electric Company (common)	35⅛	a35⅜
Washington Ry. & Electric Company (preferred)	89¼	a90
West End Street Railway, Boston (common)	a90½	a90
West End Street Railway, Boston (preferred)	104	a103¼
Westinghouse Elec. & Mfg. Co.	76	75¾
Westinghouse Elec. & Mfg. Co. (1st pref.)	a118¼	a120

a Asked. *Last sale.

ANNUAL REPORT

London (Ont.) Street Railway

A comparative statement of operations for the last two years follows:

Year ended Dec. 31.	1909.	1910.
Earnings:		
Passengers	$238,267	$250,897
Miscellaneous	5,092	5,381
Gross earnings	$243,359	$256,278
Expenses:		
Maintenance—		
Way and structures	$21,736	$21,737
Equipment	24,743	25,102
Transportation:		
Power plant	27,796	31,610
Car service	67,866	73,851
General	27,689	29,891
Total operating expense	$169,830	$182,191
Net earnings	73,529	74,087
Deductions:		
Interest on bonds	$28,346	$28,750
Interest on overdraft	542	
Total deductions	$28,888	$28,750
Net income	$44,641	$45,337

Henry A. Everett, the president, says in part:

"The expenditure for track purposes continues to increase, owing to the general reconstruction necessary throughout the system.

"The rolling stock has been well maintained and is being constantly overhauled and repainted in order to keep it in first-class condition.

"We have considered several propositions submitted by the Hydro-Electric Commission, relative to Niagara power, which we find are not attractive in comparison with modern steam generation. However, there is still a possibility that some arrangement can yet be made to our mutual satisfaction.

"The wages of motormen and conductors were voluntarily increased on April 1, the new scale for regular men being 18 cents per hour for the first and second years, 19 cents per hour for the third year, and 20 cents per hour for the fourth year. Other wages have also been increased as conditions required.

"As we have had sufficient money for our requirements, your directors have not yet considered it necessary to dispose of the $25,000 bonds recently authorized.

"The gross earnings and surplus for the past year have shown a substantial increase, and we believe the coming year will be quite as satisfactory.

"Your directors are pleased to state that our relation with the public is very gratifying, and that no litigation of any kind appears against the company."

A statistical statement given in the report shows the following:

Year ended Dec. 31.	1909.	1910.
Expenses, per cent of earnings	69.8	71.0
Net income, per cent of capital	8.08	8.21
Passengers carried	6,673,709	6,930,602
Car earnings per revenue pass—cents	3.62	3.67
Transfers	1,015,164	1,063,531
Total passengers	7,688,873	7,994,133
Car earnings per passenger—cents	3.09	3.13
Car mileage	1,422,223	1,418,030
Gross earnings per car mile—cents	17.11	18.07
Operating expenses per car mile—cents	11.94	12.84
Net earnings per car mile—cents	5.17	5.23
Number of miles of track	33.25	33.25
Gross earnings per mile of track	$7,319	$7,707

Republic Railway & Light Company

A new corporation, which will probably be known as the Republic Railway & Light Company, is being formed with an authorized capital stock of $17,500,000, to take over the controlling interest in a number of companies operating electric light, power, gas, street railway and other public utilities. Among the companies on whose stock it is reported that options are being obtained are Mahoning & Shenango Railway & Light Company, Youngstown-Sharon Railway & Light Company, the Sharon & New Castle Railways Company, Pennsylvania & Mahoning Valley Railway Company, New Castle Traction Company, the New Castle Electric Company, the Lawrence Gas Company, the Mahoning Valley Railway, the Mahoning Valley South Eastern Railway Company, the New Castle & Lowell Railway, New Castle & Lowell Realty Company, Wheatland Street Railway, the Youngstown Park & Falls Street Railway, New Castle Electric Street Railway, the Trumbull Electric Railroad, the Mineral Ridge & Niles Traction Company, the Youngstown Consolidated Gas & Electric Company, the Merchants Light, Heat & Power Company, the Youngstown & Sharon Street Railway, the Shenango Valley Electric Light Company, Sharpsville Electric Light Company, Sharon Gas & Water Company, the Sharon & Wheatland Street Railway, the Shenango Valley Street Railway, the Valley Street Railway, Sharon & New Castle Street Railway, the Sharon & New Castle Railway.

It is stated that the directorate will include: Samuel McRoberts, vice-president National City Bank, New York; Myron T. Herrick, president Society for Savings, Cleveland; Anson W. Burchard, assistant to president General Electric Company; R. E. Reed, president American Gas & Electric Company; Henry H. Wehrhane, Hallgarten & Company, bankers, and executive committee American Gas & Electric Company; James Parmlee, president Cleveland Electric Illuminating Company; Ray Morris, White, Weld & Company, bankers; Harrison Williams, president Springfield Railway & Light Company; Thomas A. Reynolds, National City Bank; J. J. Bodell, of Bodell & Company, bankers, and director American Textile Company, and P. W. Herrick, a director of the Cleveland Electric Illuminating Company.

Of the total capital stock $10,000,000 will be 6 per cent cumulative preferred stock and $7,500,000 common stock. It is planned to issue $5,200,000 and $6,360,000 respectively.

Progress of New Orleans Railway & Light and American Cities Railway & Light Company Merger

A special meeting of the stockholders of the American Cities Railway & Light Company was called for June 28, 1911, at Jersey City, to act on the proposal of the directors to sell to the American Cities Company, recently incorporated in New Jersey, all the property and assets of the American Cities Railway & Light Company, together with approximately $1,500,000 cash, and to accept in payment therefor $10,000,000 face value of eight-year collateral trust bonds, $9,976,750 face value of the common stock and $6,476,750 of the preferred stock of the American Cities Company, which will have acquired more than 90 per cent of the capital stock of the New Orleans Railway & Light Company. The meeting was also to authorize the sale of all the American Cities Company stock for such sums as shall be sufficient to provide $1,500,000, to discharge all debts, to pay off the preferred stock at par and accrued dividend and to pay off the common stock at 75 and accrued dividend; and to consent to the firm of Isidore Newman & Son being interested in the purchase of any part of said stock and bonds.

J. K. Newman, president of the American Cities Railway & Light Company, issued a statement in which he said:

"The new holding company which is being organized to purchase the assets of the American Cities Railway & Light Company and the stocks of the New Orleans Railway & Light Company will be called the American Cities Company. The similarity of the name between this company and the American Cities Railway & Light Company does not mean there is any connection between the two companies, and they are separate and distinct.

"The notice for a special meeting of the stockholders of the American Cities Railway & Light Company refers to the payment for the assets of the American Cities Railway & Light Company in securities, but an immediate sale will be made of these securities, so that the stockholders of the American Cities Railway & Light Company will receive par and accrued dividend in cash for the preferred stock and 75 and accrued dividend at the rate of 5 per cent in cash for the common stock, and no proposition will be accepted by the American Cities Railway & Light Company which does not provide for such cash payment. In other words, payment is made in securities for a legal expediency and the securities are immediately sold for cash, thus providing cash for the stockholders of the American Cities Railway & Light Company.

"The meeting of the American Cities Railway & Light Company will be held on June 28, and if favorable action is then taken to sell its assets the payment in cash therefor will follow as soon as the necessary details for the transfer can be completed. This cash payment will probably be made about July 15."

Principal Stockholders of New Haven Railroad

The *Boston News Bureau* published recently a list of owners of 1000 shares or more of the New York, New Haven & Hartford Railroad, with the number of shares standing in their names as of April 1, 1911, and 1910. The list contained about 120 names, among which appeared the following holders:

April 1.	1911.	1910.
New England Navigation Company	156,303	172,946
Pennsylvania Railroad	37,400	34,900
Mutual Life Insurance Company	35,640	35,640
Adams Express Company	34,730	34,730
American Express Company	23,493	23,493
L. C. Ledyard, New York	20,542	20,542
New York Central Railroad	11,248	11,248
Charles Pratt & Co., New York	10,563	10,563
C. M. Pratt, New York	6,690	6,690
W. W. Astor, New York	5,051	5,051
J. J. Astor, New York	4,766	4,112
M. F. Plant, New York	4,208	4,000
Cheney Bros., South Manchester, Conn	3,191	2,091
C. S. Mellen	3,580	3,580
N. Thayer, trustee	3,135	2,496
Lee, Higginson & Company	2,706	2,931
Rhode Island Company	1,479	1,600

The statement says that as the New England Navigation Company is a subsidiary corporation, the amount of stock standing in its name is practically the same as if that amount of stock was in the treasury of the New York, New Haven & Hartford Railroad.

American Cities Railway & Light Company, New York, N. Y.—A semi-annual dividend of 2½ per cent has been declared on the $10,761,165 of common stock of the American Cities Railway & Light Company payable on July 1, 1911, to holders of record on June 17, 1911. This dividend compares with 2 per cent and ¼ of 1 per cent extra in January, 1911, 1¾ per cent in July and 1½ per cent in January, 1910, and 1 per cent in July, 1909. The regular quarterly dividend of 1½ per cent on the preferred stock was also declared, payable at the same time. The stockholders of the company have been notified of the proposed purchase by Bertron, Griscom & Jenks, New York, N. Y., of $10,000,000 of bonds of the new holding company, and the intention to make an advance offering of these bonds to the stockholders at 95 and accrued dividend, payment to be made at the office of Isidore Newman & Company after July 1, 1911.

Boone (Ia.) Electric Company.—John Reynolds, president of the Boone Electric Company, as trustee of the property of the company, is said to have arranged to transfer the property to Dows, Read & Smith, Cedar Rapids, Ia. An agreement entered into by Mr. Reynolds with Andrew Stevenson, J. H. McBride and others, in July, 1909, for the transfer of the property to them, was subsequently canceled.

Boston (Mass.) Elevated Railway.—In compliance with order of the House dated June 19, 1911, the Boston Elevated Railway has transmitted through the tax commissioner a list of stockholders who own or control more than 100 shares of the stock of the company. Included in this list are the following names: F. H. Prince & Company, 6,934; Hayden, Stone & Company, 4,807; Kidder, Peabody & Company, 4,090; J. J. Bright, Cambridge, 3,600; A. Ames, 960; W. E. Rice, 900; D. P. Kimball, trustee, 500; M. S. Ames, 500; J. S. Ames, 500; J. P. Morgan, 350; A. Thayer, trustee, 337; J. M. Prendergast, 300; W. A. Bancroft, 300.

