Street Railway Journal

VOL. XXXI. NEW YORK, SATURDAY, JANUARY 18, 1908. No. 3

PUBLISHED EVERY SATURDAY BY THE

McGraw Publishing Company

James H. McGraw, Pres. Curtis E. Whittlesey, Sec. & Treas.

MAIN OFFICE:
NEW YORK, 239 WEST THIRTY-NINTH STREET.

BRANCH OFFICES:
Chicago: Old Colony Building.
Philadelphia: Real Estate Trust Building.
Cleveland: Schofield Building.
San Francisco: Atlas Building.
London: Hastings House, Norfolk St., Strand.

Cable Address, "Stryjourn, New York"; "Stryjourn, London"—Lieber's Code used.

TERMS OF SUBSCRIPTION

In tbe United States, Hawaii, Puerto Rico, Philippines, Cuba, Mexico and the Canal Zone:
Street Railway Journal (52 issues).....$3.00 per annum
Single copies .....10 cents
Combination Rate, with Electric Railway Directory and Buyer's Manual (3 issues—Feb., Aug. and Nov.).....$4.00 per annum
Both of tbe above, in connection with American Street Railway Investments (The "Red Book"—Published annually in May; regular price, $5.00 per copy).....$6.50 per annum

To Dominion of Canada:
Street Railway Journal (52 issues), postage prepaid.....$4.50 per annum
Single copies .....10 cents

To All Countries Other Than Those Mentioned Above:
Street Railway Journal (52 issues), postage prepaid.....$6.00
25 shillings. 25 marks. 31 francs.
Single copies .....20 cents
Remittances for foreign subscriptions may be made through our European office.

NOTICE TO SUBSCRIBERS.

REMITTANCES.—Remittances should be made by check, New York draft, or money order, in favor of the STREET RAILWAY JOURNAL.

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

BACK COPIES.—No copies of issues prior to September, 1904, are kept on sale, except in bound volumes.

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

During 1907 the Street Railway Journal printed and circulated 427,250 copies, an average of 8216 copies per week. Of this issue 7500 copies are printed.

A Study of Electrification

Mr. Murray's Institute paper gives a vivid idea of the multifarious problems that confront the engineer in dealing even with a relatively simple case of electrification of a steam road. The very beginning of such a study plunges one into a vexatious tangle of seemingly petty, but really important, details from which he escapes only with great difficulty. The explanation of the reasons for preferring a direct utilization of a single generator phase for the whole distribution instead of splitting up the line between two or three phases is much to the point, and there is little question that the event will prove the choice to have been a wise one. The choice of 11,000 volts as the distributing pressure is also one which will be a source of satisfaction. When it comes to passing above the modest voltages used on street railways one might as well go far enough to secure the advantages of high voltage. As modern potentials go, 11,000 volts is eminently conservative. It is not materially more dangerous or more difficult to insulate than lower pressures, say from 2000 volts up, and gives the very material gains of a much smaller current to collect and a relative improvement in the copper losses, enabling the whole system to be operated without sub-stations.

The major part of Mr. Murray's paper is devoted to the questions of sectionalization of the working conductor. As he very properly points out, this is not so much a matter of averting the results of local grounds as of giving complete control of the energy on the system. By making the section termini in the regular signal towers and putting the signal men in charge it becomes possible to introduce a new element in the safe running of trains, since, if necessary, a signal man can halt a train by cutting off its power at his own end of the section and telephone the signal man at the other end to do the same. Incidentally, we note that an effective remedy for interference with the telephone service between towns has been found in the use of a twisted pair, lead sheathed, and with the sheath grounded. In extreme cases on long lines, impedance coils across the telephone circuit with their middle points grounded, seem to remove the residual troubles.

On a 11,000-volt distribution system it is very easy to sectionalize to any desired extent, for all the appliances are of moderate cost. Mr. Murray believes that the sections should be made at least 1½ miles long and preferably of greater length. This makes it easier to give them termini in convenient towns and lessens the number of section switches, regarding which the author grimly remarks that there is general agreement that a switch in any line does not increase the reliability of that line. Incidentally, this leads into the question of insulation, since, the sections being terminated at anchor insulators, the endurance of these becomes a serious matter. In fact, there has been considerable trouble from their deterioration, due to the blast from the stacks of the steam locomotives on the line. If steam and electric locomotives are to be used on the same track, it is evident that especial care will have to be taken in the design of insulators for the working conductor. It is also interesting to note the suggestion in favor of greater flexibility between the overhead wires and the pantograph. This can be secured in either element, and the New Haven Company expects to experiment with a different form of catenary on its branch lines and a flexible connection to its pantograph. These tests will be of great assistance in throwing light on the important question of satisfactory current collection at high speeds.

The Proposed Association of Operating Managers

Members of the American Street and Interurban Railway Association will recall that at the Atlantic City Convention it was decided to organize another affiliated association, to take up questions of transportation, traffic and general operating subjects. The committee of the American Street and Interurban Railway Association in charge of the formation of this new body has consequently issued a call for a meeting of the operating officers of member companies to take place in New York on Jan. 30, to elect officers, appoint committees, outline the program for the 1908 convention, and take such other action as may be necessary in the organization of the association. It is hoped that there will be a large attendance, and that the results will be as successful as in the case of the other affiliated associations.

There are certainly a vast number of topics which can be considered by the proposed organization. They include not only the proper means of caring for the traffic already in existence, but in providing ways and means for its stimulation. They embrace such questions as fares and transfers and their proper collection, and possibly their registration as well. The new association, in connection with the Engineering or Claim Agents' association, can take up the means for preventing accidents, the best form of car, and many other topics where the fields of the associations will overlap. We presume that the subject of rules for employees, as well as the discipline of employees and the conduct of benefit associations will also be considered as coming within the purview of the new organization. A wide field of usefulness is thus open to the new body, and we believe that the plan of removing these subjects from the main organization and placing them entirely in the hands of those whose duty it is, in a street railway company to execute them, will prove eminently satisfactory.

The topics which will thus be considered at the conventions by the new organization will be those which have largely, during the last few years, been considered as peculiarly belonging to the parent association, which inferentially will, in the future, devote itself largely to discussions of policy and other executive matters. This should not mean, however, a retirement in any respect from the floor of the conventions of those presidents who have taken an active part in the past in the affairs of the American Association. These gentlemen will, undoubtedly, now feel at more liberty to attend meetings of any one of the four affiliated associations in whose work they may have a more personal interest. Those whose inclinations turn toward the engineering side will probably attend the meetings of that association; those who are attracted to the questions of accounts will give their preference to that body; managers of a legal turn of mind will be more interested in the meetings of the claim agents, while those who consider operation their special province will become closely affiliated with the new organization. The separation will certainly give a better opportunity for the discussion of operating topics than under the old methods, where the time devoted to these subjects had to be divided with those of policy. The results should result in progress for the street railway industry as a whole.

Improving Car Sign Practice

Observation of car signs in several cities lately visited suggests the need of closer attention to this important matter, which bears so directly upon revenue. It is easy to let the sign question slip out of sight on busy systems where new problems are constantly coming up for solution, but if it was feasible to measure the influences of suitable signs upon the traffic, there is no doubt that the conditions now often found would be very much improved. The circumstances in different cities, of course, require varied treatments of the sign problem, but there are a few points of fundamental importance which ought not to be overlooked. They may seem self-evident to some managers, but their neglect justifies reference to them at this time.

It is certainly a mistake to run a car over a given route other than a belt line without changing the destination sign at the end of each half trip. Even on the average belt line it is desirable to indicate a definite destination or direction of movement. On some roads no hint is given as to the course of a car on a belt line, and the result is that passengers unfamiliar with the system may, for example, be carried far out of their courses through taking a northbound belt car when the destination would have been reached in half or a third the time by taking a southbound belt car. It is not always feasible to ask the conductor from the street the general course of a car, and when this can be done the stops are made needlessly long, as a rule. Every possible effort should be made to encourage short-distance riding, for the profits are far greater than in the case of the long haul. It is a simple matter to sign up belt line cars with a side sign that shall indicate the general course of the route, and the service can sometimes be perceptibly improved by such a policy.

Failure to use a different destination sign over the front of the car at the end of each trip opens the way toward an extensive boarding of the wrong cars by the public, with resulting delays to the rolling stock through an excessive number of stops. It ought to be a cardinal motto of street railways to cut out every unnecessary stop on their systems. No one can make a scientific study of rapid transit without soon coming to the conclusion that unnecessarily long or too frequent stops are costly to both the service and the motive power and maintenance departments. Is it too much to urge that car signs be maintained on the rolling stock with the specific object of reducing false boardings, as well as of indicating correct destinations? A car whose front vestibule sign indicates the two opposite terminals of a route, and whose rear vestibule sign indicates some other point reached on one part of the round trip, simply encourages delay and inconvenience as far as strangers are concerned. Americans are traveling more and more in this country; and while the great majority of passengers may know the destination of a car imperfectly signed, by its direction of motion, a considerable percentage of outsiders find the service less convenient than it would be with a little more care in sign arrangement. The side sign is doubtless worked out too extensively in some cities where the routes are complex, but in other places there is no intimation of important points or streets passed on the trips. It is thoroughly good practice to omit destinations from the side

signs, and to use special placards on the front and rear vestibules when necessary, but the rear vestibule signing should confirm that on the front, rather than include additional or different route data. In rapid transit systems—whether they be elevated or subway—the need is equally apparent. A single passenger who stops to ask the guard whether the train is going to one destination or another is apt to hold back a number of passengers anxious to board the train. A certain number of inquiries will be made by careless passengers, who will neglect to read any signs, no matter how clear and numerous they are. But the company should attempt to reduce these delays to a minimum by providing all regular and careful passengers with means to know the destination and routes of trains.

Keeping Track of Distantly Located Shops

After a consolidation of several small electric railway companies, the conduct and unification of the repair shops and their work form one of the first problems to be faced by the management. Each road forming the combination has presumably had its own shop, and if the roads are interurban in character the shops will probably be found to be located at considerable distances from each other. The first step usually is the selection of the largest or most advantageously situated shop as headquarters of the master mechanic of the entire system and the appointment of foremen to take charge of the other shops. Such a division of work has its advantages, but may also result in the management losing sight to some extent, even possibly neglecting, the smaller shops. If this is done, the almost invariable result will be less work and less thorough work in them. To be sure, there are foremen who can and will work and who will keep others at work just as well when left alone as when they feel they are under close supervision, but they are exceptions.

One way of keeping track of the more distantly located shops is for the master mechanic to make very frequent inspection trips over the system and visit all of the different points at which the work of his department is being done. This, however, takes a great deal of time. The next best way is to establish a system of reporting everything done by the small shops, such as records of wheels or armatures changed, brake-shoes put on, controllers repaired, cars oiled, etc. A perusal of such reports, together with a knowledge of the number of men employed and of the local conditions, will enable the master mechanic to judge pretty well whether or not the shop force is keeping busy. To an extent these reports will indicate the nature of the work being accomplished. For instance, if they show frequent changes of armatures due to low bearings, the natural inference is that the cars are either not properly oiled or are not being well inspected.

Of course, if the reports are received and simply filed away, the time spent in getting them up is almost wasted. The head of the department should make it an invariable practice to look them over and compare them, and when there are indications of anything unusual, the foreman should be asked for an explanation. In most cases the master mechanic should communicate with each shop at least once a day, either by letter or telephone, if he cannot make a personal visit, and comment on the reports or at least refer to them in such a manner as to show that they have been examined. Such procedure will result in the foreman of each shop realizing that his work is being followed by those in charge, and that he is being credited for any good work which he does, as well as being watched for any points in which he may fall behind the standard.

Tool Locations in Repair Shops

Repair shop practice on electric railways differs radically from the work of regular production in manufacturing plants, for while the same class of operations is often repeated in each case, in the railway shop there is no sequence of handlings, and tool work in a progressive manner with a single product passing from one end of the establishment to the other is not a part of the routine. Nevertheless, tool location is important in relation to convenience of repair shop work, and it has a direct bearing upon the cost of maintainance.

The main points to insure in laying out tools in an electric railway shop are those bearing upon minimum cost of installation, least time in transferring work between cars and tools, an ample supply of natural light, convenience in access to the storeroom, compactness in electric driving where the group system is employed, and the placing together of tools closely related in their use upon the same parts of the equipment. Some of these conditions are obvious, as the location of wood-working tools near the paint shop, and the removal of lathes, drills and other metal working machinery from the immediate vicinity of the forge shop. Orders are often neglected in shop arrangements.

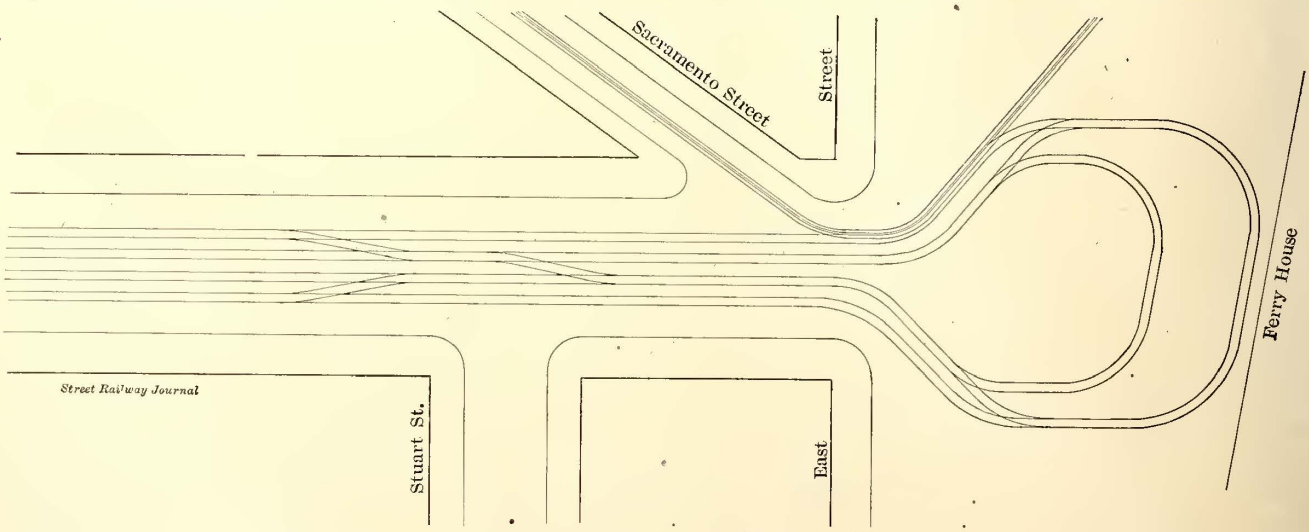
While compactness is desirable because of its reduction in the cost of belts and shafting, and also on account of the decreased friction losses and lessened dangers of accidents through the fouling of the overhead equipment, it should not be carried so far that long pieces of work cannot be readily handled. It is often necessary to saw rails and steel girders or beams in sections in the shop, and it should be possible to do this at the hack saw without inference with other work. A location of the hack saw which enables the longer pieces to be put in place without requiring work to be temporarily stopped at any other machine or bench is highly desirable. In the case of wheel repairs it is advantageous to locate the boring mill and wheel press near each other, and to avoid long handlings between these tools and the pit tracks devoted to truck inspection and adjustment. It is also desirable to locate the lathes used largely in turning down commutators near the armature winding room, unless, as in some cases, these tools are so placed inside the space given to this class of repairs. Large planers are preferably located in close proximity to overhead traveling hoists, and machines devoted to bolt cutting, turning and facing of trolley wheels, grinding contact surfaces smooth, as in circuit breaker and controller repairs, are convenient if placed not far from the storeroom. At times it is an excellent plan to locate an emery wheel inside the room itself for the removal of burrs and other defects on small castings. Register, circuit breaker, headlight and controller repairs require mainly hand work, and the removal of these well away from the machine tools is a distinct step in advance.