Chicago (Ill.) City Railway.—The Chicago City Railway has announced that an agreement has been reached by which it will take over the property of the Chicago & Southern Traction Company in Chicago at a valuation to be fixed by Bion J. Arnold and George Weston, who on June 21, 1911, were appointed a valuation committee to evaluate that part of the Chicago & Southern Traction Company's property which lies within the city limits of Chicago.

Citizens' Railway Company, Waco, Tex.—H. S. Shear, Waco, who has exercised an option on the property of the Citizens' Railway Company, as noted in the ELECTRIC RAILWAY JOURNAL of June 17, 1911, page 1085, is connected with the Southern Traction Company, organized to build an electric railway between Dallas and Waco, through Waxahachie and Hillsboro, with a branch line to Corsicana. The option was secured by J. F. Strickland and associates; and on June 1, 1911, the Waco Gas Company, comprising the gas and electric light companies at Waco, and the Citizens' Railway Company passed under the management of the J. F. Strickland Company, which manages and operates the Texas Traction Company, Bonham Electric & Gas Company, Cleburne Electric & Gas Company, Dublin Electric & Gas Company, Hillsboro Electric & Gas Company, Sherman Electric & Gas Company and Waxahachie Electric & Gas Company. The interurban cars will operate over the Citizens' Railway into Waco terminals, but new tracks will be laid under the franchise of the Citizens' Railway into the heart of the city. The Waco Street Railway has been incorporated with a capital stock of $1,000,000 to succeed the Citizens' Railway Company.

Electric Properties Company, New York, N. Y.—The annual report of the Electric Properties Company for the year ended April 30, 1911, shows income through interest and dividends on securities owned, and interest on notes and accounts receivable, of $251,840. Expenses, including salaries, legal expenses, taxes, etc., amounted to $62,100, leaving a balance of $189,739, compared with $184,991 in the previous year. The profit and loss surplus for the year was $138,636. No dividends were paid.

Indianapolis & Louisville Traction Company, Louisville, Ky.—John E. Greely, Jeffersonville, Ind., has been appointed receiver of the Indianapolis & Louisville Traction Company by Federal Judge Anderson, at Indianapolis, on the application of the Colonial Trust Company, Philadelphia, Pa., which is said to represent holders of $750,000 of the first mortgage bonds of the company and $300,000 of the second mortgage bonds.

Interborough-Metropolitan Company, New York, N. Y.—August Belmont, Edward J. Berwind, Andrew Freedman, Theodore P. Shonts and Cornelius Vanderbilt, voting trustees of the Interborough-Metropolitan Company, have requested the holders of the preferred stock of the Interborough-Metropolitan Company to send in their stock to August Belmont & Company, New York, N. Y., for exchange into the new voting trust certificates. A majority has already been exchanged. The old voting trust certificates for the common stock have been stricken from the list of the Stock Exchange and the new common voting trust certificates are now the only delivery. As soon as a sufficient amount of the preferred stock has been exchanged it is expected that the Stock Exchange authorities will take the same course with respect to the preferred stock.

Metropolitan Street Railway, Kansas City, Mo.—The receivers of the Metropolitan Street Railway have arranged with the holders of $300,000 of bonds of underlying companies which become due on July 1, 1911, for an extension of the time of payment.

Northwestern Elevated Railroad, Chicago, Ill.—The special meeting of the stockholders of the Northwestern Elevated Railroad to pass upon the plan to issue a mortgage covering the property to secure an issue of $25,000,000 of bonds has been called for Aug. 21, 1911. At the close of business on June 24, 1911, deposits of stock of the elevated railways which it is planned to merge totaled 71 per cent of all the outstanding stock of the companies.

Norwich & Westerly Railway, Norwich, Conn.—The property of the Norwich & Westerly Railway was sold under foreclosure at Norwich on June 23, 1911, for $940,000 to A. E. Locke, Boston, Mass., and H. M. Merrill, Portland, Me., who are said to represent the bondholders.

Pueblo & Suburban Traction & Lighting Company, Pueblo, Col.—H. M. Byllesby & Company, Chicago, Ill., confirm the report of the purchase by them of the property of the Pueblo & Suburban Traction & Lighting Company and allied interests in Colorado, referred to in the ELECTRIC RAILWAY JOURNAL of June 24, 1911, page 1128. The property was taken over on June 14. The Pueblo & Suburban Traction & Lighting Company operates the street railway system of

Pueblo and supplies electricity to Pueblo and the Cripple Creek Gold Mining district, including Cripple Creek, Victor and Goldfield. The towns of La Junta and Rockyford are served with electricity by subsidiary corporations. W. F. Raber, general manager of the Ottumwa Railway & Light Company, Ottumwa, Ia., has been placed in charge at Pueblo temporarily by Byllesby & Company.

Springfield (Ill.) Consolidated Railway.—The Illinois Traction System has submitted to the Springfield Consolidated Railway terms upon which it will lease to that company the unoccupied right of way which runs to the zinc plant, the Devereaux mine, the state biological laboratory, etc., and also to lease to the company the line between Sangamon Avenue, Springfield, and Ridgely Junction.

Twin City Traction Company, Dennison, Ohio.—The Twin City Traction Company has been incorporated to succeed the United Electric Company, which operates between Dennison and Uhrichsville.

United Railways & Electric Company, Baltimore, Md.—The United Railways & Electric Company has applied to the Maryland Public Service Commission for permission to issue $3,125,000 of three-year 5 per cent secured convertible coupon notes to provide funds to pay $2,000,000 of Baltimore City Passenger Railway first-mortgage 5 per cent bonds, which mature on Nov. 2, 1911, and $500,000 of the 4½ per cent certificates of indebtedness of the same company, which mature on the same day, and to redeem $535,000 series "B" and "C" car trust certificates outstanding after Oct. 1, 1911. The notes will be convertible into United Railways & Electric Company stock at $25 a share at any time before maturity, provided the notes shall not have been redeemed. The notes will be secured by deposit as collateral of $2,500,000 United Railways & Electric Company first-mortgage 4 per cent bonds and by an amount of the company's stock sufficient to meet the conversion rights. The notes will be redeemable by the company at par upon sixty days' notice.

Virginia Railway & Power Company, Richmond, Va.—The stockholders of the Virginia Railway & Power Company and the Norfolk & Portsmouth Traction Company have approved the merger of these companies as the Virginia Railway & Power Company, effective July 1, 1910, in accordance with the terms which were given in the Electric Railway Journal of May 27, 1911, page 930.

Waukegan, Rockport & Elgin Traction Company, Waukegan, Ill.—It is reported that the Chicago & Northwestern Railroad is negotiating for the purchase of the property of the Waukegan, Rockford & Elgin Traction Company.

West Jersey & Seashore Railroad, Camden, N. J.—The State Board of Public Utility Commissioners of New Jersey has approved an issue of bonds to the amount of $1,089,000 by the West Jersey & Seashore Railroad to retire underlying issues which mature on July 1, 1911.

Dividends Declared

Auburn & Syracuse Electric Railroad, Syracuse, N. Y., quarterly, 1½ per cent, preferred.

Aurora, Elgin & Chicago Railroad, Chicago, Ill., quarterly, 1½ per cent, preferred; quarterly, ¾ per cent common.

Carolina Power & Light Company, Raleigh, N. C., quarterly, 1¾ per cent, preferred.

Chicago City & Connecting Railways, Chicago, Ill., $2.25 on preferred participation certificates; $1.00 on common participation certificates.

Cincinnati, Dayton & Toledo Traction Company, Hamilton, Ohio, 2½ per cent, preferred; ⅝ per cent, common.

Cincinnati, Newport & Covington Light & Traction Company, Covington, Ky., quarterly, 1⅛ per cent, preferred; quarterly, 1¼ per cent, common.

Citizens' Electric Street Railway, Newburyport, Mass., 2½ per cent.

Columbus, Newark & Zanesville Electric Railway, quarterly, 1½ per cent, preferred.

Consolidated Traction Company, Newark, N. J., 2 per cent.

Denver & Northwestern Railway, Denver, Colo., quarterly, 2 per cent.

El Paso (Tex.) Electric Company, 3 per cent, preferred.

Little Rock Railway & Electric Company, Little Rock, Ark., 3 per cent, preferred; 4 per cent, common; 1 per cent, common (extra).

London (Ont.) Street Railway, 3 per cent.

Louisville & Northern Railway & Lighting Company, New Albany, Ind., quarterly, ⅝ per cent, preferred.

Nashville Railway & Light Company, Nashville, Tenn., quarterly, 1¼ per cent, preferred; quarterly, 1 per cent, common.

New England Investment & Security Company, Springfield, Mass., 2 per cent, preferred.

New Orleans Railway & Light Company, New Orleans, La., quarterly, 1¼ per cent, preferred.

Ohio Traction Company, Cincinnati, Ohio, 1 per cent, common.

Omaha & Council Bluffs Street Railway, Omaha, Neb., quarterly, 1¼ per cent, preferred; quarterly, 1 per cent common.

Ottawa (Ont.) Electric Railway, quarterly, 2½ per cent.

Pacific Coast Power Company, 3 per cent, preferred; 2½ per cent, common; 5 cents, common (extra).

Philadelphia Company, Pittsburgh, Pa., quarterly, 1½ per cent, common; ½ per cent, common (extra).

Porto Rico Railways, Ltd., San Juan, P. R., quarterly, 1¾ per cent, preferred.

Public Service Corporation of New Jersey, Newark, N. J., quarterly, 1½ per cent.

Puget Sound Electric Railway, 3 per cent, preferred.

Ridge Avenue Passenger Railway, Philadelphia, Pa., quarterly, $3.

Scioto Valley Traction Company, Columbus, Ohio, quarterly, 1½ per cent, first preferred and preferred.

Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind., 1¼ per cent, preferred.

Utica & Mohawk Valley Railway, Utica, N. Y., quarterly, 1¼ per cent, preferred; quarterly, ½ per cent, common.

Washington Water Power Company, Spokane, Wash., quarterly, 2 per cent.

Western Ohio Railway, Lima, Ohio, quarterly, 1½ per cent, second preferred.