TRACK RECONSTRUCTION IN SAN FRANCISCO

Considerable interesting track work has been carried on in San Francisco by the United Railroads since the earthquake and fire of April 18, 1907. Some of this work has been necessitated by the changing of the old cable lines over to operation by electricity, the alteration consisting principally in taking out the old cable rails, slot rails and yokes and relaying the track with heavy girder rails. On many of the old electric lines new rails had to be laid and a large portion of the roadbed worked over to eliminate the damage caused by the earthquake and the subsequent heavy traffic during the removal of débris.

On lower Market Street, in addition to altering the cable tracks for permanent electric operation, the entire roadbed from Sansome Street to the Ferry Building has been raised to an established city grade. For some distance at the lower end the tracks had to be raised as much as four feet. This work was started last summer and has been carried on without interruption to the car service which at this point is more congested than in any other section of the city. The lack of interruption to service was due to there being four tracks on this portion of Market Street, two of which could be temporarily out of commission at a time. Work was first started on the outer north track and then on the south outer track. The north inner track was next raised and finally the south inner track is now being brought up to the required level while the cars are being operated on the outer tracks.

THE COMPLETED LOOPS AT THE FERRY BUILDING



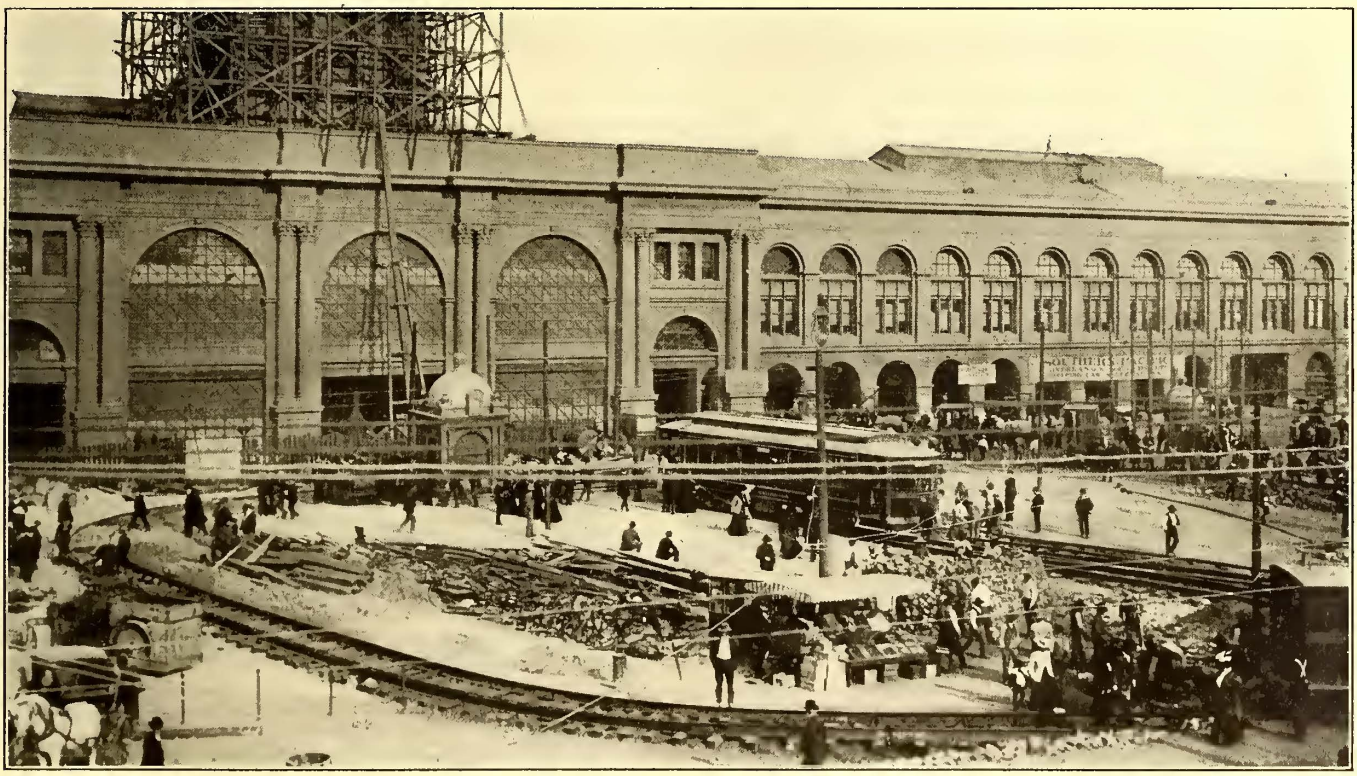
PLAN OF LOOPS AT FERRY BUILDING

The different stages of the work are well illustrated by the accompanying photographs. First the old track rails were removed and then the slot rails. These rails had been

in service for more than twenty years and were so well secured in a solid roadbed that even though laid entirely on made ground they were not damaged by the earthquake. As a good-sized fill had to be made nearly the entire length of the section, the old concrete roadbed with cable yokes was left in place, thus forming a solid foundation for the new bed.

TRACK FILLED IN READY FOR CONCRETE STRINGERS

After the sand or crushed brick fill was brought up to the required grade, eight inches of ballast were placed on it. This ballast consisted of crushed rock or old concrete broken up. This was then rolled thoroughly with a 10-ton steam roller and brought up to a point two inches below the bottom of the ties, which were embedded in a crushed red rock. On the hewn redwood ties were placed the rails, consisting of 9-in. 141-lb. grooved rail in 60-ft. lengths. Steel tie rods are used every ten feet and in addition the rails are braced by steel angle chains every eight feet. After the track was lined up and the rails brought up to grade a concrete stringer 18 ins. wide at the top and 24 ins. at the bottom was cast under each rail so as to bed in the foot of each rail. The V-shaped space between the stringers was filled with crushed rock to the top of the ties.

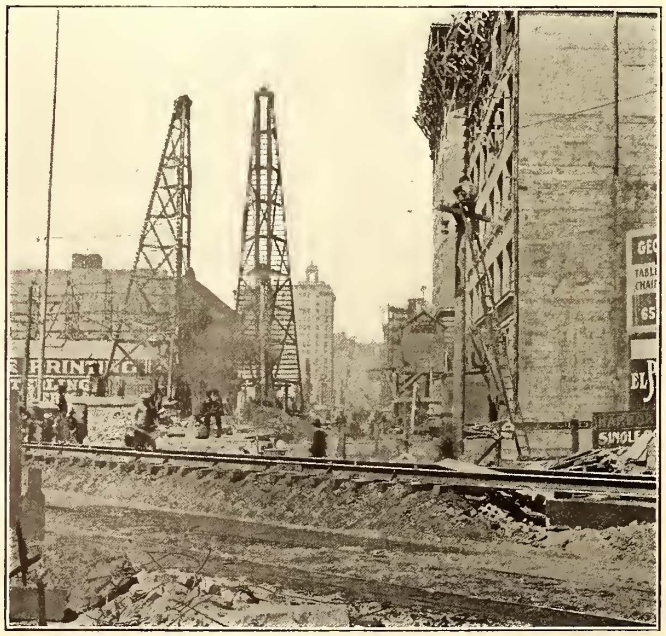


TEMPORARY OUTER LOOP AT THE FERRY BUILDING

Basalt paving block toothing was next laid against the rails and filled in between with concrete to within two inches of grade. The roadbed was topped with two inches of asphalt.

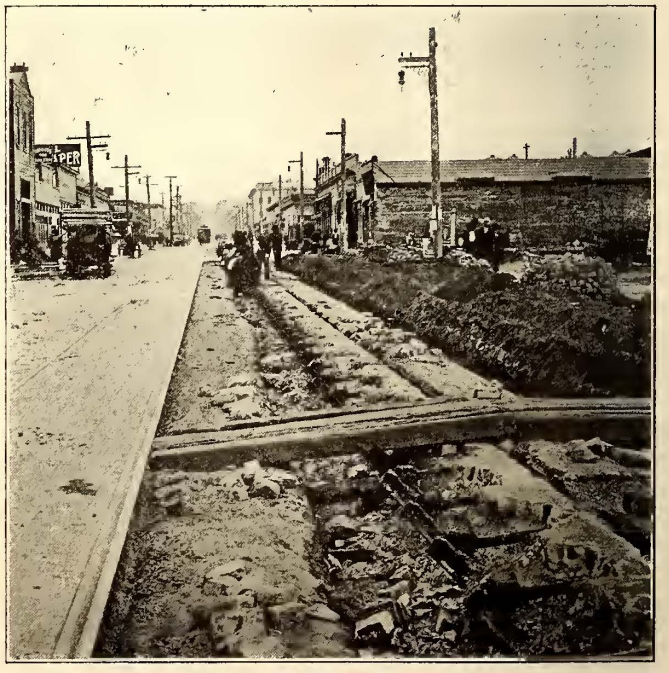
PULLING UP OLD CABLE RAILS, PREPARATORY TO FILLING IN AND RAISING ROADBED TO PERMANENT GRADE OF TRACKS AT SIDE

The space between tracks was built up in the same manner. The four tracks are laid on 11-ft. centers, and as the company is required to place and maintain the pavement to



LOOKING UP CALIFORNIA STREET, SHOWING NEW TRACK AT PERMANENT GRADE LEVEL

a line two feet outside the outer rails, it has had to put in more than forty-one feet of roadbed and pavement, or nearly half the entire width of Market Street. As the city is paving the rest of Market Street in a similar manner the completed street will be a very valuable improvement and will also tend to remove the unfavorable impression found by strangers this past year, who have obtained their first and often lasting idea of San Francisco by wading through and over the débris, dust or mud, building obstacles, etc., that have been predominant on lower Market Street since

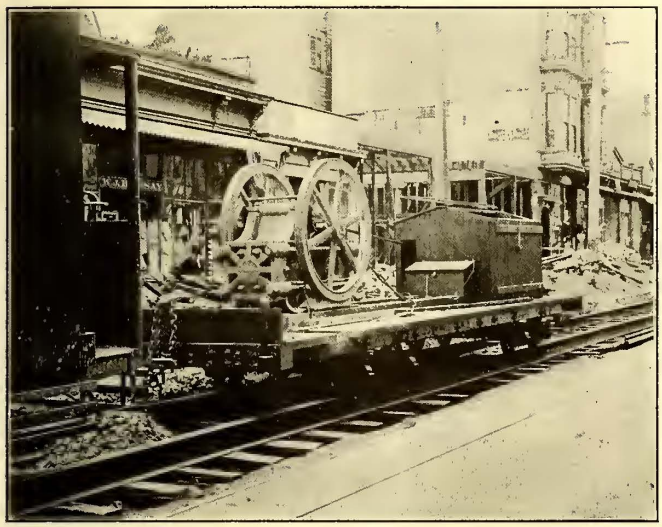


OLD CABLE RAILS AND SLOT REMOVED, PREPARATORY TO CHANGE TO ELECTRIC OPERATION

the fire. The improved Market Street will stand as one of the first monuments of a clean anti-graft municipal administration.

Another feature of the improvements on lower Market

Street is the construction of a double loop by the United Railroads at the Ferry terminus of the Market Street lines. Previous to the fire of April, 1906, the cable cars ran on to a turntable and had to be reversed before they could start back on the line. To say nothing of the inconvenience caused by the necessity of jumping onto the cars while they were being turned, they could not be dispatched quickly enough in the evening rush hours to prevent daily a block-



CONCRETE CRUSHER ON FLAT CAR FOR CRUSHING OLD CONCRETE FOR NEW ROADBED

ade stretching up Market Street for from four to six blocks.

During the fall of 1906 a temporary loop was laid in front of the Ferry Building, as shown in the view on page 69, taken Oct. 22, 1906. Later this track was made permanent and recently an inner loop has been added and

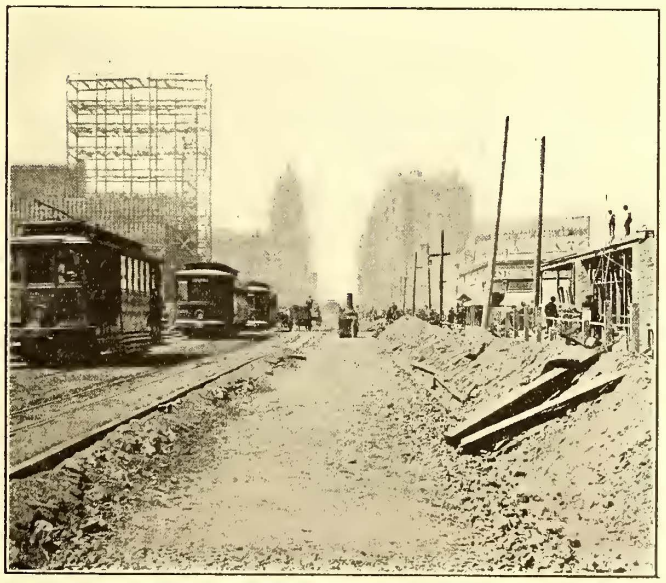
REMOVING CABLE YOKES AND CONCRETE ROADBED BY DERRICK CAR

the straight tracks in the center removed. With the new arrangement the double loop system will in reality extend up the street as far as Sutter and Sansome streets, as shown on the accompanying drawing. The Sutter and some of the north of Market lines will switch to the outer tracks at Sutter Street and continue on this track around the outer loop and and back on the outer track. The remaining Market Street lines will continue straight down the inner tracks and use the inner loop. Cross-overs will be provided so that the service can be flexibly handled

LAYOUT IN SHOP OF SPECIAL TRACK FOR 3-FT. 6-IN. CABLE TRACK AND STANDARD GAGE ELECTRIC TRACK ON EDGE OF LOOP AT THE FERRY

in case of trouble on any one track. Even as the service has been operated the last fall, with only one loop in use at a time, there has been very little and generally no blockade during rush hours.

In rehabilitating the old Sacramento and Clay Street cable road opportunity has been taken to obviate the dangerous "death curve" at Sacramento, East and Market streets. Formerly the cars passed within about five feet of



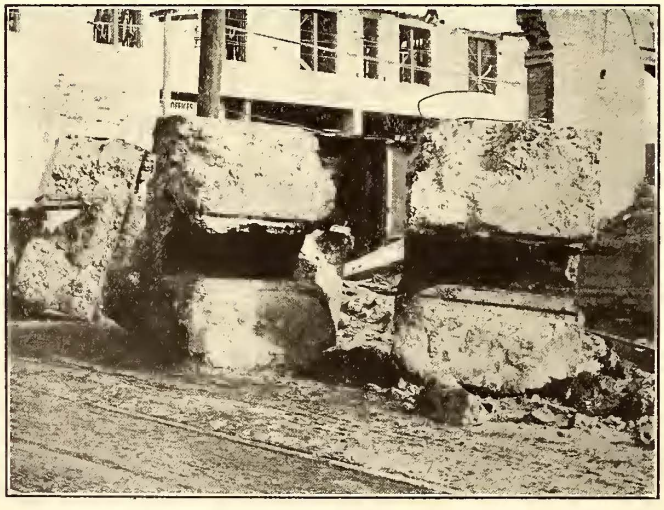
ROLLING THE ROADBED

the curb in rounding the corner. The improvement consisted in building the cable track and the outer track of the trolley loop in conjunction for a short distance, thus enabling the cable line to be placed seventeen feet from the curb at the dangerous corner. Two of the illustrations show the special work for this point as assembled in the

shops of the United Railroads and also as laid. It will be noticed that the cable track is of 3-ft. 6-in. gage, while the electric track is of standard gage. But one crossing of rails is necessary and the short rail does not have to be broken. The roadbed of the cable road was constructed in a manner similar to that described for the Market Street lines, except that basalt blocks cemented in place were used between the rails. One object of the special cementing was to make the trackway smooth and slippery so that horses would be kept off and out of the way of the cars, the street being narrow and subject to congestion.

MOVING CABLE ROADBED BY HYDRAULIC JACKS

Formerly the cars on this line were operated down Sacramento and out Clay streets. Owing to the joint operation on a portion of the loop, however, the direction of the cars had to be reversed. This change necessitated shifting the Sacramento Street track between Hyde and Larkin streets so as to make a cross-over to the opposite side of the loop, beginning at Larkin street. This work of shifting the entire concrete roadbed was accomplished successfully with the aid of hydraulic jacks, as shown on this page, the method being similar to that used on the Sutter Street line and described in the Street Railway Journal about two years ago.



CONCRETE AS REMOVED FROM CABLE ROADBED

The old double cable track crossing at Powell and California streets, at the corner of the Fairmount Hotel, and the new one which has replaced it with steel-hardened centers, heavy yokes, rails and plates.

As previously mentioned, most of the track reconstruction work of the United Railroads where electric operation superseded cable the entire concrete roadbed of the cable track was removed. The method of doing this work is illustrated in the engravings which appear on pages 70 and 71. The track and slot rails were first broken loose and removed, the yokes were then loosened by picks and by means of a car derrick the large chunks of concrete were hoisted out. As the yokes were generally firmly imbedded in these blocks, the latter were swung over the pavement, the hoisting winch released and the block allowed to fall to the ground. This operation was generally successful in breaking the yoke away from the concrete. For the new roadbed this broken concrete was run through a crusher which was mounted on a flat car and driven by an electric motor from the trolley circuit. The crushed concrete was thus quickly and efficiently deposited on the new roadbed at the points desired.

The red rock spoken of as being used for the top fill of the track on the Market Street work is obtained from a quarry near Sutro Heights on the Cliff House line. It is shoveled out by means of the improvised electric shovel, which consists of a standard railway derrick car to the boom of which, at about its center, has been pivoted an arm with a two-yard bucket at the lower end. The entire apparatus is driven by one motor at trolley voltage and works very successfully.

The reconstruction work mentioned is being carried on under the general supervision of General Manager Charles N. Black, the direct oversight and designing of the work being in the hands of B. Peyton Legaré, engineer of maintenance of way and construction for the United Railroads. The photographs are by J. H. Mentz, official photographer of the company.

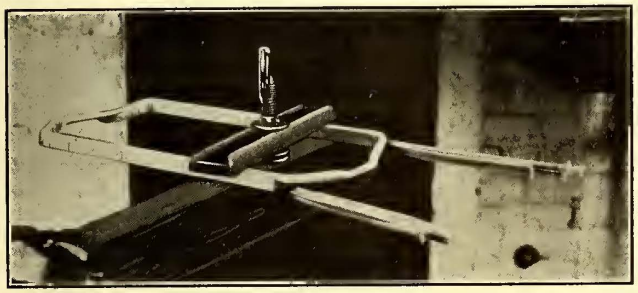
Two hundred and eighty-eight employees of the electrical department of the Georgia Railway & Electric Company were on Jan. 1 the guests of H. M. Atkinson, Chairman of the Board, at a dinner, given at the Davis Street plant. It was the twelfth annual gathering, Mr. Atkinson having inaugurated the custom when the employees numbered only thirty-two men. There are now more than 350 men in the department, while the parent company, which includes the street railway department and the gas company, employs more than 2000 people. Mr. Atkinson's guests were conducted from the electric and gas building to the plant in special cars. Half an hour was consumed in inspecting the machinery, the most interesting part of which was the huge 3000-hp gas engine. The luncheon was served on long tables ranged down the west side of the building.

WINDING ROOM DEVICES IN THE SHOPS OF THE WEST PENN RAILWAYS

The West Penn Railways Company makes all its armature and field coils, and several original devices have been developed in the winding room for facilitating and decreasing the cost of their manufacture.

HOT COIL PRESS

To press the coils, a hot press with a double motion has been built. After the coil has been placed in the slot, the crank shown in the accompanying illustration is turned and the slot or groove is narrowed down to the proper width. The hand wheel on top is then employed to lower the top



METHOD OF HOLDING COIL WHILE TAPING IT

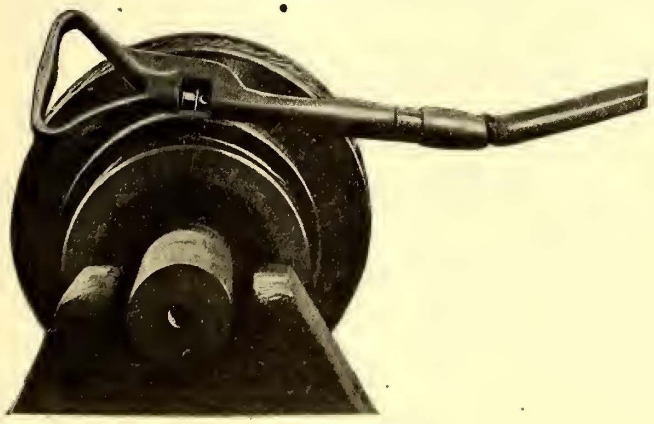
iron and press the insulation of the coil to shape. The press is heated by a gas flame underneath. Two similar presses are in use in the winding room.

COIL CLAMP

One of the accompanying illustrations also shows a convenient method of holding a coil while it is being taped. A crank on a screw projecting upward through the clamp presses the clamp down against the coil.

INSULATION CABINET

On the wall of the winding room is a cupboard built especially for insulating materials of various kinds. The lower part holds ten standard length rolls of duck, linen, asbestos or other materials. Above are shelves for tape, cut mica, fibre and similar winding room materials. The



COMMUTATOR GROOVER

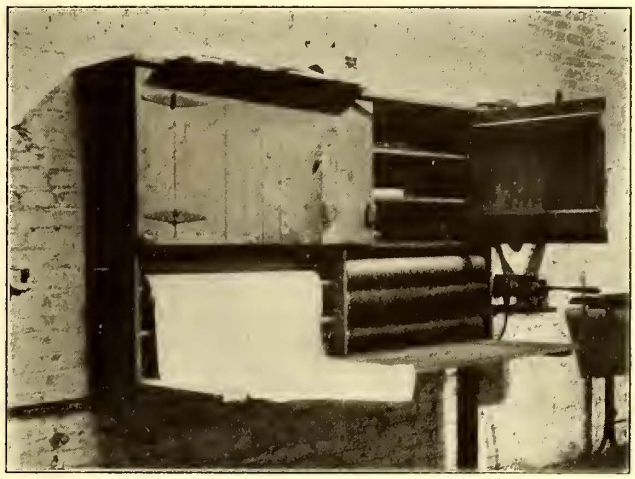
lower portion of the front of the cabinet is hinged so that it may be swung open and be used as a cutting table.

COMMUTATOR SLOTTER

The commutators of all railway armatures on the system are kept slotted. The work is accomplished by means of a 1½-in. diameter circular metal saw held in a special device and driven by a small motor through a flexible shaft. The saw is secured to the shaft of the holder in such a manner that when worn it may readily be removed and replaced by a new one. About twenty-five minutes is required to slot a Westinghouse 56 commutator ⅛ in. deep. A small motor driven blower on the same circuit as the driving motor is employed to blow the mica dust away from the operator.

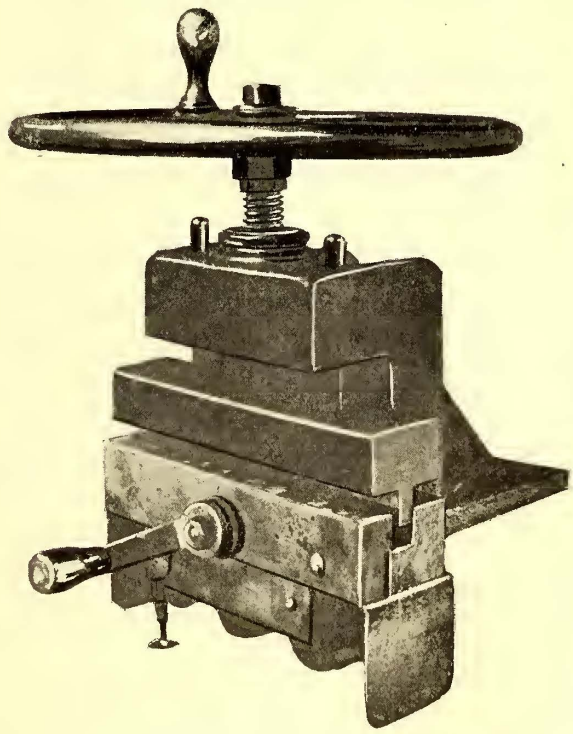
FIELD COIL TESTER

A transformer field coil tester in use is also illustrated



INSULATION CLOSET IN THE WEST PENN RAILWAYS COMPANY'S SHOPS

herewith. The magnetic circuit is built of laminations and is 3 ins. x 5 ins. in cross section. The opening inside is 5 ins. x 12 ins. A wooden frame holds the laminations to-



DOUBLE MOVEMENT DEVICE FOR HOT PRESSING COILS

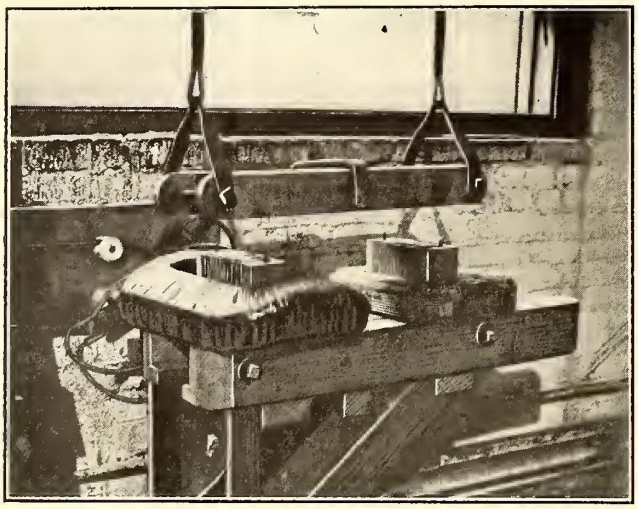
gether. The top section of the circuit is suspended by a rope passing over a pully above and counterbalanced. The illustration shows a field coil being used as a primary coil. However, a specially wound coil of seventy-eight turns of No. 5 wire is usually employed. Alternating current is obtained from connections with the city lighting system.

BAKING OVEN

Coils and armatures are baked in an electrically heated box built of reinforced concrete. The wiring is so ar-

ranged that the electric heaters may be used in connection with armature testing circuits where from 5 to 12 amperes are required.

The winding room devices described were gotten up



FIELD COIL TESTER

largely by Mr. Crawford, shop foreman, and O. B. Eve, foreman of the winding room. This article is published through the courtesy of Geo. W. Wells, master mechanic of the system.

INTEGRAL OIL BOX FOR RAILWAY MOTORS

Several large electric railway companies in the East have recently adopted an improved method for arranging the oil feed in the old type motors formerly lubricated with grease. The use of an oil cup has proven troublesome in many ways and at the present time is the cause of a number of railways continuing to use grease. The oil cup for such motors has not only caused a lot of trouble, but has also been an expensive arrangement. One of the troubles was due to the great differences in the size of the opening or old grease receptacle in the motor frame of the same type of motor; and as it would be impossible to make different sizes of cups to care for this variation, a large percentage of them are such a poor fit that it is impossible to hold them tight enough to prevent their jumping out and getting lost or broken when the car goes over special work or switches.

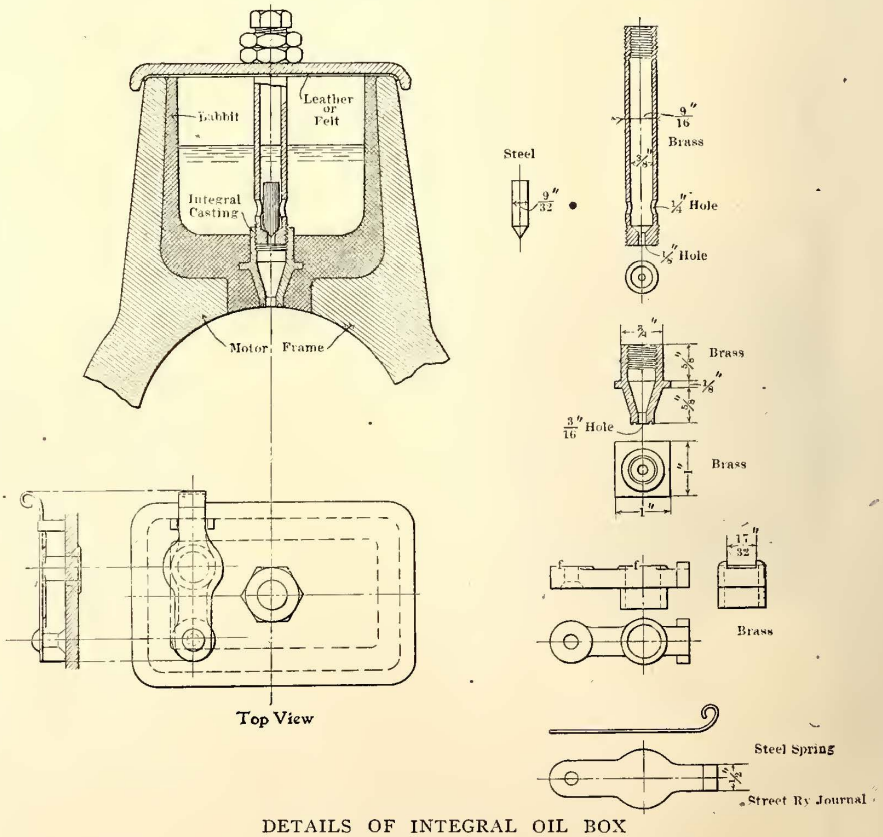
Another great trouble is that it is necessary to have two or three patterns for the same motor, as the armature boxes are entirely different in form and size from those on the axle bearing, so that a system having several different types of motors would of necessity require numerous sizes and shapes of oil cups.

Still another disadvantage in using an oil cup is that during extremely cold weather the oil congeals and does not feed until the bearing becomes warm enough to heat the oil through the cup. As the oil cup has quite an air space around it, considerable heat must be generated before the oil begins to flow and as a consequence the bearing may become so hot that the babbitt will melt and run out.

To eliminate these troubles, the novel method shown in the accompanying print was devised by a lubrication expert. The material comprises a small casting with the upper end tapped out for ½-in. gas pipe and having a tapering hole so that the lower end has an opening of only 3-16 in. The casting is set in the center of the hole in the motor shell and a hard wood print placed on top. The print is so made that there is a space for any desirable thickness of babbitt metal. The metal then is poured into this space and when cool the print is withdrawn, leaving a perfect oil-tight box integral with the motor frame. If a cross-bar is required it can be cast in the babbitt. Any type of feed can be used in this cup.

The drawing shows the cup equipped with the Remelius type of post, which consists of a tapering pin in a hollow tube, the tube having a seat fitted to the taper on the end of the pin. The post extends through the cover with two nuts on top, one nut acting as a lock. The regulating valve does not have to be in the post, as the whole regulating device can be placed in the small casting.