MONTHLY ELECTRIC RAILWAY EARNINGS

Period.			Gross Revenue.	Operating Expenses.	Net Revenue.	Fixed Charges.	Net Income
ATLANTIC SHORE RAILWAY.							
1m.,	May,	'11	$26,660	$20,487	$6,173	$8,339	+$2,166
1 "	"	'10	25,357	17,543	7,815	12,549	+4,734
5 "	"	'11	103,366	91,937	11,428	40,495	+29,066
5 "	"	'10	111,339	84,726	26,614	62,701	+36,087
BANGOR RAILWAY & ELECTRIC COMPANY.							
1m.,	May,	'11	$41,750	*$20,882	$20,868	$12,483	$8,385
1 "	"	'10	42,875	*22,524	20,351	11,712	8,639
11 "	"	'11	525,400	*244,963	280,437	134,046	146,391
11 "	"	'10	510,230	*237,145	273,085	129,041	144,044
EL PASO ELECTRIC COMPANY.							
1m.,	April,	'11	$53,695	$30,797	$22,898	$8,221	$14,677
1 "	"	'10	49,490	28,874	20,616	8,306	12,310
12 "	"	'11	655,195	381,905	273,290	98,067	175,223
12 "	"	'10	624,844	359,328	265,516	100,599	164,917
GALVESTON-HOUSTON ELECTRIC COMPANY.							
1m.,	April,	'11	$121,147	$69,393	$51,753	$24,856	$26,897
1 "	"	'10	104,550	66,059	38,491	23,540	14,951
12 "	"	'11	1,365,290	807,876	557,414	296,136	261,278
12 "	"	'10	1,239,449	745,649	493,800	270,407	223,393
JACKSONVILLE TRACTION COMPANY.							
1m.,	April,	'11	$46,165	$26,826	$19,339	$10,161	$9,178
1 "	"	'10	47,213	24,443	22,770	9,290	13,480
12 "	"	'11	583,544	321,877	261,667	116,910	144,757
12 "	"	'10	521,035	275,572	245,463	112,295	133,168
MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY.							
1m.,	May,	'11	$412,771	$223,308	$189,463	$125,217	$64,246
1 "	"	'10	384,866	214,358	170,508	113,219	57,289
2 "	"	'11	2,010,663	1,075,937	934,725	599,994	334,731
2 "	"	'10	1,879,343	1,030,679	848,664	554,411	294,254
NORFOLK & PORTSMOUTH TRACTION COMPANY.							
11m.,	May,	'11	$1,906,275	$1,090,922	$815,353	$685,972	$129,381
11 "	"	'10	1,754,018	1,001,546	752,472	709,503	42,969
PENSACOLA ELECTRIC COMPANY.							
1m.,	April,	'11	$22,734	$13,238	$9,496	$5,850	$3,646
1 "	"	'10	22,263	12,754	9,508	4,937	4,571
12 "	"	'11	279,149	164,169	114,980	64,987	49,993
12 "	"	'10	254,445	145,892	108,553	54,657	53,896
PUGET SOUND ELECTRIC RAILWAY.							
1m.,	April,	'11	$145,604	$104,440	$41,163	$48,227	$7,064
1 "	"	'10	158,919	105,573	53,346	50,547	2,800
12 "	"	'11	1,885,663	1,250,515	635,148	608,292	26,856
12 "	"	'10	1,927,477	1,291,724	635,753	591,378	44,375
WHATCOM COUNTY RAILWAY & LIGHT COMPANY.							
1m.,	April,	'11	$32,093	$17,669	$11,625	$10,920	$706
1 "	"	'10	32,662	19,091	13,571	8,370	5,201
12 "	"	'11	433,339	221,745	180,282	117,494	62,788
12 "	"	'10	413,567	236,546	177,021	76,139	76,139

Traffic and Transportation

Accidents in New York City in April

The Public Service Commission of the First District of New York has issued the following comparative summary of accidents during April, 1909, 1910 and 1911, on the street railways which come within its jurisdiction:

April.	1909.	1910.	1911.
Car collisions	84	92	102
Persons and vehicles struck by cars	986	954	1,320
Boarding	552	685	658
Alighting	547	614	592
Contact electricity	18	21	20
Other accidents	1,767	1,699	1,925
Totals	3,954	4,065	4,554
INJURIES:			
Passengers	1,577	1,794	1,742
Not passengers	475	458	505
Employees	275	329	369
Totals	2,327	2,581	2,616
SERIOUS (Included in above):			
Killed	18	25	14
Fractured skulls	7	8	10
Amputated limbs	2	4	4
Broken limbs	15	36	27
Other serious	99	113	109
Totals	141	186	164

To Call Street Names in Des Moines.—Conductors of the Des Moines (Ia.) City Railway have been instructed to announce the names of streets as the cars approach street corners.

New Round-Trip Chartered Car Rates.—On July 21, 1911, the Buffalo & Lake Erie Traction Company, Buffalo, N. Y., will put into effect new round-trip chartered car rates between various local stations in New York State.

Electric Sign Railway Advertising in San Francisco.—The San Francisco, Vallejo & Napa Valley Electric Railway, Vallejo, Cal., is spending $5000 for advertising its Napa Valley route by means of electric signs placed at intervals along Market Street in San Francisco.

Service in Atlanta.—P. S. Arkwright, president of the Georgia Railway & Electric Company, Atlanta, Ga., has addressed a long letter to Campbell Wallace, secretary of the Railroad Commisison of Georgia, Atlanta, Ga., in which he shows what the company has done to comply with the recent orders of the commission in regard to service in Atlanta.

Chair Cars Between Indianapolis and Louisville.—The Indianapolis, Columbus & Southern Traction Company, Columbus, Ind., which operates between Indianapolis and Seymour, Ind., and over whose line cars are run between Indianapolis and Louisville, has announced that it will establish a chair-car service, the chair cars to be attached to the limited cars between Indianapolis and Louisville.

Increase in Wages in Pottsville.—The employees of the Eastern Pennsylvania Railway, Pottsville, Pa., have entered into a two years' agreement with the company by which they receive an increase of 3 cents an hour in wages. The first-year men will receive 22 cents an hour and the employees who have served the company more than a year will receive 25 cents an hour. The new agreement becomes effective on July 1, 1911.

San Francisco's No-Seat-No-Fare Ordinance.—The public utilities committee of the Board of Supervisors of San Francisco, Cal., met on June 15, 1911, to consider the no-seat-no-fare ordinance introduced by Supervisor Walsh. The committee adjourned until June 29, 1911, at which time the ordinance will be considered again. The committee announced that in the meantime it hoped to be able to induce B. J. Arnold, Chicago, Ill., to stop in San Francisco on his way to Los Angeles, and confer with the members of the committee in regard to the proposed investigation.

Key Route Trolley Trips.—Wm. R. Alberger, traffic manager of the San Francisco, Oakland & San José Consolidated Railway, San Francisco, Cal., the Key Route, has announced that on July 15, 1911, the company will establish regular trolley trips. Mr. Alberger is reported to have said: "On July 15, 1911, the company will start 'Key Route trolley trips.' These will be sightseeing trips, the first ever had on the Oakland side of the bay. We will advertise these trips throughout the East. Facilities at the Key Route pier are to be increased. Additions to the pier facilities will cost in the neighborhood of $500,000. The work will begin at the time the filling in of the pier is begun.

Subway Accident Record in New York.—In a speech which James L. Quackenbush, counsel of the Interborough Rapid Transit Company, New York, made before the Brooklyn League on June 15, 1911, he said in referring to the operating record of the company on its subway division: "We have never killed a passenger on the Interborough. Yet we have carried on our cars more people than the entire population of the earth. There is an element of luck in it you will say, but it can't all of it be luck when we run ten-car trains so close together that one is going out of a station as the other is coming in. That can't be all luck. There must be some good management in it. A train every minute and forty-eight seconds; that is our schedule, and we have never killed a passenger."

Through Limited Service Between Cleveland and Detroit.—Through limited passenger service was established between Cleveland and Detroit on June 21, 1911. Six trains are operated each way. A train leaves each terminal at 7:30 in the morning and every two hours thereafter until 5:30 in the evening. The running time is six hours and twenty minutes. Train crews are changed at Toledo. The service is being conducted by the Detroit United Railway and the Lake Shore Electric Railway. Cars run on the schedule of the Lake Shore Electric Railway and the Detroit, Monroe & Toledo Short Line is used between Detroit and Toledo. Three of the cars each way run by way of Sandusky and the other three by way of Norwalk. It is said that a package and express business will be established within a short time with cars operating on limited time.

Suppressing Tipplers in Illinois.—All of the railroads which operate in Illinois are preparing placards promulgating the law just passed by the Illinois Legislature making it unlawful to drink intoxicating liquors or to be intoxicated in or upon railroad passenger cars in use for transportation of passengers or in or about any railroad station or platform. According to the final section of the law the railroads failing to put printed copies of the law in all of their stations are liable to a forfeiture of $50 for each omission. The law says that there shall be no drinking in smoking cars, parlor cars, day coaches, interurban cars and cabooses used for the transportation of passengers. It does not mention buffet cars. Railroad conductors are called upon to arrest all violators of the law. Furthermore, they will become liable to a fine of not less than $10 nor more than $25 if they fail to arrest violators. By the provisions of the law every conductor who is on duty is authorized and empowered to exercise the powers of a sheriff in any county of the State.

Indiana Railroad Commission News.—The Indiana Railroad Commission has heard the evidence in the case of the Kokomo, Marion & Western Traction Company against the Pennsylvania Railroad and other steam railroads to compel them to deliver coal to the electric railway at the same rate as is charged Kokomo manufacturers. The petitioners are now paying 10 cents more on the ton than is paid by the manufacturers. The Kokomo, Marion & Western Traction Company contended that with the domestic rate it could compete with the manufacturers in supplying motive power. The company's petition was opposed on the ground that it is not a bona fide manufacturer, and that the power furnished manufacturing concerns is surplus power. The commission has taken the matter under advisement. The commission has granted the special committee which is investigating block signal systems a further extension of time for presenting its report. The report was due on June 23, 1911, but Chairman Wood of the commission said the matter was of great importance and that the committee should have every opportunity to present a complete report. The commission has addressed to all the steam and electric railways in Indiana Circular No. 76, concerning reports of accidents. This superseded Circulars Nos. 8, 9 and 41. It has also addressed to the electric railways Circular No. 77 in regard to highway crossing signs. This circular supersedes Circulars Nos. 21 and 60.

Personal Mention

Mr. John E. Benton, a lawyer of Keene, N. H., has been appointed a member of the Public Service Commission of New Hampshire by Governor Robert P. Bass.

Mr. James R. Empey has resigned as general foreman of shops and carhouses of the Lehigh Valley Transit Company, Allentown, Pa., effective on July 1, 1911.

Mr. Edward C. Niles, a lawyer of Concord, N. H., has been appointed a member of the Public Service Commission of New Hampshire by Governor Robert P. Bass.

Prof. Thomas W. Worthen, head of the department of mathematics at Dartmouth College, Hanover, N. H., has been appointed a member of the Public Service Commission of New Hampshire by Governor Robert P. Bass.

Mr. Samuel J. Herrell, formerly assistant superintendent of transportation of the Knoxville Railway & Light Company, Knoxville, Tenn., has been appointed claim agent of the company to succeed the late Eugene R. Roberts.

Mr. A. D. Kimmett, assistant master mechanic of the Lackawanna & Wyoming Valley Railroad, Scranton, Pa., has been appointed master mechanic of the company, to succeed Mr. F. J. Stevens, whose appointment to the Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind., is noted below.

Mr. F. von Schilling, auditor of the Newport News & Old Point Railway & Electric Company, Newport News, Va., has been given the title of acting general manager of the company and has succeeded to the duties performed previously by Mr. W. W. S. Butler, who resigned from the company some time ago.

Mr. Jacob W. Gerke has resigned as master mechanic of the Tri-City Railway & Light Company, Davenport, Ia., to become master mechanic of the Wilmington & Philadelphia Traction Company and Southern Pennsylvania Traction Company, with headquarters at Wilmington, Del. He will assume his new duties on Aug. 1, 1911.

Mr. F. J. Stevens, master mechanic of the Lackawanna & Wyoming Railroad, Scranton, Pa., has resigned, effective July 1, 1911, to accept a like position with the Ft. Wayne & Northern Indiana Traction Company, Ft. Wayne, Ind. Mr. Stevens entered the service of the Lackawanna & Wyoming Valley Railroad during the construction period nine years ago.

Mr. E. M. Wharff has resigned from the Beebe System, Syracuse, N. Y., to become connected with the operating engineering department of the Illinois Traction System, Peoria, Ill. Mr. Wharff was graduated from Syracuse University as a member of the class of 1903 of the College of Liberal Arts. Subsequently he was graduated from the L. C. Smith College of Applied Science. For the last five years he has been connected with the so-called Beebe System of electric railways in Central New York as apprentice, electrical engineer of the Syracuse, Lake Shore & Northern Railroad and the Syracuse & South Bay Electric Railroad, in charge of power houses, substations, carhouses and overhead line and as superintendent of track work and overhead construction, including the catenary line.

Mr. John Blair McAfee, who retired on July 1 as president of the Norfolk & Portsmouth Traction Company, Norfolk, Va., the property of which has been merged with the Virginia Railway & Power Company, was tendered a farewell banquet by the business men of Norfolk on June 17, 1911, by whom he was presented with a silver punch bowl. In acknowledging this token of esteem Mr. McAfee paid the following tribute to his associates in the company: "I am glad that I am afforded an opportunity to say a few words thus publicly of those with whom I have so closely associated in the work of the company for the last three and a half years. I mean by those with whom I have been associated the local directors, the officers and the employees of every class. In more than a quarter of a century of experience in corporate work I have never met a company, its officers and employees, in which there was less personal strife. This unison of effort, this co-working sympathy, has done as much as any other one thing to make the company a successful operating and growing concern. I want now to extend to those whom I have mentioned, as a class, my sincere thanks and fullest appreciation of their ability, their efforts and their kindliness toward me."

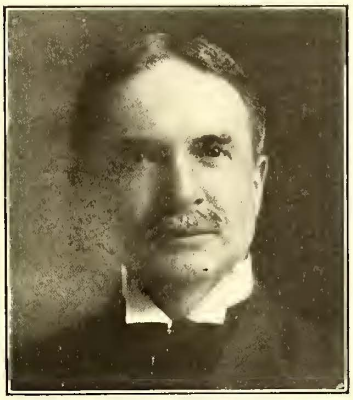
Mr. John A. Cleveland, who has been general manager of the electric railway, electric light and gas properties of the Commonwealth Power Railway & Light Company in Bay City, Mich., has been appointed general manager of the Saginaw-Bay City Railway, Saginaw Power Company, Saginaw City Gas Company, Bay City Power Company, Bay City Gas Company, Saginaw and Bay City, Mich., all of which are controlled by the Commonwealth Power, Rail way & Light Company, to succeed Mr. F. T. Hepburn, whose resignation was noted in the Electric Railway Journal of June 3, 1911. Mr. Cleveland has been manager of the properties at Bay City for the last two years. He was graduated from Cornell University and entered business with the Rochester Railway & Light Company, Rochester, N. Y., as a member of that company's electric sales department. He was subsequently made one of the superintendents of the Rochester Railway & Light Company. His connection with the properties in Saginaw and Bay City dates from 1906, when he was appointed superintendent of new business of the electric companies in both Saginaw and Bay City.

Mr. George H. Whitfield has retired as general superintendent of the light and power department of the Virginia Railway & Power Company, Richmond, Va., to devote himself more particularly to consulting engineering work, in which capacity he will be retained for all the Gould properties in Virginia, which include the Virginia Railway & Power Company and the Norfolk & Portsmouth Traction Company, with plants at Richmond, Petersburg, Norfolk and Fredericksburg. Mr. Whitfield was graduated from Richmond College with the degree of A.B. in 1892 and from Cornell University with the degree of M.E. 1896. He first entered the street railway manufacturing field, but in 1899 became superintendent of shops of the United Railways & Electric Company, Baltimore, Md., where he remained until 1901. He was also general superintendent of the San Francisco & San Mateo Electric Railway for a year. Mr. Whitfield became connected with the Virginia Railway & Power Company in 1902. In addition to his work with that company Mr. Whitfield designed the electrical features of several plants, including that of the Emporia Hydro-Electric Company and the Richmond & Chesapeake Bay Railway. Mr. Whitfield is a member of the American Institute of Electrical Engineers and has represented the Virginia Railway & Power Company actively in the National Electric Light Association for some time.

Mr. Lucius S. Storrs, president of the New England Investment & Security Company, has been appointed vice-president of the Connecticut Company and Berkshire Street Railway Company, with headquarters at New Haven, Conn. Mr. Storrs is widely known in electric transportation circles as the executive head of the street railway systems serving central Massachusetts under an operating organization, including the Worcester and Springfield urban and interurban networks, and extending from the Connecticut Valley to Rhode Island via the Blackstone Valley. He was born in Buffalo, N. Y., in 1869, and was graduated with the degree of A. B. from the University of Nebraska in 1890, taking the scientific course. Later the degree of A. M. was given to Mr. Storrs by his alma mater. For about seven years after graduation he was on the staff of the Colorado Fuel & Iron Company with the title of geologist, joining the organization of the Northern Pacific Railroad in 1897 and working along similar lines under Presidents Mellen and Hill. In 1906 Mr. Storrs entered the organization of the New York, New Haven & Hartford Railroad at New Haven, Conn., going to Boston in 1907 as vice-president of the New England Investment & Security Company. He soon became president of the organization and since 1908 has maintained headquarters in Springfield, Mass., having charge of the administration of the electric railway properties above indicated, with particular interest in the development of the central Massachusetts territory of both passenger and express service and the co-ordination of the several systems into an organization of improved earning power and efficiency. Mr. Storrs is a member of numerous scientific and

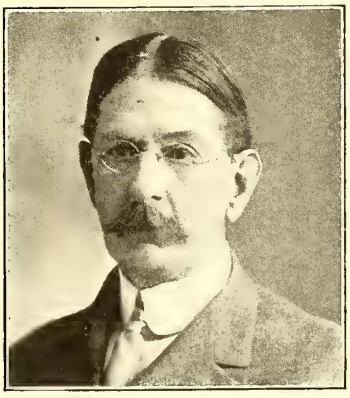
professional organizations, including the Sigma Xi Society and the American Institute of Mining Engineers.

Mr. Calvert Townley has resigned as vice-president of the Connecticut Company, New Haven, Conn., and has re-entered the service of the Westinghouse Electric & Manufacturing Company, with which he had long been connected prior to his going with the New York, New Haven & Hartford Railroad. His headquarters will be at the New York office of the Westinghouse Electric & Manufacturing Company, and his duties for the present will be to cover certain special fields of work under the direction of the chairman and the president of the company. His position will be a confidential one of importance, but nothing more in detail concerning his duties can be made public at the present time. He will enter upon his new work July 1. Mr. Townley has had an extended experience as an electric railway engineer and manager. He was graduated from Sheffield Scientific School, Yale University, in 1886, and later received the degree of M. E. from that university. Immediately after graduation he became associated with the Westinghouse Electric & Manufacturing Company, and was located first at Pittsburgh. In 1895 he went to the company's Boston office, where he remained until 1901, when he moved to New York. While with the Westinghouse Company he made a specialty of electric railway problems. In the fall of 1904 he was invited by the New York, New Haven & Hartford Railroad to take charge of and consolidate the various electric railways which it had recently purchased in Connecticut. He undertook this work and accomplished it with signal success, and after the formation of the consolidated company was elected its vice-president. As such he has had general charge of the management of these properties. Mr. Townley has always taken an active interest in association matters, and has been a member of important committees of the American Institute of Electrical Engineers and of the American Electric Railway Association.