The change in the method of securing the cover was made owing to the loss of thousands of badly hinged oil box covers on the old type motors. Not only is the cover held tight, but also dust proof, as it is flanged and has either a felt or leather washer. The cover has an oblong hole protected by a spring cover, through which oil is poured into the box.



DETAILS OF INTEGRAL OIL BOX

The Brooklyn Rapid Transit Company has notified the Public Service Commission, in compliance with a request made at the public hearing, that in November it had available for winter service 1604 surface cars, as compared with 1403 surface cars available in 1906. The increase in cars is 14.3 per cent, and in seating capacity 16.8 per cent.

NOVEL CAR USED IN TROY, N. Y.

The United Traction Company, which operates the street railways of Albany and Troy and vicinity, recently ordered twenty-five cars of a type embodying several interesting departures from current city practice. Fifteen of these cars have been completed and are now used in Troy, for which service they were especially designed.

APPEARANCE OF THE NEW TROY CAR WHEN THE DOORS ARE CLOSED AND THE STEPS ARE UP

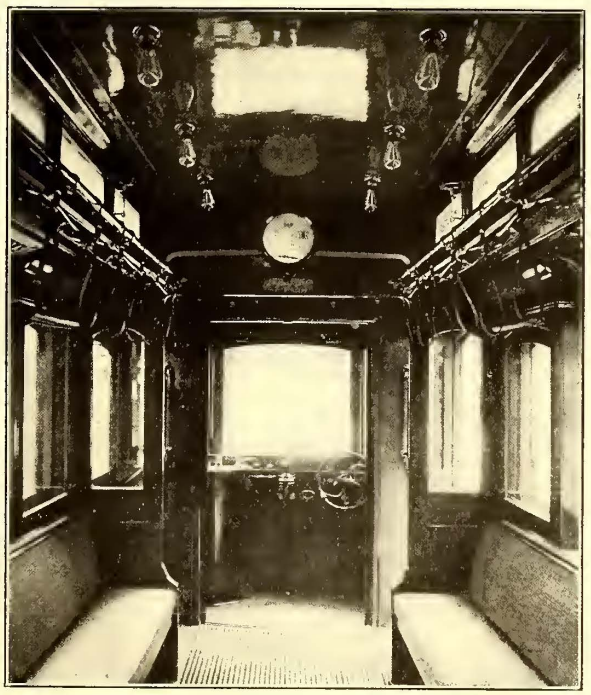
Unlike Albany, which is noted for its steep hills, the greater part of Troy extends as a very level and narrow belt about 7½ miles long and parallel to the Hudson River. When the numerous factories in this section close in the evening, there is a tremendous rush to the cars, attended by the usual quota of platform accidents. Consequently, the problem before the company was to secure a car which would give the maximum carrying capacity, eliminate the platform accidents and improve the headway by requiring less time for loading and unloading.

VIEW OF THE TROY CAR WITH THE DOOR OPEN AND THE STEPS DOWN. THE GRAB HANDLES ARE INSIDE THE CLOSED DOOR

These objects appear to have been admirably fulfilled by adopting a car practically without platforms and which cannot be boarded after the doors are closed by the motorman. The cab arrangement as well as the door and step features are similar to those of the Boston car, described in the STREET RAILWAY JOURNAL of Aug. 25, 1906, but the elimination of the usual overhanging platform is due to important changes in the underframing.

It will be noted from the accompanying plan and section that the underframe has two center sills, each consisting of a 6-in. I-beam. These center sills are carried clear through to the end of the car, where they are tied into the angle-iron buffers. They carry the larger portion of the floor loads and transmit the weight of the vestibules through the 5 in. x 3 in. T-iron end sills. That portion of the center sills extending from the body bolsters to the buffer is supported by the end sills which are attached to the side sills, as shown in the drawing. The side sills are 4½ in. x 7½ in. yellow pine, are 28 ft. long and covered with ½-in. steel plate on both sides. The rest of the underframe consists of short oak cross sills and two plated sills extending the length of the vestibule from the end sill or from the end sill to the buffer. The trap-door location and timbers are also shown in the half plan of the car.

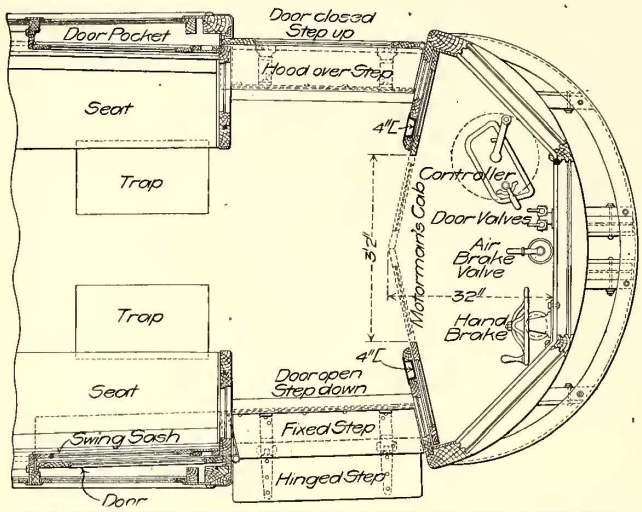
From the arrangement of the underframing it is apparent that this design avoids all possibility of platforms sagging or dropping down. In reality the car is an integral structure, having but one floor level and containing two doors at each end with a cab for the motorman. Another feature of the underframe construction is the greater resistance offered in collisions, owing to the way the body bolster is attached to the floor framing. In case a collision occurs, when the car body is stopped suddenly while the trucks go forward under their momentum, something must give way. With this kind of construction, the most likely accident would be to have the king-bolt twist the body bolster, which can be easily removed and repaired, leaving most of the



INTERIOR VIEW LOOKING TOWARD OPENED MOTORMAN'S CAB, SHOWING DOORLESS ENTRANCE TO SEATING COMPARTMENT

shock of the collision to be borne by the two 6-in. I-beams serving as the center sills.

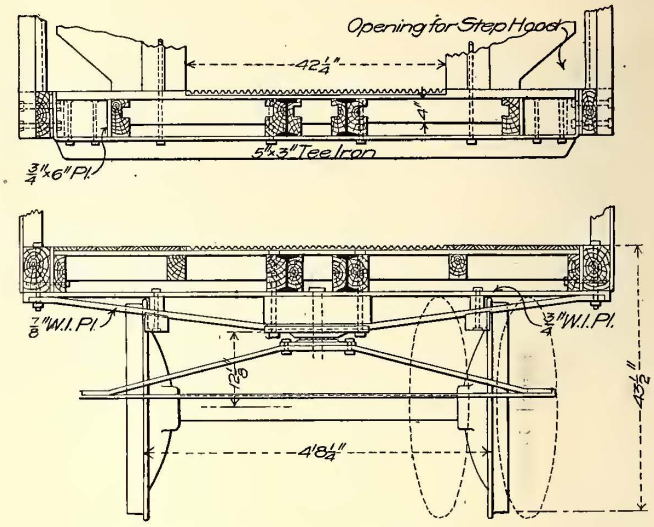
The total over-all length of this car is 51 ft. 8½ ins. and its width 8 ft. The section in which the seats are placed is only 28 ft. long, but it would hardly be proper to call the seating compartment the car body in the usual sense, as there are no doors separating it from the vestibules, the arrangement in this respect being exactly like that of the New York subway cars. The seats, which are arranged longitudinally to give maximum standing room, will accommodate forty persons. They are of rattan and 18 ins. wide, leaving an aisle about 3 ft. 4 ins. wide for standing passengers in addition to the large space in the vestibules. This large proportion of standing room is particularly desirable in this case because of the nature of the rush-hour travel in Troy. One can readily understand why maximum standing capacity is a necessity on these routes in view of the fact that only one of the Troy collar and cuff companies has fully 4500 girls who leave the works in the evening at the same time.



ARRANGEMENT OF PLATFORM, MOTORMAN'S VESTIBULE, STEPS, ETC.

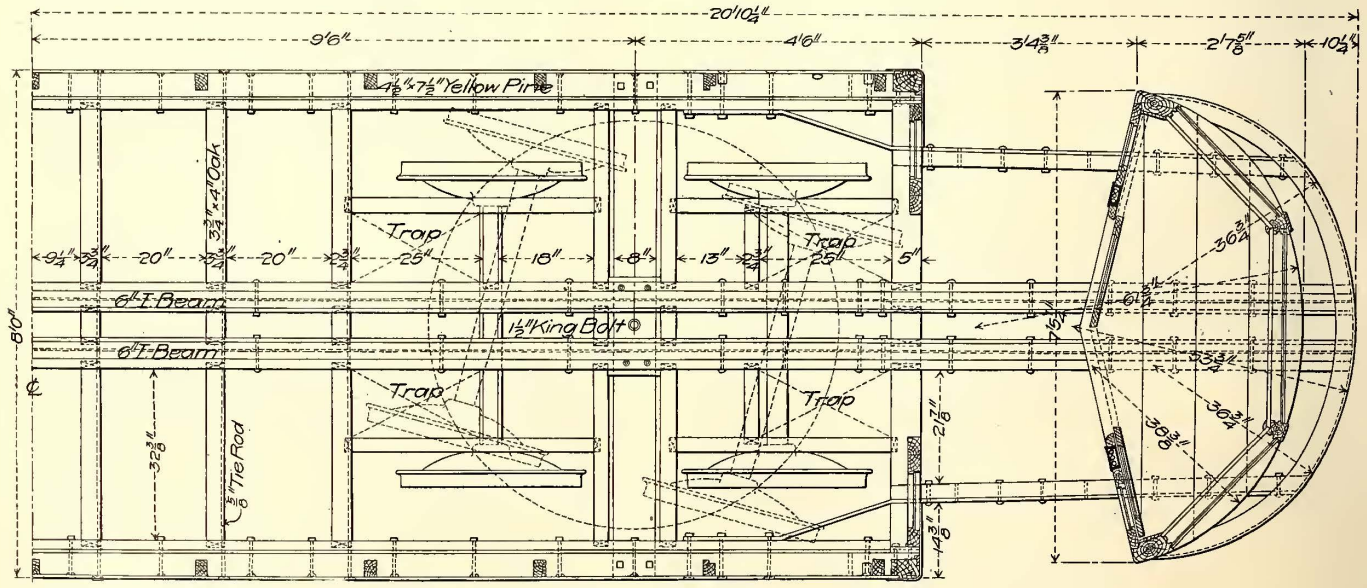
The general arrangement of what would ordinarily be called the platforms is well shown in one of the plans and also in one of the interior views. The motorman's cab extends the full width of the vestibule and has a maximum depth of 32 ins. It is separated from the rest of the car by two folding doors provided with glass sash, through which the motorman can observe boarding and alighting passengers without coming into contact with them. These doors are attached to channel beams, inside of which the car wiring is led, as shown in the platform plan.

The most interesting feature in the operation of the car, and the one which is expected to do so much to reduce platform accidents and delays, is the method of simultaneously closing the doors and raising the car steps, or contrariwise, opening the doors and lowering the steps. The latter, of course, are double because the vestibule is flush with the rest of the car floor.



CROSS SECTION AT END SILL AND BOLSTER

The actuating mechanism for a pair of doors on each side consists of an air motor supplied from the regular air-brake reservoir, and a system of levers connecting with the doors and steps. The device is controlled pneumatically by the motorman through two handles in the cab, one handle caring for the front end and the other for the rear end of the car. The motorman, of course, while controlling the front door does not close the rear door until he receives the starting bells from the conductor, nor does he open the doors before the car has stopped. The doors are adjusted to open in one second and close in two, but the



HALF-PLAN OF UNDERFRAMING, SHOWING EXTENSION OF CENTER SILLS TO THE END OF THE CAR

movement can be slowed or quickened one way or the other if found desirable. Rubber air cushions are attached to the closing edge of the doors, and as the latter are automatically retarded in the last two or three inches of the closing movement, there is little danger that passengers will be pinched or have their clothing caught. The step levers are conected to the main lever which controls the corresponding door. When the door is closing the lower and upper hinged steps fold together parallel to the side of the car in a position where it is impossible to get a hold of any kind, because the grab-handles are inside the doors. Should the air mechanism fail the door and step could be operated by hand. The doors are also wide enough for two passengers to enter or leave together.

The cars were built by J. M. Jones & Sons, Watervliet, N. Y. They are operated on Brill 27 G-1 double trucks, have four G. E. 80, 40-hp motors, K-28 controllers, General Electric air brakes and Peacock hand brakes. The door and step mechanism was furnished by the Consolidated Car Heating Company. The general design and construction of the cars was in charge of H. A. Benedict, mechanical and electrical engineer of the United Traction Company.

THE NEW HAVEN SYSTEM OF SINGLE-PHASE DISTRIBUTION WITH SPECIAL REFERENCE TO SECTIONALIZATION *

BY W. S. MURRAY,
Electrical Engineer, New York, New Haven & Hartford Railroad Company.

In the New Haven installation a number of methods of distribution were considered, among them the following:

(1) Eleven thousand-volt, three-phase generation at the power house, transmission along the right of way at this voltage; step-down transformers furnishing trolley voltage at 3300; track mileage divided into three equal linear parts, each part being supplied by an individual phase.

(2) The same arrangement as (1) with the exception that step-down transformers furnish 6600 volts to trolley.

(3) Eleven thousand-volt, three-phase generation at power house; transmission along the right of way at this voltage; track mileage divided into two equal linear parts, each part having its trolley connected through the transmission line to one of the three terminals of the power house bus-bar, the remaining bus-bar being connected to the tracks, thus making a common connection for the two trolley sections.

(4) Eleven thousand-volt, three-phase generation, transmission along the right of way at this voltage, only one phase being applied to all sectionalized trolley wires throughout the zone of electrification. The three phases are also carried throughout the electrification zone, and are at all points available for polyphase motors, such as would be used in railway machine shops and for the operation of motor-driven generators in local direct-current railway plants owned by the railroad company.

Fig. 1 shows the three first mentioned. Fig. 2 shows the fourth, which was the one actually adopted.

There are advantages to be gained in any one of the above mentioned alternatives, but the single-phase distribution as described under (4) carries with it advantages, the sum of which far outweighs the sum of the advantages in the others. In a word, the distribution, as described under (1), (2) and (3), would seem to offer a better opportunity to distribute the load in the three-phase windings of the generators, yet this is open to question on account of the possible unequal distribution of trains in the individual phased sections. But the greatest and deciding disadvantage of any of the three-phase distribution schemes is the complication that results in the overhead system, together with the fact that for an equal weight of overhead copper the efficiency of the single-phase system is higher than any of the polyphase arrangements.

A modification of arrangement (4), which was considered, may be mentioned, namely, 11,000-volt, three-phase generation, single-phase distribution for traction with step-down transformers distributed along the line, their secondaries furnishing 3300 or 6600 volts to the sectionalized trolleys. For the reason that the life-hazard in using 11,000 volts was not considered to be greatly increased over that of 3300 or 6600 volts, and in view of the higher efficiency, lesser currents to be collected by locomotive shoe contacts, greater reliability and the lower operating costs (no transformer sub-stations) the advantages of the 11,000-volt direct transmission to the sectionalized trolleys was immediately apparent, and the problem became simply one of insulation.

As concerns the choice of three-phase generators in connection with single-phase distribution for traction purposes, again local conditions were the real factors that framed this conclusion. Single-phase or balanced polyphase voltages are undeniably more desirable than unbalanced ones; at the same time when proper allowance and arrangement are made for the unbalanced voltages, and there is a decided market for polyphase power, it is difficult to escape the conclusion that it is a desirable and necessary adjunct to the system. In connection with its application to the New Haven electrification, it may be said that synchronous motors will be shortly substituted for steam engines in one of our lighting plants. Such arrangements will bring about the centralization of power generation, and by proper field adjustment of the synchronous motors the general power factor of the single-phase system will be raised.