Calvert Townley

Mr. Joseph K. Choate, general manager of the Otsego & Herkimer Railroad, who was elected president of the Street Railway Association of the State of New York at the annual meeting on June 28, was born on Aug. 22, 1854, in Salem, Mass. He attended school at Taunton, Mass., and prepared for college, but did not enter college until later in life, when he took a degree in the University of Colorado. Mr. Choate started his business career as a civil engineer, serving as an axeman in Central Park, New York, in 1875. He was made chief engineer of the bureau of streets and avenues of New York City in 1880, and after one year resigned and went with the Pennsylvania Railroad as supervisor of track on the New York division. In the same year he left that company and went with the Erie Railroad as principal engineer of construction on the New York, Lake Erie & Western Coal & Railroad Company. In 1882 Mr. Choate was made principal engineer of construction on the Erie & Wyoming Valley Railroad. In 1884 he went to the Union Pacific Railroad as assistant to the general manager. He then served as general manager of the Nevada Central road and afterward as superintendent of the Park division of the Union Pacific road and general superintendent of all Colorado lines. While in Colorado in this position Mr. Choate had charge of all operation and also jurisdiction over all traffic matters. He resigned from this company in 1900 and after spending several years in New York City as consulting engineer and acting in an advisory capacity on matters of railway operation he went to the Otsego & Herkimer road, first in the capacity of consulting engineer, and four years ago was made general manager. Mr. Choate has been an active worker in the New York association, serving on a number of committees, including the executive committee. He has also been an active member of the American Electric Railway Association and is a member of the committee on compensation for carrying United States mail. Mr. Choate is a member of the American Society of Civil Engineers.



J. K. Choate

OBITUARY

George K. Trask, railroad editor of the Indianapolis *Star,* and the originator of the railroad news column in the American press, died at his home in Indianapolis on June 26, 1911. Mr. Trask was seventy-nine years old. He had been engaged in newspaper work continuously since 1871, first as railroad editor of the Indianapolis *Journal,* and after the purchase of that paper by the Star Publishing Company, as railroad editor of the Indianapolis *Star.*

William Richard Brixey, whose death on June 9, 1911, at Seymour, Conn., was noted briefly in the ELECTRIC RAILWAY JOURNAL of June 24, 1911, was born at Southampton, England, on May 11, 1851. He was educated there and then entered the British Mercantile Marine service, commanding his own ship and visiting all the leading ports of the world. He came to this country in 1878, became at once an American citizen and went into business with his brother-in-law, Mr. A. G. Day, a pioneer in the American rubber industry and the inventor of "Kerite." He became general manager of the Kerite Company on the death of Mr. Day, and sole proprietor upon the death of his sister, Mrs. Day. Noteworthy among the large contracts undertaken by him were the supplying and laying of the Alaskan cable, the furnishing of the Panama Zone cable and furnishing the wires and cables for the Pennsylvania tunnel and terminal connecting the two shores of the Hudson and East Rivers. In 1908 Mr. Brixey incorporated the business as a company and soon after retired, leaving it to the management of his eldest son, Mr. Richard D. Brixey, president of the Kerite Insulated Wire & Cable Company. Mr. Brixey left two other sons, Mr. Reginald W. Brixey, vice-president, and Mr. Austin D. Brixey, secretary of the company.

D. L. Huntington, president and general manager of the Washington Water Power Company, Spokane, Wash., has outlined more in detail the important work which the company has in hand to which reference was made in the ELECTRIC RAILWAY JOURNAL of June 3, 1911, page 989. According to Mr. Huntington the principal project which the company has under way at present is the construction of a hydraulic power station on the Spokane River about 25 miles west of Spokane, to contain ultimately four 12,500-kw units. The first two units have been ordered for delivery early next year. The present stage of the work is that of rock excavation and unwatering the river for the construction of a dam 170 ft. above the present water level, creating a lake about 23 miles in length with an average width of about three-eighths of a mile. The land and water rights for this development have all been acquired, and there are now about 400 men engaged on the construction work.

The company is also constructing a railroad about 21 miles in length to connect this power plant, for construction purposes, with the Great Northern Railway at Springdale, Wash. It expects to complete the railroad by Aug. 1, 1911. The work of installing the last of the four 5000-kw generators at Little Falls power station is under way, and that new station, which has been in operation less than a year, will be entirely completed by midsummer. The company has put twenty-five new pay-as-you-enter cars in service. The first section of the new carhouse, with a capacity of twenty-five cars, has been put in operation. The other expenditures of the company cover a multitude of items, the most important expenditure, perhaps, being for the extension of the underground duct and conduit system.

Construction News

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

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

RECENT INCORPORATIONS

Elberton & Eastern Railway, Augusta, Ga.—Chartered in Georgia to build a 50-mile electric railway between Elberton, Tignall, Washington and Lincolnton. Capital stock, $500,000. Incorporators: W. O. Jones, W. F. Anderson, J. H. Blackwell, J. M. Heard, R. L. Cauthen and J. Z. Rogers. [E. R. J., June 3, '11.]

***Kokomo, Frankfort & Western Railway, Kokomo, Ind.**—Application for a charter has been made in Indiana by this company to build a 25-mile electric railway in Indiana. Capital stock, $750,000. Incorporators: George J. Marott, John H. Holliday, Indianapolis; T. C. Reynolds and J. B. Carter, Kokomo.

***Twin City Traction Company, Dennison, Ohio.**—Incorporated in Ohio to succeed the United Electric Company, which operates between Dennison and Uhrichsville. Headquarters, Dennison. Capital stock, $100,000. Incorporators: Ralph E. Westfall, Smith N. G. Bennett, M. R. Thornton, H. Miller and W. M. Huffman.

***Waco (Tex.) Street Railway.**—Incorporated in Texas to succeed the Citizens' Railway Company, which was taken over under an option secured by J. F. Strickland and his associates, as noted in the Electric Railway Journal for June 17, 1911. Captial stock, $1,000,000. Incorporators: J. F. Strickland, Osce Goodwin and M. B. Templeton, all of Dallas.

***Ridgeley & Miller Avenue Railway, Ridgeley, W. Va.**—Application for a charter has been made in West Virginia by this company to build an electric railway from the Blue Bridge over the Potomac River, about 2 miles, to Miller's farm. It is expected to connect with the Cumberland Electric Railway at the bridge. Incorporators: John L. Miller, Alfred Ridgeley, J. T. Vandergrift and R. A. Radcliffe, all of Ridgeley, W. Va., and Conrad Miller, Cumberland, Md.

***Twin Mountain & Potomac Railway, Twin Mountain, W. Va.**—Chartered in West Virginia to build a 22-mile railway from McNeil to Twin Mountain. Capital stock, $100,000. Incorporators: R. T. Cunningham, H. R. Hinzelman, J. M. Brownfield, Kemble White and E. A. Russell, all of Fairmont.

FRANCHISES

Little Rock, Ark.—The Little Rock Railway & Electric Company has asked the City Council for a franchise to extend its Main Street line into the southern part of Little Rock.

Lodi, Cal.—The Central California Traction Company, San Francisco, has received a franchise from the Board of Trustees to extend its tracks north on Sacramento Street in Lodi.

San Diego, Cal.—The San Diego & El Cajon Valley Interurban Railway has received an extension of its franchise from the Common Council permitting it to build its tracks over certain streets in San Diego.

Hartford, Conn.—The Connecticut Company has received permission from the Council to double-track, extend and rebuild some of its lines in Hartford.

Elgin, Ill.—The Elgin & Belvidere Electric Company, Chicago, will ask the Commissioners for a franchise to extend its line in Elgin from Wing Park to North State Street.

Gary, Ind.—C. H. Geist, Philadelphia, Pa., and associates have received a franchise from the City Council in Gary. This is part of a plan to build an electric railway to connect Gary, Chesterton and Whiting. [E. R. J., Dec. 10, '10.]

Washington, Ind.—The Vincennes, Washington & Eastern Traction Company has received a fifty-year franchise from the City Council in Washington. The road will connect Vincennes, Washington and Loogootee. [E. R. J., April 15, '11.]

Burlington, Ia.—The People's Gas & Electric Company has asked the City Council for a franchise to double-track its North Hill line from Fourth Street to Sunnyside.

Boston, Mass.—Governor Foss has signed the bill granting the Boston & Eastern Railroad a certificate of exigency for the right to build a high-speed interurban railway over a private right-of-way from Boston to Danvers and intermediate points.

Montague, Mass.—The Miller's River Street Railway, Orange, has asked the Council for a franchise in Montague. This 14-mile railway will connect Miller's Falls, Montague, Irving, Wendall and Orange. D. P. Abercrombie is interested. [E. R. J., May 13, '11.]

New Bedford, Mass.—The Union Street Railway has received permission from the Commissioners to extend its tracks in New Bedford.

Springfield, Mass.—The Springfield Street Railway has received an extension of one year of its franchise from the Aldermen in which to extend its St. James Avenue line.

Worcester, Mass.—The Worcester Consolidated Street Railway has asked the Board of Aldermen for franchises to double-track and extend several of its lines in Worcester.

Durham, N. C.—The Durham Traction Company has asked the County Commissioners for a franchise to extend its tracks from the city limits to the West End Land Company's property.

Statesville, N. C.—T. H. Vanderford and W. F. Snider, of the Salisbury & Spencer Electric Railway, Salisbury, have asked the Board of Aldermen for a franchise in Statesville.

Summit, N. J.—The Morris County Traction Company, Morristown, has asked the Common Council for a thirty-year franchise to build a double track line from Maple Street, Summit, to the dividing line between Summit and Chatham.

North Tonawanda, N. Y.—The Frontier Electric Railway has again asked the Common Council for a franchise in North Tonawanda. This line will extend from Buffalo to Niagara Falls. T. S. Ramsdell, president. [E. R. J., June 17, '11.]

Portland, Ore.—The Portland Railway, Light & Power Company has asked the Council for a franchise on Belmont Street and Nebraska Street, in Portland.

Middletown, Pa.—F. H. Alleman, representing the Middletown & Elizabethtown Street Railway, has asked the Council for a franchise in Middletown. [E. R. J., June 3, '11.]

***Philadelphia, Pa.**—Edward N. Patton has introduced in the Councils of Philadelphia an ordinance authorizing the laying of tracks with the necessary equipment for the operation of cars upon several hundred miles of thoroughfares in the northern, northeastern and northwestern sections of the city. Mr. Patton stated that he does not feel at liberty at present to divulge the names of the persons at whose instance the ordinance was presented to the Council.

Scranton, Pa.—The Scranton & Lake Ariel Railway has asked the City Council for a franchise in Scranton. This line will connect Lake Ariel and Scranton. J. J. Brown, president. [E. R. J., Oct. 1, '10.]

Providence, R. I.—The Rhode Island Company has received a franchise from the City Council to double-track Eddy Street, in Providence.

Columbia, S. C.—The Columbia Electric Street Railway, Light & Power Company has received franchises from the City Council to double-track and extend a number of its lines in Columbia.

Glendale, W. Va.—The Wheeling Traction Company has asked the County Court for a franchise to double-track its line through Glendale.

La Crosse, Wis.—The La Crosse City Railway has asked the Council for a franchise for an extension in La Crosse.

TRACK AND ROADWAY

Owens River Valley Electric Railway, Bishop, Cal.—Grading has been begun by this company on its 4½-mile electric railway between Bishop and Laws. Henry Shaw, president. [E. R. J., April 15, '11.]

Pacific Electric Railway, Los Angeles, Cal.—Charles W. Cearbaley, Wilcox Building, Los Angeles, has been awarded the contract by this company to build a single-track pile trestle bridge 320 ft. long across the Verdugo Wash on the Glendale-Burbank extension.

Oakland (Cal.) Traction Company.—Plans are being made by this company to begin work on the many improvements to its lines in Richmond, Alameda, San Leandro and Oakland. The San Pablo Avenue line is to be double-tracked to the county line. The proposition of double-tracking the lines of the East Shore & Suburban Railway, Richmond, is now being considered. In North Berkeley the Grove Street line will be double-tracked from University Avenue to the Circle. The Claremont Avenue line of the Key Route will be double-tracked from Telegraph Avenue to the end of the line. Work will be begun at once.

Geary Street, Park & Ocean Railway, San Francisco, Cal.—Work has been begun by the city on the reconstruction of this line as a municipal undertaking.

Bridgeport & Danbury Electric Railway, Bridgeport, Conn.—Work has been begun by the Sperry Engineering Company at the Trumbull line for this company. It will connect Bridgeport, Trumbull, Monroe, Newton, Bethel, Stepney and Danbury. [E. R. J., April 8, '11.]

Shore Line Electric Railway, New Haven, Conn.—Work has been begun by this company laying its tracks on Middletown Avenue in New Haven. It is expected to have the line from New Haven to Guilford in operation within the next two months.

Groton & Stonington Street Railroad, New London, Conn.—Work has been begun by this company on its extension from Mystic station to Old Mystic.

St. Simons Railway, St. Simons, Ga.—This company has decided to extend its line on St. Simons Island. [E. R. J., March 20, '11.]

Chicago, Ottawa & Peoria Railway, La Salle, Ill.—Grading for the extension to Joliet has been completed by this company and ties and 90-lb. rails are being laid.

Rock Island Southern Railroad, Monmouth, Ill.—The Myers Construction Company, St. Louis, has been awarded the contract by this company to build a bridge on its extension to Alexis. Grading has been completed and construction will be begun at once.

Springfield & Central Illinois Traction Company, Springfield, Ill.—This company is considering plans to build a line from Edwardsville to Greenville, to connect with the main line. It will connect Pawnee, Morrisonville, Hillsboro, Greenville, Carlyle, Hoffman and Centralia. Isaac Smith, St. Louis, president. [E. R. J., Jan. 4, '11.]

***Martinsville, Ind.**—J. S. Bradley and M. S. Howel, Martinsville, plan to build an electric railway between Martinsville, Morovia, Hall and Eminence. It is said that it is proposed to have the line connect with the Terre Haute, Indianapolis & Eastern Railway at Mooresville and operate over that line into Indianapolis.

Indianapolis, New Castle & Toledo Railway, New Castle, Ind.—Arrangements are being made by this company to finance the extension of its line from New Castle to Muncie. Work is expected to be begun in the fall.

Vincennes, Washington & Eastern Traction Company, Vincennes, Ind.—The Canadian Construction Company has been awarded the contract by this company to build its electric railway between Vincennes, Washington and Loogootee. Work has been begun. J. L. Ebner, Vincennes, is interested. [E. R. J., April 15, '11.]

Davenport-Muscatine Railway, Davenport, Ia.—This company has increased its capital stock from $100,000 to $1,000,000 to insure the construction of this line between Davenport and Muscatine. J. F. Porter, Davenport, president. [E. R. J., June 24, '11.]

Southwestern Interurban Railway, Arkansas City, Kan.—Material has been ordered and construction will soon be begun by this company on a 3-mile extension in Winfield.

Manhattan City & Interurban Railway, Manhattan, Kan.—The Public Utilities Commission has authorized this company to issue $200,000 in bonds to build an extension from Manhattan to Ft. Riley.

***Kenner, La.**—Plans are being made to begin the construction in the near future of an electric railway between Kenner and Metairie Ridge.

Boston & Northern Street Railway, Boston, Mass.—This company will double-track its line from Malden to Revere Beach in the near future.

Benton Harbor, St. Joe Railway & Light Company, Benton Harbor, Mich.—Grading and preliminary work is being rushed by this company on its line from Benton Harbor to Dowagiac. The company expects to build two concrete bridges across the Dowagiac Creek.

Minneapolis Northern Suburban Railway, Minneapolis, Minn.—The Atlas Engineering & Construction Company has been awarded the contract by this company to build its railway between Minneapolis and Little Falls. Work has been begun. [E. R. J., June 17, '11.]

Vicksburg (Miss.) Traction Company.—All material is at hand and construction has been begun by this company on its 2-mile extension between Vicksburg and Walters.

Kansas City & Southeastern Traction Company, Kansas City, Mo.—This company advises that it will begin construction in the fall on its 126-mile line between Leeds, Raytown, Little Blue, Lee's Summit, Warrensburg, Sedalia and Jefferson City. The company will furnish power for lighting purposes. Its repair shops will be located at Little Blue Station. Capital stock, authorized, $5,000,000. Capital stock, issued, $180,000. Bonds, authorized, $5,000,000. Officers: Charles A. Sims, 3724 East Twenty-seventh Street, Kansas City, president; Howard W. Gibson, vice-president; C. Guy Minturn, 2714 Mersington Street, secretary; Benjamin F. Shouse, treasurer, and Jerome C. Herring, Twenty-second and Jackson Streets, chief engineer. [E. R. J., March 6, '09.]

St. Louis, St. Charles & Northern Traction Company, Middletown, Mo.—This company advises that it has not yet awarded any contracts for the construction of its line. Work will begin within the next eight months. It will connect St. Louis, St. Charles, Old Monroe, Middletown, Laddonia and Mexico. The motive power will be electricity or gasoline. Capital stock authorized, $3,000,000. Officers: C. B. Duncan, Corso, president; R. E. Race, Mexico, vice-president and general manager; C. Pearson, Middletown, secretary, and R. M. Hendershott, Middletown, treasurer. [E. R. J., Nov. 19, '10.]

Public Service Railway, Newark, N. J.—This company has decided to build a viaduct over the West Shore and the Susquehanna Railroads tracks at Little Ferry to avoid crossing these roads at grade.

Binghamton (N. Y.) Railway.—Plans are being made by this company to extend its tracks in Binghamton.

Buffalo & Williamsville Electric Railway, Buffalo, N. Y.—This company is building 1½ miles of track with 85-lb. T-rails and brick pavement in Williamsville.

Catskill (N. Y.) Traction Company.—The Public Service Commission of the Second District has received an application from this company for permission to extend its railroad from Leeds to Cairo, 6.7 miles.

Suffern (N. Y.) Railway.—The Public Service Commission of the Second District has authorized the Suffern Railroad to construct a single-track electric railroad from Orange Avenue to Lafayette Avenue in Suffern, Rockland County. The company is also authorized to issue $24,000 of its common-capital stock at par for cash to pay the cost of constructing such track. The Suffern Railway will connect with the North Jersey Rapid Transit Railway at State Line and complete an interurban road from Paterson, N. J., to Suffern. [E. R. J., May 13, '11.]

Syracuse, Watertown & St. Lawrence Railroad, Syracuse, N. Y.—The Public Service Commission, Second District, has authorized this company to construct a 6-mile electric railroad from a point near Stop 9 on the Syracuse & South Bay Electric Railroad in Cicero to and into Brewerton. [E. R. J., June 3, '11.]

Carolina Light & Power Company, Raleigh, N. C.—This company will soon award contracts to build its 3-mile extension from the city limits to the Raleigh Country Club.

***Cleveland, Ohio.**—O. P. Van Sweringen, M. J. Van Sweringen and associates plan to build an electric railway in the southeastern part of Cleveland.

Fostoria & Fremont Railway, Lima, Ohio.—This company placed in operation on June 15 its 20-mile railway between Fostoria and Fremont.

Lane County Asset Company, Eugene, Ore.—This company has begun work on its 12-mile electric railway to connect Eugene and Elmira. It will ultimately be extended to Coos Bay. [E. R. J., June 17, '11.]

Portland, Eugene & Eastern Railway, Eugene, Ore.—A permanent survey is being made and most of the right-of-way has been secured by this company for its line between Eugene and Corvallis.

Lancaster & York Furnace Street Railway, Lancaster, Pa.—This company is building a 3-mile extension connecting with the Lancaster & Southern Street Railway at Mount Nebo.

Philadelphia Railways, Philadelphia, Pa.—This company recently chartered to take over the Southwestern Street Railway has planned extensive improvements to its lines. Among these are the establishment of a through service to Prospect Park and Media and the double-tracking of the line westward from the Schuylkill River. Isaac H. Silverman, 605 Land Title Building, Philadelphia, president. [E. R. J., May 27, '11.]

Aberdeen (S. D.) Street Railway.—Work has been begun by this company on an extension in Aberdeen to Wylie Park.

Bristol (Tenn.) Traction Company.—This company has placed in operation its extension in Bristol to Virginia Park.

Tennessee Traction Company, Memphis, Tenn.—This company plans to reorganize and increase its capital stock. W. K. Burton, president. [E. R. J., June 17, '11.]

***McKinney, Tex.**—The Commercial Club, McKinney, is endeavoring to interest capital in the construction of a 36-mile electric railway between McKinney and Bonham.

Richmond & Henrico Railway, Richmond, Va.—This company is considering plans to build several extensions to its line.