Having touched upon some of the determining factors that brought about the arrangement of three-phase generation and single-phase distribution, the remainder of this paper will be confined to a discussion of the methods and lengths involved in the sectionalizing of the single-phase distribution, and as the power wire (which is the outside wire in Fig. 2) plays only an unimportant part in its applications to the traction system, it will not be referred to again.

Single-phase distribution offers an excellent opportunity for sectionalizing. As may be seen from Fig. 2, the system consists simply of the track trolleys, two auxiliary wires immediately adjacent and the necessary switching complement. Although these auxiliary wires have been called feeder wires and while, as a matter of fact, they do serve to increase the capacity of the overhead system, this is not their principal function, as the amount of copper included in the trolleys would suffice to be within the economic figures of copper loss. The auxiliary wires are installed to serve as by-passes, in the event of it being desired to cut dead any or all of the trolley wires in any section. Thus by this system of auxiliary by-passes any degree of sectionalizing can be used, and any or all trolley voltages in sections can be removed without interrupting the continuity of the voltages throughout the zone. The lengths of sections are governed entirely by local conditions. No two sections of the 14 that exist in the 21 miles

*Abstract of paper presented at the meeting of the American Institute of Electrical Engineers, Jan. 10, 1908.

of New Haven electrification are the same. It is seen, however, from these figures that the average length of sections is 1.68 miles, that none of these is over 2.19 miles or less than 1.07 miles.

The best reason that can be assigned for the use of sections is in order that line troubles may be localized. There are many others, and some of a most important character. Indeed, it may be said that were the line absolutely immune from trouble, such as grounding, mechanical failures, etc., there would still be many good reasons for sectionalizing it, and these reasons will develop as the subject is further studied.

Of the 14 electrical sections between Woodlawn and Stamford, nine are co-terminus with the signal towers. In each of these towers there is installed a small panel containing the pilot switches controlling the trolley (and by-pass) circuit breakers installed on the anchor bridges. Aside from the economical features of this scheme of control, as no operators other than our present signal operators are required, the value of placing the distribution in the hands of this class of men is most important. Their constant attention to matters pertaining to the operation of trains brings about the attention which should be accorded to the distribution of current, and their thorough understanding of the conditions of traffic on the various tracks permits the most intelligent handling of electrified and de-electrified trolleys, assuring at once prompt and reliable service in the matter of handling a situation when cross-overs have to be made on electrified tracks, and while repairs are being made on others from which the voltage has been removed. The value of placing the distribution system in the hands of the signal operators may be again illustrated by saying that should an electric train run past a stop signal set by the operator, or should the operator desire to stop a train in his block he has only to trip the pilot switch controlling the trolley circuit breaker, from which the train is drawing its power, and signal the operator in the adjacent tower to do likewise. The individual value of this protective perquisite is an illustration of the use of sectionalizing outside of the question of line troubles.

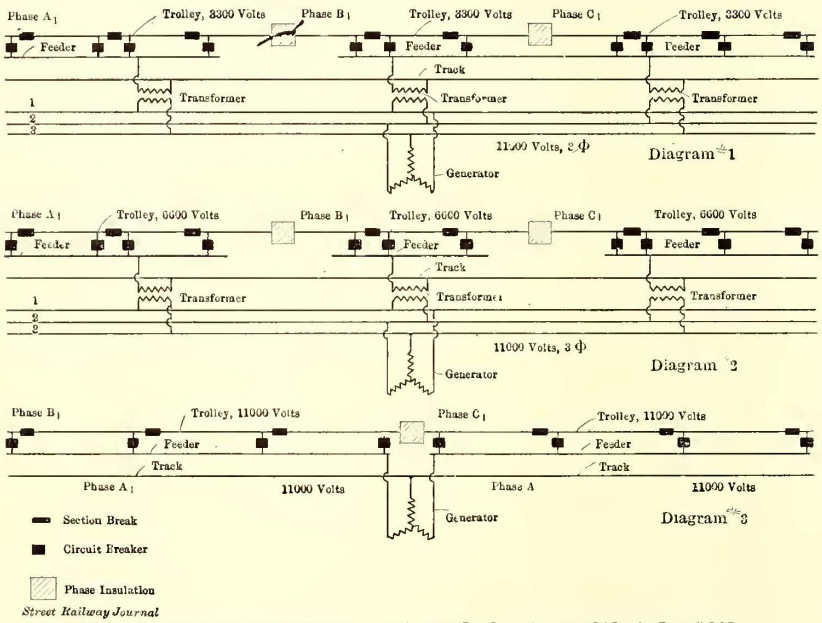


FIG. 1.—THREE PROPOSED SYSTEMS OF SECTIONALIZATION

In the discussion of sectionalization it would seem interesting to enumerate the advantages and disadvantages peculiar to a choice of a "small number" and a "large number" of sections over a given distance. In this table it should be remembered that usually the items of advantage for the "small number" of sections will be items of disadvantage for the "larger number" and vice versa. It is also assumed that the signal towers along the right of way average about 1½ miles apart and that electrical sections of this length, or longer, will be classed as a "small number" and sections shorter than this will be classed as a "large number."

A tabulation of the advantages and disadvantages of the use of a "small number" against a "large number" of sections is as follows:

SMALL NUMBER

Advantages	*Disadvantages*
1. Co-terminus tower scheme more easily arranged.	1. Difficulty of locating grounds increased.
2. Fewer switches to maintain.	2. Greater section of track cut dead in case of ground or other trouble. Disadvantage, however, related to cross-overs.
3. Greater reliability, due to less frequent grounding of line.	3. Larger section breakers required.
4. Less cost.	

In advance of a discussion of the items in the above table, is is fair to assume that convenience of construction of the apparatus required for either the long or short sections may be equated. That is to say, the work-train service, in either case, would be about the same, and the structures would require much the same general superintendence and engineering.

With long sections it would, of course, be necessary to splice the messenger cables, as they could hardly be manufactured on single reels greater than 2 miles in length, but the splicing process would not be a matter of great inconvenience, and would not detract from the value of the cables. On the other hand, with the shorter sections a greater number of anchor bridges would be required for the supply of sectionalizing switches, but these structures would not increase, to any extent, the difficulties of erection, nor would the placing of apparatus upon them interfere with regular traffic.

Taking up now the discussion of the advantages and disadvantages mentioned above, we note that under "advantages":

1. *Co-terminus tower scheme more easily arranged.* In my estimation this is by far the most important factor favoring a small number of sections. It is quite clear that with a great number of sections, their termini would fall at points between towers, necessitating some form of substation or building for the electrical operators. This would be inconvenient, both for the railroad company and the operator, on account of the cost of maintenance and operation for the former, while the latter would be far removed from his living point. The reason that the co-terminus scheme is more readily arranged with the use of long sections is apparent, in view of the fact that no convention is necessary to be followed in regard to standard distances, it being at the option of the engineer to choose such towers as are already located on the line as a termini of electrical blocks.

2. *Fewer switches to maitain.* This advantage is ap-

parent since the number of switches varies directly with the number of sections, and I believe there is general agreement that a switch in any line does not increase the reliability of that line.

3. *Greater reliability, due to less frequent grounding of line.* In the present stage of the art, the anchor insulators, which have given the best results from a combined mechanical and electrical strain point of view, have been of corrugated cylindrical form. The insulating value as well as the reliability of this form of insulator is unquestionably less than that of the mushroom or petticoat type of insulator, which is used to support the messenger cables on intermediate catenary bridges. It is my belief, however, that the insulating value of the anchor insulator described could be greatly enhanced by suspending from it some form of protective shield or petticoat. At present the blast from steam locomotives seems to produce on its surface a very rough enamel of coal dust and cinders which is almost impossible to remove, and which greatly reduces the insulating values of the insulator.

4. *Less cost.* It is immediately apparent that the cost would be much less on account of the elimination of a larger amount of switching apparatus and the heavy bridge work required at all anchorages.

In the table of "Disadvantages" we note:

1. *Difficulty of locating grounds increased.* This is quite apparent, in view of the fact that there are a greater number of insulators between the circuit breakers, but experience in actual operation has indicated that this is not a serious matter, as the offending insulators are very quickly located, and there is also being perfected at this time a resistance scheme of measurement by which the point of ground can be approximated within 5 per cent of its actual location. Upon the perfection of this apparatus this difficulty will be eliminated.

2. *Greater section of track cut dead in case of ground or other trouble; disadvantage, however, related to cross-overs.* This trouble would be of a more serious character if it were railroad practice to include a great many cross-overs on the main line. The average distance between cross-overs on the New Haven road is even greater than the distance of the electrical blocks. In consequence of this, should a section become dead on account of a ground, it is possible that the train would have to cross over at a distance from the trouble greater than the length of the electrical section. Railroad engineers look upon cross-overs as a necessary evil on account of remembering their high cost of maintenance and the necessity of interlocking machines in conjunction with them, and it is fair to assume that their distance apart will not be decreased for the convenience of shortening the electrical sections; hence, this difficulty cannot be classed as one of special moment.

3. *Larger section breakers required.* In the use of longer sections, it is apparent that more trains may be drawing power from the section breakers, so that it will be necessary to design them for greater capacity and they will be called upon to open larger propulsion currents. This disadvantage, however, fades when we consider that the

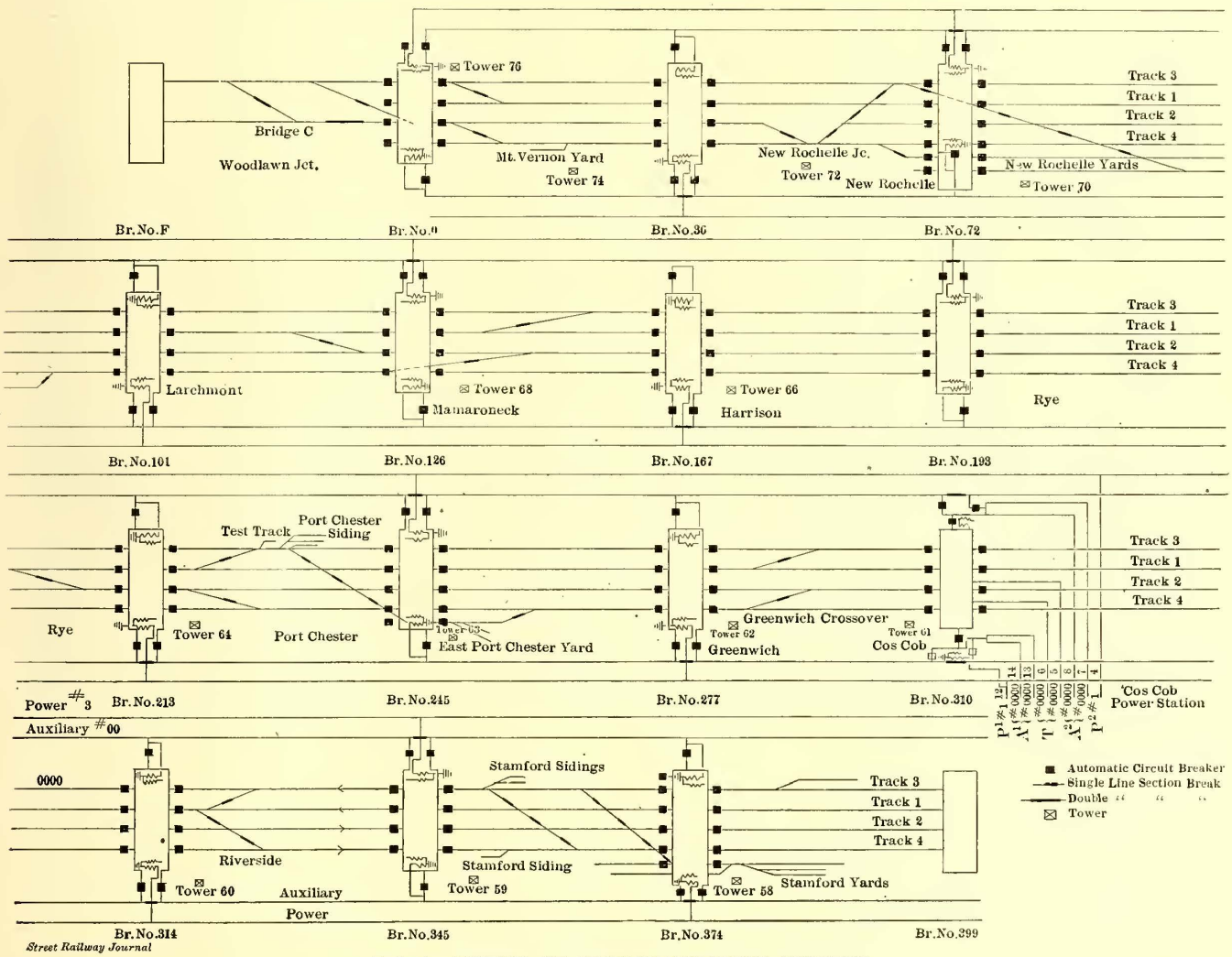


FIG. 2.—SYSTEM OF SECTIONALIZATION ADOPTED

maximum demand upon the breakers is a short circuit, and as this is a duty which a section breaker of any capacity has to stand ready to perform, this objection might be considered as not existing. It would be a strange state of affairs if it were impossible to improve upon any principle or form of construction adopted. In regard to the principles which governed the electrification and sectionalization adopted by the New Haven road, I have found by careful inquiry into the opinion of those who are responsible for the operation of our electric trains and the distribution of currents to them, that if any change were to be made possibly some advantages would accrue in the use of longer sections.

In regard to form of construction. It is fair to say that there are many changes that can be and are being made which will greatly increase the efficacy of distribution. It is my observation that the New Haven electrification has been looked upon as a radical departure from engineering practice. There is no question about the justice of such a remark when viewing the matter as a whole. If, however, we segregate each link in the chain which forms the whole, I believe it will be found that no one link is a great departure from a practice that has existed many years. It has simply been the putting together of old principles into a new form. One exception can be made to this statement. The alternating-current railway motor is new, yet an exposition of its characteristics, such as in its speed and torque curves, show that within it old underlying principles prevail. Its complements, the power house and line, involve no new principles that have not been tried out under various forms and conditions. A high tension moving contact has nothing new or of a disturbing nature about it.

When the form of electrification of the New York division came up for decision the easy path of the least resistance lay open to the engineers of the New Haven road. A form of electrification had been adopted and applied to traffic rails over which the New Haven trains were obliged to go in their entrance to New York City. An acceptance of this form of electrification would have simplified and made easy the duties and responsibility of the engineers of the New Haven road. The right path, however, is not always the easiest, and the principles which existed in their minds were of a character that required a radical departure from the easy and tempting alternative. There is an old saying: "Nothing that is worth while ever came easy," and such has been the case with the New Haven road. We have encountered unexpected difficulties, which are always common to initiative, though none of them has been of a character which could be interpreted as a menace to the general principles involved. The difficulties have either been corrected or their correction is easily in sight.

The last six months of operation have offered the opportunity for a collection of valuable data, and the following observations and recommendations are offered in the hope that they may be of some value to other engineers interested in the electrification of steam roads:

1. In one, two, three or four-track railroads, the single-phase distribution should include besides the trolley wires, by-passes or feeders.

2. Electrical sections should not average less than 1.5 miles in length; greater averages are entirely acceptable and individual lengths should be governed by local conditions.

3. Twenty-two feet is a safe general working distance of trolley from rail.

4. The de-insulating effect of steam locomotive stack discharges is a most important consideration to be kept in mind in the matter of properly insulating high-tension wires from ground.

5. High insulation factors should be used where high-tension construction due to low bridges is brought nearer the rails than the normal height of 22 feet. Strong mechanical shields should be used to deflect locomotive blasts from messenger insulators at low bridges. Care should be exercised in the installation of these shields so that high-tension conductors and ground are separated by a safe working distance. Wherever possible, insulators should be installed away from the direct line of the locomotive blast.

6. Where auxiliary wires connected with the electrification cannot be carried over highway bridges as aerial conductors, they should not be carried under, unless they are enclosed in lead-covered cables, with end-bells properly enclosed in suitable housings at points where the conductors change from aerial to lead-covered cables.

7. All circuit breakers connecting feed wires (or by-passes) to the trolley busbars should be equipped with time relays, so that any short circuit will immediately open the trolley breakers, thus locating the trolley section grounded. Equipping the feeder breakers with time relays insures continuity of voltage on wires not affected by the short circuit. Each trolley breaker pilot switch should be provided with a light to indicate when it opens, and an announcer bell should ring in the signal tower at the same time so that the operator is promptly notified.

8. On account of deleterious influences of weather and locomotive stack discharges, and the general inconvenience of getting at busbars and switches when installed on anchor bridges, all section oil switches should be installed in switch houses erected at the side of the tracks, with lead-covered cable connections between trolley and switches.

9. Signaling should be arranged so that the operator can prevent the engineer from spanning two sections by his locomotive shoes in the event of the advance section being grounded.

10. All signal towers should be interconnected with a reliable telephone service. Immunity from electromagnetic and electrostatic disturbance in the telephone system can be secured by using twisted wire pairs enclosed in lead-covered sheath, the sheath being grounded frequently. This suggestion is more particularly applicable to the interrupted or tower-to-tower telephone system. In this case the distance of exposures of the telephone wires is not great, and thus the summated effect of electromagnetic induction is negligible. In the case of the through telephone line where the circuit is uninterrupted throughout the zone of electrification, the lead sheath and twisted pair respectively are again effective in removing all static charges and electromagnetically balancing the circuit; but on account of the cumulative action of the electromagnetic induction, either compensating transformers or a system of impedance coils installed across the telephone circuits at intervals of 2 miles (this distance may be less, depending on the electromagnetic density) with their central points grounded should be used. Either method will satisfactorily remove the impressed voltage due to electromagnetic induction. The importance of reliable telephone service between operating towers cannot be too greatly emphasized.

The above mentioned are some of the fundamental requisites which design and practice have brought out in connection with the New Haven electrification. Design and practice are many times good friends, but if a difference

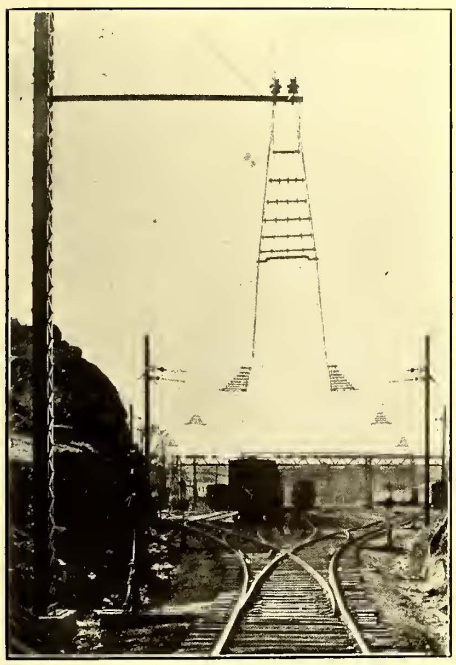
of opinion arises, practice will, in nine times out of ten, have the better of the argument. Experience, the great teacher, has brought out either the efficacy of the original design or the proper modification of it.

The observations and recommendations above cited are those that have been impressed upon the writer during the period of operation so far attained. Except for certain minor and easily remedied details, experience to date with the New Haven arrangement of single-phase distribution would indicate that the fundamental principles involved have been correctly applied.

The discussion of double or single catenary construction on main line electrification was intentionally omitted from the paper. A choice of the one or the other must be a compromise of a great many considerations, the principal one being the number of tracks to be electrified and local conditions, but there is one fact that has been conclusively demonstrated to me, viz., either the trolley wire or the trolley shoe must be flexible, whether the construction be for main or branch lines. Of course, in the single catenary construction a flexible contact conductor is provided. In the triangular construction the contact conductor is rigid. This requires a flexible shoe, which in a degree is secured by the spring pantograph arrangement. Experience, however, has forced upon me the conclusion that the pantograph must be still further supplemented by a light but strong mechanism which will insure flexible contact between the shoe and trolley wire, thus not offering a great deal of inertia in movement when the shoe meets the hard spots of the line, which exists at the catenary hanger points.

We have adopted a form of construction in our East Portchester yard, in which the latitudinal catenaries are supported by cross catenaries, in some cases spanning as many as ten tracks. This construction has about it a great many attractive features, and I am not sure but that experience will not bring out the possibility of using the cross catenary for main-line work. Such an arrangement, if more frequently reinforced with cross bridge anchorages such as now used in the New Haven electrification, will bring a lighter and cheaper construction and possibly afford a greater opportunity in insulating the overhead system from ground. I can see no reason why single catenary spans need be made any less than those used in the double catenary construction, as the cross rigidity that may be desired can be obtained by tying into adjacent latitudinal catenaries, all of which, of course, are subject to the pull-off construction at present employed. Of course, there are a great many pros and cons about this, and again we are forced to the conclusion that to-day is not the time for standardization, as it will not pay to accelerate our conclusions at a greater rate than the operating evidence upon which they should be based.

Still another point that has not been touched upon in the paper is the great flexibility offered in the double switch arrangement of supplying power to a trolley wire at the two extremities of its section. It is readily seen that if the trouble exists in one of the circuit-breakers supplying a trolley wire in any given section, this switch can be immediately cut out and all the power supplied will be from the remaining switch at the other end. This flexibility, of course, is secured in virtue of the low loss due to high-tension transmission and the employment of by-passes or feeders, to which previous reference has been made.



VIEWS IN PORTCHESTER YARDS OF NEW HAVEN RAILROAD, SHOWING SINGLE CATENARY CONSTRUCTION

An impression has come to me that I might have dwelt more fully on the details of the system of distribution. As stated previously, it has been so universally described in the engineering papers that I have rather felt that I was writing about results and experiences with something, with the general parts of which we were all acquainted. If I have universal support in this impression, I can only offer in amelioration Fig. 4, which assembles all the links of our transmission chain, the functions of any one link of which is common knowledge.

[The flexible suspension in the Port Chester yards, described by Mr. Murray in the above paragraphs, is illustrated in the two half-tone engravings herewith.—EDS. STREET RAILWAY JOURNAL.]

A NEW SINGLE-PHASE RAILWAY MOTOR

At the meeting of the American Institute of Electrical Engineers, held on Jan. 10, E. F. Alexanderson, of the General Electric Company, presented a paper devoted to a technical description of a single-phase commutator motor which has recently been put on the market by that company. The machine is called a "series-repulsion" motor, because it embodies many of the best features of the so-called plain repulsion motor and of the compensated series motor. Its terminal voltage can be selected with greater liberty than with the series motor, but not so arbitrarily as with the repulsion motor.

In mechanical construction the machine differs immaterially from either the Thomson-Atkinson repulsion motor or a conductively compensated motor. However, the "compensating" winding, termed the "inducing" winding, has twice as many turns as would usually be employed for a series motor. The mechanical arrangements of the circuits are indicated in Fig. 1. The electrical connections of the rotor and stator circuits during the starting and the running periods are shown in Figs. 2 and 3, respectively. The magnetizing actions of the stator windings are not indicated in the last two illustrations, but they can be ascertained by studying these two diagrams in connection with Fig. 1. It is believed that the characteristics of the motor under starting and running conditions can most readily be shown by the use of Figs. 4, 5, 6 and 7.

The connections of Fig. 4 are electrically equivalent in all respects to those of Fig. 2, while the magnetic relations are also properly shown. Fig. 5 shows circuits whose electrical characteristics and magnetic behavior are the same in every respect to those in the circuits of Fig. 4 or Fig 2. It will be noted that the motor indicated in Fig. 5 is a so-called plain Thomson-Atkinson repulsion motor, and possesses all of the characteristics of this machine. The "inducing" winding has twice as many effective turns as the armature, hence the armature current at starting is equal to twice the current in the inducing coil, or to twice the current in the field coil, as shown in Fig. 2. It is claimed that by the connections shown in Fig. 2 (and re-

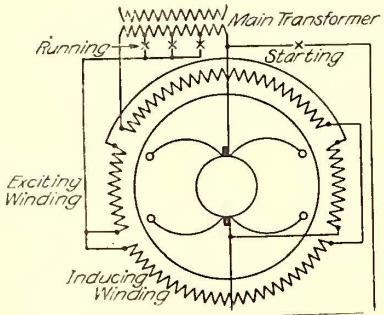
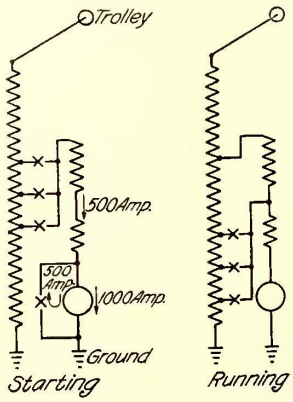


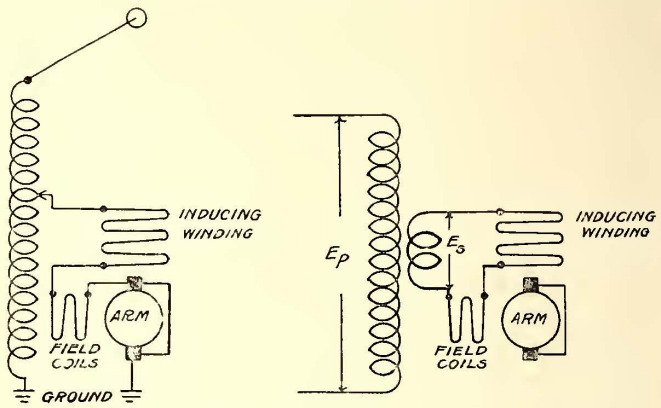
FIG. 1.—ARRANGEMENT OF MAGNETIZING CIRCUITS



FIGS. 2 AND 3.—ELECTRICAL CONNECTIONS IN STARTING AND RUNNING POSITIONS

produced in Figs. 4 and 5) the starting torque is doubled for the same current and same commutation as would be obtained with a compensated series motor.

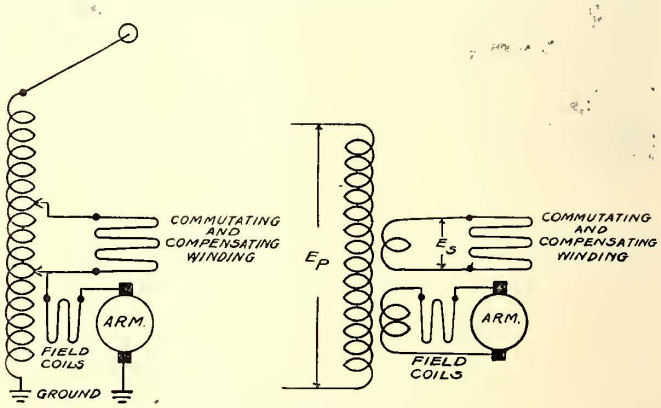
The electrical connections shown in Fig. 3 are reproduced in Fig. 6, which indicates also the magnetic relations. The circuits of Fig. 7 are electrically and magnetically equivalent to those of Fig. 3. The performance characteristics of the motor of Fig. 7 are similar to those of a compensated single-phase motor, but the action throughout the commutation zone is quite different. In the motor of Fig. 7 the flux along the brush axis depends solely upon the e. m. f., E_s, and is unaffected in any way by the current in the armature. The current in the compensating and commutating winding is a dependent variable, having a value such as not only to oppose the magnetomotive force of the armature current, but also to supply the m. m. f. to produce the flux demanded by the e. m. f. E_s. The cutting of this flux by the armature conductors under running conditions



FIGS. 4 AND 5.—EQUIVALENT OF CIRCUITS SHOWN IN FIGS. 1 AND 2

generates in the armature coil under the brush a speed e. m. f. that neutralizes the transformer e. m. f. produced in this coil by the alternating field flux.

It is interesting to examine the required value and time-phase position of the commutating flux. The transformer e. m. f. of the field flux varies in value solely with the field strength, and is always in time-quadrature therewith; it is unaffected by the speed except to the extent that the



FIGS. 6 AND 7.—EQUIVALENT OF CIRCUITS SHOWN IN FIGS. 1 AND 3.

speed may alter the field strength. The speed e. m. f. of the commutating flux is in time-phase with this flux and it varies in value with both the flux and the speed. It is seen, therefore, that the commutating flux should be in time-quadrature with the field flux and it should decrease in value as the speed increases. When the connections shown in Fig. 7 are used, the commutating flux is always in time-quadrature with the e. m. f. E_s (or E_p). Now, under speed conditions the current through the armature and field circuits is approximately in time-phase with the e. m. f. E_p. Hence, the field flux, which is in time-phase with the field current, is almost in time-quadrature with the commutating flux. Fig. 2 shows the arrangement of connections which allows the e. m. f. E_s, and therefore the commutating flux, to be decreased as the e. m. f. impressed across the motor field

and armature circuits is increased, or as the speed increases.

It is stated that the commutation of the machine at a frequency of 25 cycles is much better than that of a conductively compensated series motor at the same frequency, and even better than that of the latter motor at 15 cycles. This result is due largely to the use of the connections described above, although some improvement is attributed to the use of a fractional-pitch winding on the armature. The latter improvement is said to be of the same character as that accompanying the change from an ordinary direct-current machine to a commutating-pole machine. The introduction of the commutating flux tends to lower the power factor, but Mr. Alexanderson claims that the greater liberty in design that is gained in the new type allows the motor as constructed for railway service to possess practically the same power factor as does a conductively compensated series motor for the same duty.

DISCUSSION AT THE A. I. E. E.

The discussion of the papers on Jan. 10 was opened by L. B. Stillwell, who congratulated the Institute upon the attitude of the engineers of the New Haven Railroad in frankly disclosing not only their successes but also their difficulties. He thought that the Institute should have more papers of the kind of Mr. Murray's, in which actual work is described. Such papers are presented before other technical bodies, and the resulting criticism of practice is beneficial to all concerned. He also congratulated Mr. Alexanderson and his associates on the production of a single-phase motor in which there was no idle resistance in the armature winding, but was anxious to learn how much this step had cost in other directions. The strong point of the motor appears to be its facility to commutate under speed without sparking, but at the moment of starting the sparking may be serious. It would also be interesting to know the power factor, both at starting and at speed, as well as the ratio of output to weight. Little was said in Mr. Alexanderson's paper in regard to the performance at low frequencies. From the facts given it would look as if the motor would gain as much in the ratio of output to weight by a reduction of the frequency from 25 to 15 cycles, as the compensating series motor, but in view of the limited space on a railway truck, information on this subject is of importance.

A communication from B. G. Lamme was read by F. H. Shepard. Mr. Lamme showed that in order to limit the sparking at starting in the Alexanderson repulsion motor it is necessary to reduce the field strength considerably below the value allowable when resistance leads are used with a compensated-series motor. Even if the field strength were reduced to 70 per cent of normal the short-circuit current would have five times the normal value and the working current for double-torque would have to be 2.86 times the normal. With preventive leads the short-circuit current would be 1.25 times normal and the working current for double-torque only 1.6 times normal. Thus the brushes of the former motor would have to carry three times as much current at starting as those of the latter. With the same limiting short-circuit voltage, the flux could be increased by 66 per cent by using 15 instead of 25 cycles, and the output could be increased by about 30 per cent.