Seattle, Wash.—A. O. Powell, Rufus R. Wilson, C. J. Farmer, T. T. Aldwell and associates have completed the organization for the financing and construction of a 51-mile electric railway between Port Angeles and Port Ludlow. Work will be begun at once. [E. R. J., June 10, 1911.]

Seattle, Wash.—W. H. Coughlin, 302 American Bank Building, Seattle, advises that franchises, right-of-way and $90,000 in subsidy bonds have been obtained to build a 7½-mile electric railway between Seattle, Highland Park and Lake Burien. This will be turned over to anyone who will agree to build and operate the line. [E. R. J., May 20, '11.]

Grafton (W. Va.) Traction Company.—This company is building a 3-mile extension in West Grafton and has begun work on its proposed extension on Walnut Street to the Beaumont addition.

Parkersburg & Ohio Valley Electric Railway, Parkersburg, W. Va.—John Shrader has been awarded the contract by this company to complete the 5 miles of track between Friendly and Sistersville.

***Eau Claire, Wis.**—Harry Norris, Hudson, Wis., and Fred Carr, Minneapolis, Minn., propose to build an electric railway between Eau Claire, Wis., and St. Paul and Minneapolis.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis.—An extension from Racine to Eagle Lake is being considered by this company.

SHOPS AND BUILDINGS

Pacific Electric Railway, Los Angeles, Cal.—It is reported that this company has selected a site for its proposed carhouse on Homeward Avenue, in Los Angeles, on the Moneta Avenue branch of the Redondo Beach line.

Central California Traction Company, San Francisco, Cal.—This company's freight depot at Tenth Street and X Street, in Sacramento, was destroyed by fire on June 13. The loss is estimated to be about $3,000.

Tidewater Power Company, Wilmington, N. C.—This company has let a contract for the erection of several concrete combination stations and waiting rooms. These will be located at Greenville, Sheel Road Crossing, Winter Park Gardens, and other points on the line between Wilmington and the terminus, Lumina, at the beach.

Southern Pennsylvania Traction Company, Chester, Pa.—Plans have been drawn for an annex to the present carhouse of this company in Chester. It will be enlarged at an early date.

Galveston-Houston Electric Railway, Houston, Tex.—Construction has been begun by this company on its new terminal station in Houston. The structure will be 160 ft. x 100 ft., and of brick construction.

Longview & Junction Street Railway, Longview, Tex.—During the next three months this company will award contracts to build a new carhouse in Longview.

Seattle-Everett Traction Company, Seattle, Wash.—The contract has been awarded by this company for the construction of a terminal station for its own use and the Everett Railway, Light & Water Company and the Puget Sound International Railway & Power Company, in Seattle. This building will house the general offices, and the yard will be used by the Snohomish & Seattle Interurban Railway Company.

POWER HOUSES AND SUBSTATIONS

Pueblo & Suburban Traction & Lighting Company, Pueblo, Col.—H. M. Byllesby & Company, Chicago, Ill., who have purchased the property of the Pueblo & Suburban Traction & Lighting Company, are arranging to increase the capacity of the steam station at Pueblo, build additional transmission lines and enlarge its hydro-electric development. At present the company has a steam electric power station of 4135-kw at Pueblo and a hydro-electric plant of 1600-kw at Skaguay.

Athens (Ga.) Electric Railway.—This company is enlarging its Mitchell's Bridge power plant, which has a capacity of 1000 hp. It will be increased by 200 hp. The company also plans to increase the capacity of its Tallahassee Shoals plant.

Chicago, Ottawa & Peoria Railway, Ottawa, Ill.—This 90-mile division of the McKinley system in northern Illinois, which is completing a 22-mile extension from Morris to Joliet, has purchased from the Westinghouse Electric & Manufacturing Company three substation equipments of 300 kw each.

Illinois Traction System, Peoria, Ill.—The St. Louis, Springfield & Peoria Railway, a subsidiary of the Illinois Traction System, has purchased from the Westinghouse Electric & Manufacturing Company two rotary-converter substation equipments, one of 300-kw and the other of 500-kw capacity. These are made necessary by the increase of traffic occasioned by the entrance of the road into St. Louis.

Arkansas Valley Interurban Railway, Wichita, Kan.—Construction has been begun by this company on a new brick power house at the junction of the Newton and Halstead lines, in Halstead.

Kansas Ctiy Railway & Light Company, Kansas City, Mo.—A substation is being built at Fortieth Street and State Line for the use of this company and the Metropolitan Street Railway. The structure will be one-story, 40 ft. x 132 ft., and of reinforced concrete construction. The cost is estimated to be about $17,000.

Syracuse (N. Y.) Rapid Transit Railway.—This company has ordered three 1000-kva transformers, one 1000-kw rotary converter, three 350-kva transformers and a switchboard from the General Electric Company.

Lancaster & York Furnace Street Railway, Lancaster, Pa.—This company is installing two 300-kw rotary converters at its power house.

Susquehanna Traction Company, Lock Haven, Pa.—Extensive improvements are in progress at the power house of this company in Lock Haven. The company is installing a new 300-kw generator.

Washington-Oregon Corporation, Vancouver, Wash.—Preliminary arrangements are being made by this company to build a new power plant on the Kalamon River. The cost will be about $750,000. A. Welch, 502 Fenton Building, Portland, Ore., general manager.

Manufactures & Supplies

ROLLING STOCK

Boston (Elevated) Railway has issued specifications for fifty surface cars.

Montreal (Que.) Street Railway has issued specifications for twenty-five cars.

Wausau (Wis.) Street Railway is in the market for five single-truck pay-within cars.

Connecticut Company, New Haven, Conn., has ordered one snow plow from the Wason Manufacturing Company.

Rhode Island Company, Providence, R. I., has ordered ten closed cars from the Osgood-Bradley Car Company.

Texas Traction Company, Dallas, Tex., has ordered six Brill 27-MCB-3 trucks from the American Car Company.

Greenville, Spartanburg & Anderson Railway, Greenville, S. C., has ordered five express cars from the Southern Car Company.

Denton (Tex.) Traction Company has ordered two 18-ft. closed cars mounted on Brill 21-E trucks from the Danville Car Company.

Northern Ohio Traction & Light Company, Akron, Ohio, has ordered one switching locomotive from the G. C. Kuhlman Car Company.

Springfield (Mo.) Traction Company has ordered six 21-ft. closed motor car bodies mounted on Brill 21-E trucks from the Danville Car Company.

Denver & Inter-Mountain Railway, Denver, Col., has ordered four No. 306-B railway motors from the Westinghouse Electric & Manufacturing Company.

Portland, Gray & Lewiston Railroad, Portland, Me., has ordered five 30-ft. flat cars mounted on Brill 57-F trucks from the Wason Manufacturing Company.

Charleston (W. Va.) Interurban Railroad is in the market for a number of wheel guards. The company is overhauling its cars and rebuilding some of the bodies.

Philadelphia (Pa.) Rapid Transit Company, it is reported, will order thirty cars for elevated-subway service in addition to the 200 cars to be ordered for the surface lines.

Fort Scott Gas & Electric Company, Fort Scott, Kan., has ordered one 25-ft. 4-in. closed motor car mounted on Brill 22-E trucks from the Danville Car Company.

Yonkers (N. Y.) Railroad has ordered one 34-ft. 4-in. flat motor car body mounted on Brill 27-G-2 trucks, and two Brill 27-G-2 trucks without car wheels from The J. G. Brill Company.

Emporia (Kan.) Street Railway has ordered five 21-ft. closed cars mounted on Brill 21-E trucks and four 20-ft. open cars mounted on Brill running gears from the Danville Car Company.

Muskegon Traction & Lighting Company, Muskegon, Mich., has ordered one 33-ft. 4-in. semi-convertible vestibule motor car body mounted on Brill 27-G-1 trucks from The J. G. Brill Company.

Oklahoma City (Okla.) Traction Company has ordered one quadruple equipment of No. 92-A railway motors and type K-10-A control from the Westinghouse Electric & Manufacturing Company.

Louisville (Ky.) Railway has ordered thirty partial car equipments of four motors and K-35 controllers from the General Electric Company for use on the cars being built by the Cincinnati Car Company.

Piedmont Traction Company, Charlotte, N. C., has ordered three express cars from the Southern Car Company. The company has also ordered six Brill 27-MCB special trucks from The J. G. Brill Company.

Woodlawn & Southern Street Railway Company, Woodlawn, Pa., has ordered four Brill 57-F trail trucks, four Brill 27-E-1 trucks with rolled-steel wheels and two Brill 21-E trucks with rolled-steel wheels from the G. C. Kuhlman Car Company.

Buffalo & Lake Erie Traction Company, Buffalo, N. Y., has specified that the four vestibuled closed motor cars ordered from the G. C. Kuhlman Car Company shall be 56 ft. 5⅝ in. long over all, 8 ft. 4 in. wide over all and equipped with Westinghouse air brakes. McConway & Torley couplers, Keller curtain fixtures, Brill journal boxes, four GE-205 motors and Brill-27 MCB-3 trucks.

Boston (Mass.) Elevated Railway, noted in the ELECTRIC RAILWAY JOURNAL of May 6, 1911, as having ordered forty all-steel closed subway cars from the Standard Steel Car Company, has specified the following details for this equipment:

Seating capacity 72	Control ..... West.
Weight (car body) . 38,000 lb.	Couplers ..... Tom.
Bolster centers, length . . 51 ft.	Curtain fixtures . . Cur. S. Co.
Length over all . . . 69 ft. 2½ in.	Headlights ..... Neal
Width over sills . . . 9 ft. 2¼ in.	Journal boxes ..... Sym.
Over all ..... 9 ft. 6 in.	Motors ..... 2 West. 300
Height, rail to sills . . . 22¾ in.	Motors ..... inside hung
Body ..... metal	Sash fixtures ..... Edwards
Interior trim ..... bronze	Seats ..... long
Headlining ..... steel	Trucks ..... Brill
Roof ..... semi-monitor	Ventilators. ..... Perry
Underframe. ..... metal	Wheels ..... solid forged steel
Air brakes ..... West.	Special device,
Bumpers. Hedley anti-climber	Consol. door mech.