W. B. Potter complimented the New Haven Company on the excellence of its overhead construction, but where there was joint operation with steam he believed that the third-rail was superior to an overhead construction. He agreed with Mr. Murray on the desirability of a through feeder in parallel with the different sections, but did not see the need of two such feeders on the same phase as the trolley wires. He favored from 3 to 5 miles for the length of main line sections rather than a shorter distance, and this length had proven satisfactory in third-rail operation. At cross-overs, however, there should be a short section controlling the main line and cross-over tracks. In connection with the third point mentioned by Mr. Murray, he said 22 ft. was a desirable height for the trolley wire and it was unfortunate that this height should not be maintained throughout, as it would then be possible to use a much lighter form of pantograph. He did not think it would be advisable to carry overhead wires, which are subject to lightning, through lead cables, and thought this could generally be avoided by modifications in the construction followed. Referring to the Alexanderson motor, he said that the essence of the improvement embodied in it is its better inherent commutation. By reason of this improvement it is possible to modify other features affecting the performance of the motors which have heretofore been subordinated to commutation, with an accompanying greater reliability, lessened maintenance cost and increased output for a certain amount of active material.

O. S. Lyford, Jr., agreed with Mr. Murray's recommendation in regard to by-passes or feeders when the line contained two, three or four tracks, but did not think it always necessary with a single-track road. The objects of sectionalization are (1) to minimize the interference with the operation of the road in case of line trouble; (2) to locate the fault quickly, and (3) to reach the fault with a work train. If the line is a short one, a grounded trolley wire would stop traffic in any event, and the work train should be operated by an independent unit, preferably gasoline, because more easily put into service. Again, other things must be taken into account besides the trouble on the line. On a railroad provided with a positive block system, the process of getting the rules abandoned so that a special train can proceed against the block is about as difficult as making the repair after reaching the trouble. It is essential to insulate the high-voltage trolley system thoroughly, which at the present state of the art dictates the exclusive use of porcelain. On the Rochester division of the Erie Railroad there has been practically no disturbance of any kind on the 11,000-volt system, although there were terrible thunderstorms last summer and the high-tension line was struck repeatedly. A telephone system is on the same poles with the trolley line and, with proper transposition and suitable means for removing the static charge from the telephone line, it has been possible to operate the telephone system satisfactorily.

W. I. Slichter explained that in the Alexanderson motor certain features are introduced to assist in starting, and others are employed only when running. The compensating and inducing winding is provided with twice the number of turns as are on the armature. Hence when the armature is short-circuited at starting there is twice as much current in the armature as in the field coils, while under running conditions the current in the field coils is equal to that in the armature. Thus the field flux is relatively smaller at starting than while running. The tendency to sparking, which is minimized at starting, is neutralized under running conditions. A certain amount of wattless volt-amperes is required for maintaining the com-

mutating field, but the improvement in commutation increases the efficiency and lessens the maintenance cost.

S. M. Kintner said that he was very much interested in learning about the new single-phase motor, which seemed very interesting in theory. He would like to have had information, however, of its power factor; its weight compared with d.c. motors of equal torque; its commutator wear under heavy currents; character of brush used and life in car-miles; how long the motor can stand locked with 150 per cent full-load torque, and how long it will stand overload torques of 150 to 200 per cent of the hour ratings for periods of three or four minutes when operating at normal speeds and at low speeds. It is not the running condition that is the hard one, but the starting condition, and it is then that motors with preventive leads show their greatest superiority over those without them. The power factors of a certain line of series compensated motors with which the speaker is familiar has the following values: 25-cycle motors varying in size from 75 to 250 hp at their usual ratings, 85 to 90 per cent; 15-cycle motors varying from 75 hp to 500 hp, 85 per cent to 94 per cent. Data on the weight of these same motors show that in comparison with d.c. motors on a basis of percentage of weights for equal torques, the 25-cycle motors weigh 33 per cent and the 15-cycle motors 10 per cent more. These weights include gears and gear cases. Recent calculations show that in a given space it is possible to get 50 per cent greater output with 15 cycles than with 25 cycles. The comparison of two four-motor equipments made up of 75-hp, 25-cycle motors and 95-hp, 15-cycle motors show an increase in total weight of electrical apparatus of 5 per cent with the 15 cycles and a gain in horse-power of 26 per cent. On a basis of total car weights the increase in weight of the 15 cycles was only 1.6 per cent. On a road operating 100 single-phase motors of 100 hp each, the car-miles per brush during October, November and December, 1907, averaged 15,200 car-miles. The cars averaged 200 miles per day, and one car during October ran 10,740 miles and in November 9400 miles. On another road 13,000 car miles per brush was obtained as the average for the past two months. In his experience with single-phase motors during the past year and a half, covering 600 motors, he did not recall a single case of trouble which could be traced to a preventive lead burning out.

Dr. C. P. Steinmetz stated that the two great objections to alternating-current commutator motors for railway work have been the impracticable low power factor and the hopelessly bad commutation. About eighteen years ago Mr. Eickemeyer produced the compensating winding which allows a motor to be constructed with a reasonably good power factor. The second serious problem of the motor relating to commutation has been eliminated in the Alexanderson motor, and the alternating-current commutator motor may now be considered in practically as good a shape as the direct-current motor. It may be stated, therefore, that the period of youth of the alternating-current railway motor is concluded.

In conclusion, Mr. Murray said that it was a question whether heavy induction with preventive leads was better than light induction without them, and thought that decision should be held in reserve until practical results should determine the answer. In regard to the remarks upon his own paper, he believed that in long-distance traction work, overhead construction and alternating-current transmission to the motors a necessity. Two feeders were used so that if trouble occured on one feeder a section of it could be cut out and repaired. He thought the tendency would be toward trolley sections of from 3 to 5 miles, but local conditions would govern. The question of pantographs under low bridges was a problem which had yet to be solved. At first some trouble had been experienced in the system of supports at low bridges, due to the effect of locomotive blasts. The contacts, however, were reduced to two and the insulators were placed at the side instead of at the middle, so that the locomotive blasts did not effect them. Since this change was made, four or five months ago, no difficulty or trouble has been experienced in the grounding of the contact conductor or of the messenger cables under low bridges. Referring to Mr. Lyford's remarks, the speaker thought that feeders might be omitted for short, single-track lines, but were quite necessary for long, single-track lines, so as to operate on each side of a ground. He had a high opinion of porcelain as an insulator, if it was possible to get the mechanical strength in porcelain that can be obtained in the molded material.

Mr. Alexanderson said, in answer to Mr. Stillwell's question about whether his remarks about the 25-cycle motor applied in the same ratio to the 15-cycle motor, that if the heating of the motor is a limitation they do not apply, but if the starting torque is a limitation they do apply. Where a motor can slip its wheels the limitation is the heating, and in that case the 15 and 25 cycle motors are equivalent in output. A brush that has been in service for 10,000 miles shows a wear of only 3/16 in. The motors have been in service for some time, but have not had the feature for starting described in the paper because it was impracticable to embody it at that time. Some speakers have thought the motors were for a lower starting torque than the series motor, but Mr. Alexanderson believed that it had the highest starting torque possible.

REPORTS OF THE ASSOCIATIONS

The reports of the American Street & Interurban Railway Association and of the American Street & Interurban Railway Engineering Association have been issued and were mailed to member companies the end of last week. They are out earlier this year than ever before, and Secretary Swenson, of the American Association, is to be congratulated on the promptness with which this work has been done. The American Association report contains 408 pages and that of the Engineering Association 366 pages, and both reports contain a summary index of the previous reports of the associations. The Engineering report also contains the full report of the sub-committee on rails, which has not been published in any of the technical papers.

The Columbus Railway & Light Company, of Columbus, made its usual Christmas distribution to its employes. All married men were given $2 and the single men $1, which sums were added to the savings accounts started by the men two years ago. The company made the first deposits for the men two years ago, presenting them with the bank books as Christmas presents.

The record as regards number of passengers transported in the New York subway was reached on Saturday, Dec. 21, when the number reached 688,638. The Manhattan elevated lines on the same day carried 961,114 persons, the largest number since the subway was opened.

THE PERMANENT WAY

BY H. L. WEBER,
Chief Engineer Fort Wayne & Wabash Valley Traction Company.

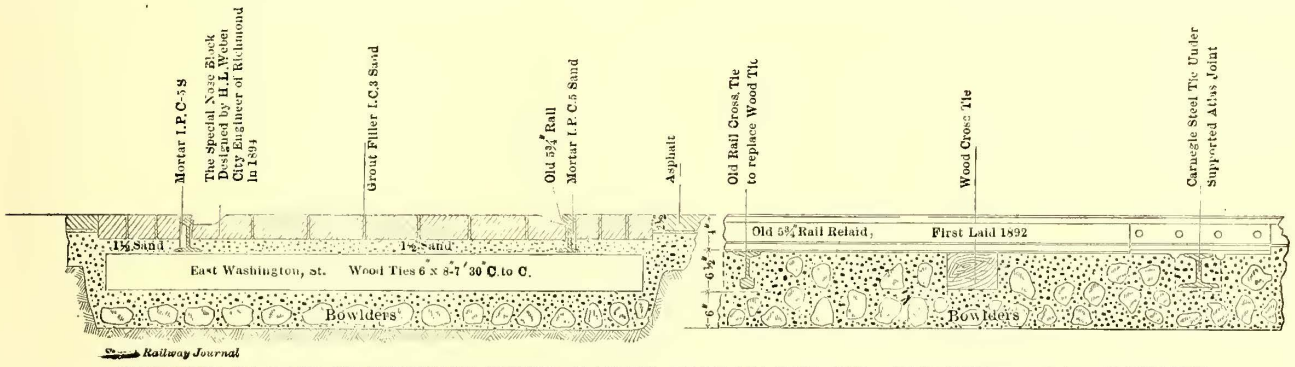
When wood ties were cheap it was a comparatively easy matter to provide track within reasonable cost which would be suitable for heavy rolling stock. But with wood ties in the neighborhood of $1 each, f. o. b., some cheaper and more durable substitute must be found, if possible, for the wood tie. An increase merely in the weight of the rail will not solve the problem, although it will help. Good foundations must be provided, and a really permanent way is the kind of a way desired if a saving is effected in the end. This may not be possible in the track alone, but if the reduction in wear and tear to the rolling stock and to the nerves of the passengers is also taken into consideration a substantially constructed permanent way will be found the cheapest, when all things are considered. The nerves of the patrons of an electric railway company is an asset which should be rated liberally by the management, although some transportation officials may think differently. The aim of the company should be to give an enjoyable, as well as a convenient, service; to have the cars always on time, and to carry its patrons gently around all curves and over all switches. A conductor ought not to be obliged to apologize to his passengers because the latter lose their equilibrium or are swung in their seats when the car is improperly sent around a curve, nor should they be jolted into a state of nervous prostration by every piece of bad track or special work,

The permanent way must receive more consideration and its proper construction should be studied to get the greatest efficiency with the least cost. In many instances, when a company substitutes a heavier for a lighter rail, the latter can be cut into short lengths and used for cross ties, if a clamp is employed to fasten the bases of the rails together, and the old rail ties are embedded in a concrete foundation. But it is poor economy to select a heavy rail section if it involves a sacrifice of strength in the ties and foundation. The best policy is first to consider the tie, next the foundation, and finally the rail. As a matter of fact, the load, rail, tie and foundation are considered in the order given, in determining what duties the ties have to perform. In a permanent way, where the tie and foundation are synonymous terms, then the tie and foundation can be considered first.

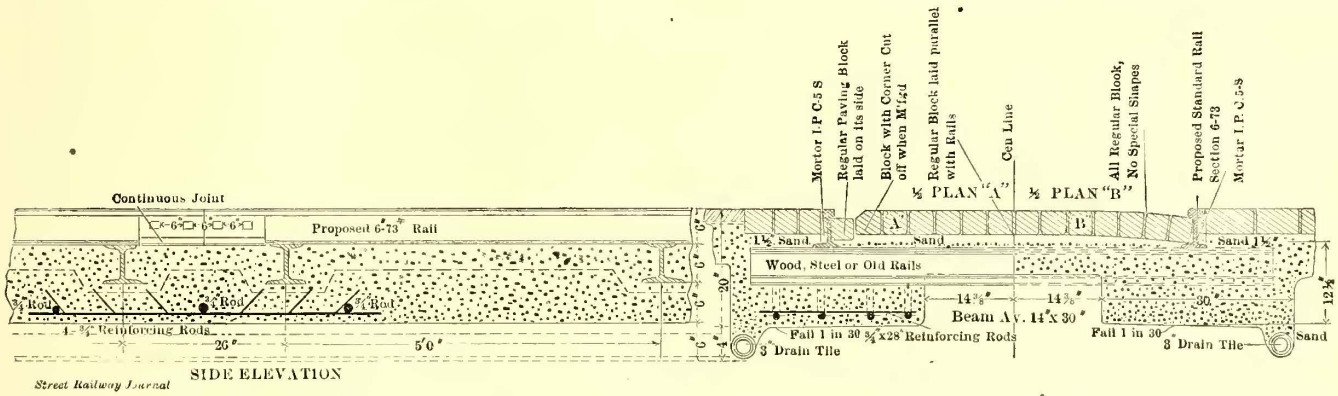
Another fact to be remembered is, that, while concrete beams of a certain size will answer in one place, they may be unsuitable in another. Local conditions which will produce absolute failure are usually connected with the sub-grade, which may be wet and poorly drained, or containing quicksand, or of a soft, spongy nature. In all such cases drainage should be provided and plenty of bearing surface secured. On all sub-grades of this kind a sheet concrete foundation for a permanent way should be used.

In many places, in the early horse-car days, many tracks were paved with boulders or cobblestones. These pavements will be found to-day to be just as good as when they were laid; not worth much then, but no worse now. During reconstruction these boulders can be used to excellent advantage in making a rubble concrete foundation. In many instances this old material will amount to 25 per cent or 33 per cent of the total stone required, thereby cutting the cost of the concrete in two, and making just as good a job if properly done. The section of the East Washington Street paving presented herewith shows how these stones were utilized. This plan reduced the cost of the concrete from $5.50 per cubic yard to $3.07 per cubic yard.

It is usually "a condition and not a theory" which confronts the engineer. Each case has its governing factors



SECTIONS OF EAST WASHINGTON STREET PAVING, FORT WAYNE, IND., SHOWING RUBBLE CONCRETE



SECTIONS SHOWING PROPOSED PLANS ("A" AND "B") WITH CONCRETE BEAM CONSTRUCTION, WOOD, STEEL OR OLD-RAIL TIES AND CONCRETE REINFORCEMENT UNDER JOINTS

which must receive due consideration at his hands, and this rule is particularly true in the construction of permanent way. Whether it is of the concrete beam or sheet concrete type, the foundations must be relied upon to support the rails and their loads. Why should not the rails be held in position by the addition of anchor bolts? It is my opinion that this scheme is practical with the properly designed appurtenances and a Continuous, Atlas or equally good rail joint, with or without reinforcement under the joint, as the case may demand. With this idea in view, I offer this plan as a suggestion with estimates of its cost.

In either plan of construction the sub-grade is prepared, the drainage is arranged and the track is assembled and placed to the proper grade and line. The foundation then is constructed.