Morris County Traction Company, Morristown, N. J., has included the following in its specifications for the ten semi-convertible cars which are being built by The J. G. Brill Company:

Seating capacity 44	Curtain material . . . pantasote
Weight (car body) . . 18,500 lb.	Gears and pinions ..... solid
Length of body . . . . 30 ft. 8 in.	Gongs ..... Dedenda
Over vestibule . . . . . 40 ft. 8 in.	Hand brakes,
Width over sills . . 8 ft. 2½ in.	12-in. Brill ratchet
Over all ..... 8 ft. 7 in.	Headlights .... Crouse-Hinds
Body ..... wood	Motors ..... 4 West. 101-B
Interior trim ..... white ash	Motors ..... outside hung
Headlining ..... birch veneer	Sanders ..... Dumpit
Roof ..... Brill plain arch	Sash fixtures ..... Edwards
Underframe ..... wood	Seats ..... Winner
Air brakes ..... West.	Seating material ..... rattan
Axles ..... 4¼-in. Std.	Step treads ..... oak
Bumpers .... Brill angle iron	Trolley base ..... Union
Car trimmings ..... bronze	Trucks ..... Brill 27-G1
Couplers ..... Hovey	Ventilators . . Brill mushroom
Curtain fixtures . . . . N. L. W.	Wheels ..... 33-in. cast iron

TRADE NOTES

Indiana Tie Company, Evansville, Ind., has increased its capital stock from $113,000 to $225,000.

D. C. & Wm. Jackson, Boston, Mass., have moved their Chicago office from the Commercial National Bank Building to the new Harris Trust Building, 111 West Monroe Street.

The J. G. Brill Company, Philadelphia, Pa., has elected Edward P. Rawle a member of the board of directors to fill the vacancy caused by the death of his brother, Francis W. Rawle.

Perry Ventilator Corporation, New Bedford, Mass., has received orders for ventilators for the twenty new cars now being built at the works of the Pressed Steel Car Company for the Boston (Mass.) Elevated Railway.

Berg Storage Battery Car Company, New York, N. Y., has been granted a charter with a capital stock of $110,000 to manufacture freight and passenger cars. The incorporators are: C. H. Lee, T. Sturgis, New York, N. Y., and R. G. Dale, Plainfield, N. J.

Asbestos Protected Metal Company, Beaver Falls, Pa., has opened a new plant for manufacturing asbesto protected metal and weather-proof non-rusting skylights at Beaver Falls. The executive offices of the company have also been removed to Beaver Falls.

Manganese Steel Rail Company, New York, N. Y., has been incorporated in Delaware with an authorized capital stock of $6,000,000 to manufacture and deal in ingots of iron and steel and manganese. The incorporators are Charles S. Fallows and George M. Judd, New York, N. Y., and Harry W. Davis, Wilmington, Del.

McKeen Motor Car Company, Omaha, Neb., has shipped a 70-ft. gasoline motor car to the Oregon Short Line, Ogden, Utah. This is the first of four cars ordered by this railroad, and will be operated for local passenger service between

Ogden and Salt Lake City. The company has also shipped the fourth motor car to the Ann Arbor Railroad.

Railway Roller Bearing Company, Syracuse, N. Y., has received an order from the Baldwin Locomotive Works for rolling journal boxes for an electric locomotive for the Portland, Gray & Lewiston Railroad, Lewiston, Me. These are said to be the largest roller bearing journal boxes installed up to this time. The axle journals are 5 in. x 9 in. and the rollers are 2¼ in. diameter.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has received orders for power equipment from the following companies: Seattle-Tacoma Power Company, Seattle, Wash., three 1000 kva, 50,000-volt oil insulated, water-cooled transformers; Empire District Electric Company, three substation equipments, consisting of nine 250 kva, 33,000-volt transformers, three switchboards and three sets of lightning protective apparatus; People's Power Company, Willows, Cal., six 100 kva, 55,000-volt oil insulated, self-cooling transformers; Sacramento Power Company, San Francisco, Cal., six 100 kva, 55,000-volt oil insulated, self-cooling transformers.

Transportation Utilities Company, New York, N. Y., has removed to its New York office at 30 Church Street the exhibit which was shown at the recent Master Mechanics' and Master Car Builders' conventions at Atlantic City. The exhibit will be a permanent one and includes the products of the Acme Supply Company and the General Railway Supply Company, which the Transportation Utilities Company represents directly. Among the exhibits are working models of four different styles of trap doors for elevated and grade level platforms, operating models of sash balances, vestibule and car window curtains, including the Tuco rack curtain fixture, which was exhibited for the first time at Atlantic City.

Ohio Brass Company, Mansfield, Ohio, has received an order from the Piedmont Traction Company and the Greenville, Spartanburg & Anderson Railway for Tomlinson radial M. C. B. couplers and sander equipments for 31 new interurban cars. The company will also furnish the entire overhead material for 150 miles of track. Single catenary construction supported by brackets will be used. The poles will be spaced 150 ft. apart on tangents and 1 and 2 deg. on curves, and the trolley wire hangers will be spaced 30 ft. apart. The pole brackets will be 10 ft. long, and the trolley will be No. 0000 grooved copper. The contract also includes all porcelain insulators for 33,000-volt transmission line, telephone, signal and feeder wires.

Walter L. Conwell, whose election as president and treasurer of the Transportation Utilities Company, New York, N. Y., was announced in the Electric Railway Journal of April 15, 1911, resigned on July 1, 1911, from the Westinghouse Electric & Manufacturing Company in order to devote his entire time to the affairs of the Transportation Utilities Company. Mr. Conwell was graduated from the University of Pennsylvania in 1898 in the course of electrical engineering. He then engaged in electric railway construction and engineering work for three years. In the fall of 1901 he became connected with the sales department of the Westinghouse Electric & Manufacturing Company, and for the past five years has had entire charge of railway work for that company in its New York territory.

Sherwin-Williams Company, Ltd., Montreal, Que., has been formed by Walter H. Cottingham, Cleveland, Ohio, and C. C. Ballantyne, Montreal, Que., to take over the Canadian business of the Sherwin-Williams Company of America, the Canada Paint Company, Ltd., and Lewis Berger & Sons, Ltd., of London, Eng. The new company will have a capital of $8,000,000, half preferred and half common. Of the $4,000,000 of cumulative preferred stock $3,000,000 is now being issued. The entire amount of common stock is being issued. The present management will be continued, and the Canadian company, under an agreement with the American company, will have the benefit of the large research and development work constantly being done by the latter. Walter H. Cottingham, founder of the Canadian business of the Sherwin-Williams Company, chairman of Lewis Berger & Sons, Ltd., and president of the Sherwin-Williams Company of America, will be president of the new company. The present management of the Canada Paint Company and Lewis Berger & Sons, Ltd., will be continued.

The Baldwin Locomotive Works, Philadelphia, Pa., which was incorporated in June, 1911, has acquired all of the capital stock of "Baldwin Locomotive Works" and intends to acquire the ownership of the plant and property of the Standard Steel Works Company. The new company has authorized $20,000,000 of 7 per cent cumulative preferred stock and $20,000,000 common stock. The holders of the $20,000,000 stock of Baldwin Locomotive Works receive $14,100,000 cash, $5,900,000 of the preferred stock and $11,970,000 of the common stock of the new company. Drexel & Company, Philadelphia, and White, Weld & Company, New York, N. Y., are offering the unsold balance of the $20,000,000 7 per cent preferred stock. As now constituted, the board consists of twelve men, among whom are four heretofore identified with the concern. They are William L. Austin, chairman of the board; Alba B. Johnson, president; Samuel M. Vauclain, vice-president, and William Burnham, president of the subsidiary Standard Steel Works. The new interests are represented by Edward T. Stotesbury, Roland Z. Taylor and Thomas De Witt Cuyler of Philadelphia; E. C. Converse, president of the Bankers' Trust Company, New York; Samuel M. Roberts, vice-president of the National City Bank, New York; Charles D. Norton, vice-president of the First National Bank, New York; Francis M. Weld, White, Weld & Company, New York, and Otis H. Cutler, president of the American Brake Shoe & Foundry Company.

ADVERTISING LITERATURE

Ohio Brass Company, Mansfield, Ohio, has issued Catalog K, listing and describing Ohio valves and steam specialties. Attention is called particularly to the Ohio gage cock, water gage and pressure regulating valve.

Goulds Manufacturing Company, Seneca Falls, N. Y., is mailing a circular covering its new line of single stage centrifugal pumps. They are made in both the single and double-suction type, either of which is designed so that it may be readily adapted to any form of drive.

Allis-Chalmers Company, Milwaukee, Wis., has issued Bulletin No. 1076, covering its line of power transformers. The bulletin describes the theory underlying the construction of power transformers and illustrates the various details of manufacture. Tables of efficiency and heating are also included.

Gold Car Heating & Lighting Company, New York, N. Y., has issued a 166-page catalog which lists and illustrates the various devices, fittings and special fixtures used in connection with the Gold systems of steam-vapor, hot-water and electric train heating. Attention is also called to the improved Gold system of acetylene car lighting.

The J. G. Brill Company, Philadelphia, in the *Brill Magazine* for June, 1911, prints a biographical sketch of A. L. C. Fell, chief officer of the London County Council Tramway system. The sketch is accompanied with an excellent portrait of Mr. Fell as a supplement. This issue of the magazine also contains a reprint of a pamphlet issued by the International Railway, Buffalo, N. Y., describing the first "near-side" type of car. Among other articles are the following: "Centrifugal Sprinkling Car for Davenport, Ia.," "Thirty More P. A. Y. E. Cars for Vancouver, B. C.," and "Pay-Within Cars for Central Pennsylvania Traction Company, Harrisburg, Pa."

General Electric Company, Schenectady, N. Y., has issued Bulletin No. 4834, which comprises an article on the electrical equipment of the Detroit River tunnel, reprinted from the Electric Railway Journal of Jan. 14 and Jan. 21, 1911. Bulletin No. 4855 illustrates and describes various types of motor-driven pumps designed for different purposes. Bulletin No. 4836 issued by the company describes and illustrates the G. E. steam flow meter, and Bulletin 4847 describes its form B belt-driven alternators. They are built in capacities ranging from 50 to 200-kw and are adapted for three-phase or two-phase winding without change except the armature and terminal blocks, the exciters and all accessories being the same for both. Designs have been made for 240, 480, 600, 1150 and 2300 volts.