The cost of constructing a concrete beam permanent way, exclusive of rails, rail joints, bolts and bonds would then be as follows:

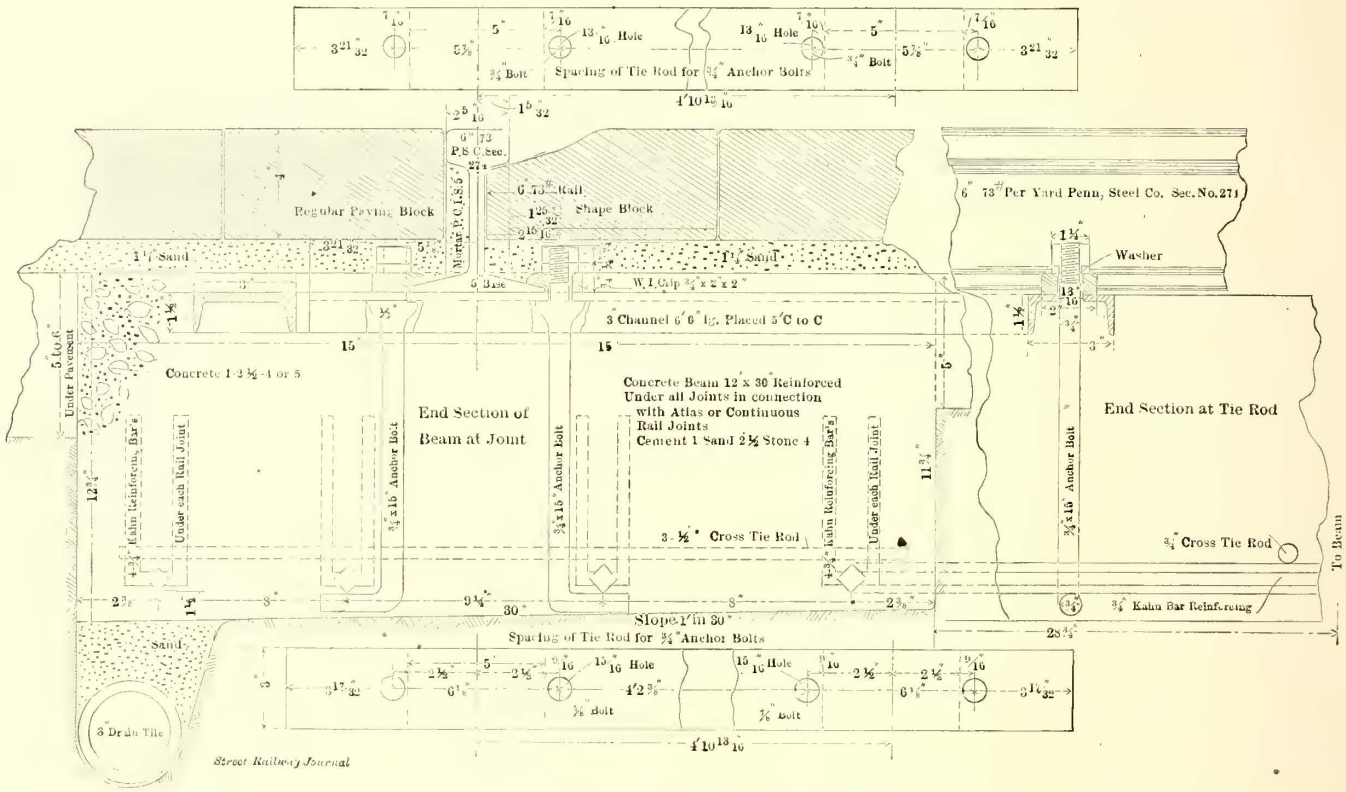
To lay single track, furnish channel cross-tie 5 lbs. per ft., anchor bolts and clips, 5-ft. centers, with tie plates between each tie with anchor bolts and clips, making anchorage 2½ ft. centers	$0.55	per lin. ft.
Excavation for track, 18 ins. deep	.17	" " "
Concrete	1.35	" " "
Brick paving	.88	" " "
Total cost	$2.92	per lin. ft.

The cost of the concrete beam construction with Carnegie steel ties, 5-ft. centers, exclusive of rails, joints, bolts and bonds, would be:

To lay single track and furnish Carnegie steel ties, bolts and clips, ties 14½ lbs. per foot of tie, reinforcement under joints	$0.60	per lin. ft.
Excavation	.22	" " "
Concrete	1.35	" " "
Brick paving	.88	" " "
Total cost	$3.05	per lin. ft.

The track on the East Washington Street Improvement was relaid with the old 5¾-in. rails that had been in service on the same street for fourteen years. The rails were reversed end for end by placing the outside of the rail balls to the gage side. The base was quite badly eaten away by rust, and it was necessary to place the ties 30-in. centers. The excavation was exceedingly heavy, running from 18 ins. to 48 ins. deep. The cost follows:

Cost to take up old track and relay same, exclusive of rail, joints, bolts and bonds, including wood ties 30 ins. centers, spikes, laying the track to line and grade ready for foundation	$0.42	per lin. ft.
Excavation	.72	" " "
Concrete foundation, $3.07 per cu. yd	.74	" " "
Brick paving	.88	" " "
Total cost	$2.76	per lin. ft.



SECTION OF PROPOSED CONCRETE BEAM UNDER JOINTS AND PLAN OF CONNECTING RAIL TO BEAM

An estimate on the same plan of work, on the same basis as East Washington Street, using Carnegie steel tie or old steel rails for ties, is:

Track laying, including ties and labor with necessary fastenings	$0.60	per lin. ft.
Excavation, 18 ins. deep	.19	" " "
Concrete, $3.07 per cu. yd	.74	" " "
Brick paving	.88	" " "
Total cost	$2.31	per lin. ft.

The accompanying diagrams show three plans for laying the bricks between the rails. Plan "A," of which a half section is shown, contemplates the use of a special block with corner clipped off, the brick next the rails being laid on its side under the ball and being followed up with the special block. This block is followed by the regular block in their order. Plan "B" contemplates using nothing but the regular block and both plans provide for laying the block parallel with the rails.

East Washington Street was laid as shown, with the Weber nose block, manufactured by the Metropolitan Paving Brick Company, of Canton, Ohio. This style of paving

has proved very popular with city engineers, and very satisfactory to the traveling public, and by its use street railway companies can make and maintain a very neat appearing street and one that meets with the general approval of city authorities in connection with the T-rail.

THE "PAY-AS-YOU-LEAVE" CAR

A novel type of car, entitled the "pay-as-you-leave" car, has recently been patented by William S. Twining, chief engineer of the Philadelphia Rapid Transit Company, and is claimed by the designer to accomplish a number of desirable objects which are not secured in any other form of car.

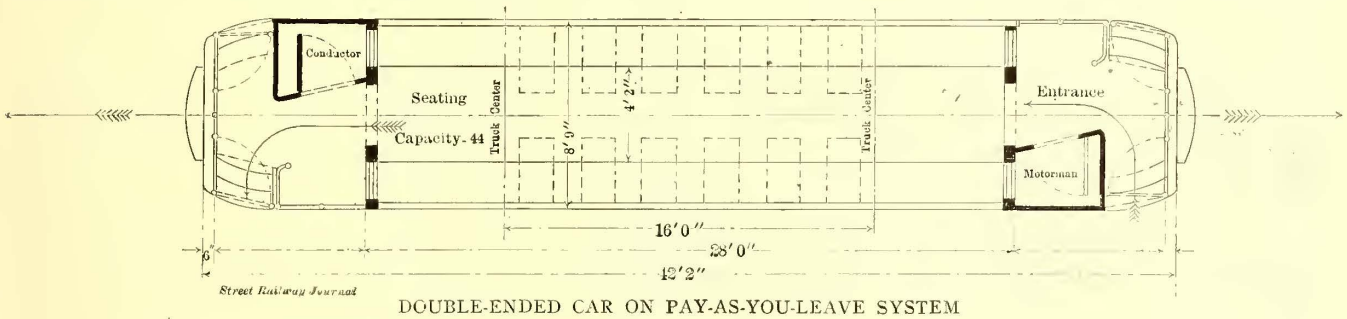
Passengers enter the car at the front end only, and by steps directly in front of the motorman. They leave by the rear exit only, directly in front of the conductor. In this way no passenger can enter or leave the car without doing so directly in front of either the motorman or conductor, a plan which, Mr. Twining considers, will reduce the liability of accident to a minimum.

As the name of this car implies, the passengers pay on leaving the car and do so as they pass the conductor, who stands on the rear platform. It is expected that after the public becomes used to the car the passengers upon leaving will have their nickels ready to give to the conductor. Those who require change will secure it from the conductor between stops so as to be prepared with the proper fare when they wish to alight. As the motorman's cab commands the entrance at front he can stop any passenger who attempts to leave the car without paying. This same cab, when at the rear of the double ended car, provides the conductor with accommodations for his storm coat or overcoat, papers, records, etc., for which there is now no place in any of the ordinary cars. It also protects him from the weather on long runs.

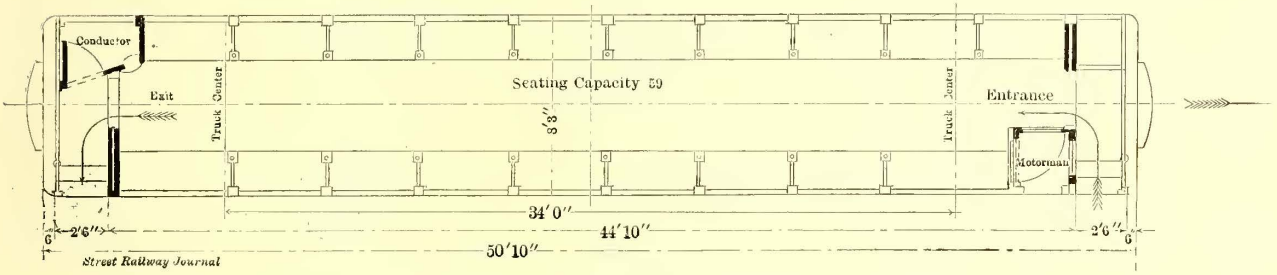
The new type of car is also claimed to be very easy to ventilate, as the window in the upper half of the entrance door can be lowered to provide a direct draft through the car, as is now done in the ordinary elevated equipment. In summer the exit door would be kept open.

Another advantage claimed by the designers of the proposed type of car is that of body construction. The car body forms a closed truss with which the wheel base can be made as long as desirable and in which the overhang is reduced to a minimum. At the same time the seating capacity of the car is a maximum. As center doors are used it is possible to equip the car with three or more steps if necessary. This affords opportunity to employ a 33-in. wheel, which in the opinion of Mr. Twining is the smallest wheel which should be used with a 40-hp motor, on account of clearance between the paving and the motor or gear case.

Plans are presented of single and double-ended cars on the pay-as-you-leave system. No definite plans have been made to introduce either of these cars on the Philadelphia system.



DOUBLE-ENDED CAR ON PAY-AS-YOU-LEAVE SYSTEM



SINGLE-ENDED CAR ON PAY-AS-YOU-LEAVE SYSTEM

CONSTRUCTION CAR FOR LISBON, PORTUGAL

The J. G. Brill Company furnished last month to the Electric Tramway Company of Lisbon, Potrugal, a construction car identical to the one shipped by the same builders to Lisbon a year ago, except that in that car two cranes were included for loading heavy pieces of material, such as wheels, axles, rails, etc. The car is powerfully constructed and has heavy sub-sills, and the posts which support the roof are composed of angle-irons which are bent to conform to the shape of the roof. The truck on which the car is mounted is of the builders' No. 21-E type and is equipped with track brakes as well as the hand brakes. The length of the car over the body is 25 ft., and the width over the posts, 8 ft. When the system in Lisbon was electrified, some five years ago, 120 eight-bench, open, Brill cars were put in service, mounted on the No. 21-E single trucks. The next shipment consisted of 40 twelve-bench open cars, mounted on Brill maximum traction trucks, and a year ago the company adopted the Brill semi-convertible type of car, mounted on No. 27-GE1 trucks for first-class service and placed 20 in operation. The John Stephenson Company at the same time furnished 20 double-truck cars with longitudinal seats, for second-class service.

The City Council of Culiacan, Mexico, has granted permission to Eng. Francis Butterfield for the construction of street car lines in that city.

THE CELEBRATION ATTENDING THE BROOKLYN TUNNEL OPENING

The opening of the tunnel to Brooklyn was fittingly marked by a public celebration, Thursday, Jan. 9, under the direction of the citizens' committee. The ceremonies were

THE CEREMONY AT THE BOROUGH HALL, BROOKLYN

begun with a reception in the New York City Hall, at which many persons prominent in city affairs met President McGowan, of the Council, the Aldermen, the old Rapid Transit Commission, which appropriated the money for building the tunnel, and the members of the Public Service Commission. The party then made the trip from the City Hall under the East River to Brooklyn, where at the Borough Hall they were met by a large delegation of local citizens and business men. Here the formal exercises were held in connection with the event. The ceremonies were concluded with a luncheon at the Hamilton Club.

Since the opening of the tunnel the riding has been very heavy, and no estimate can therefore be made of the probable traffic of the line. In anticipation of the traffic that would be offered at the Borough Hall, Brooklyn, by the opening of the new line, the Brooklyn Rapid Transit Company greatly increased its local Brooklyn surface car service which terminates at the Borough Hall, and in that way has adequately handled the crowds. Formerly during the rush hours about one hundred cars were used in this local Borough Hall traffic, but now about two hundred and fifty are used. The extension to the service includes the addition of cars to the Fulton Street, Putnam Avenue, Greene Avenue, Flatbush Avenue, Fulton, Seventh and Third Avenue lines. On the elevated lines extra guards and ticket sellers have been provided at Borough Hall stations. There has been no reduction, however, either in the number of surface or elevated cars run over the Brooklyn Bridge, although the effect of the Subway on the Brooklyn Bridge congestion at the rush hours is quite noticeable. Vice-President and General Manager Calderwood, of the company, says it is impossible to predict to just what extent the new line will relieve the Bridge until the trend of traffic has become fixed. He is of the opinion, however, that conditions will change and improve as the operation of the trains in the subway is extended up Fulton Street to Atlantic and Flatbush Avenues, the terminal. Mr. Calderwood says that the company, just as it planned to care for the Subway traffic by increasing the cars on its local City Hall service, will change and adjust the schedule of both elevated and surface lines to meet the demands.

CROWD AT THE ENTRANCE TO THE SUBWAY AT THE BACK OF THE BOROUGH HALL, OPENING DAY

In this connection another event is soon to take place, which will have a very material bearing on the traffic situation in Brooklyn. This is the proposed opening about

Feb. 1 of the new terminal at the Manhattan end of the Brooklyn Bridge for the elevated lines. At the present time, during the rush hours the elevated cars in Brooklyn are looped at the Brooklyn side and a shuttle-car service operated over the bridge proper. After the new terminal is completed, however, it is the purpose of the company to run all of its elevated trains through to Manhattan, thus eliminating the change of cars, which is now necessary. For some time past the company has run the elevated cars through to New York during the non-rush hours, but this was not possible during the rush hours, because the facilities for switching at the New York end were such that six-car trains could not be accommodated, whereas during the non-rush hours the Brooklyn trains are made up of three, four and five cars.

As many of the passengers on the subway to Brooklyn will patronize the elevated lines of the Brooklyn Rapid Transit Company, plans have been made by the company for building an island station opposite the tunnel exit on Fulton Street, between Court Street and Boerum Place.

NEW RAILWAY CONTROLLERS

The use of higher operating voltages for electric railway systems has imposed more exacting operating conditions on the controller equipments for electric cars. The General Electric Company has therefore designed a new line of cylinder controllers with improved magnetic blow-outs which can be used on systems in which the voltage peaks reach 750 volts. At present three controllers, known as the K-34, K-35 and K-36, are being built. The K-34 controller is suitable for use with either two 150-hp or four 75-hp motors. The K-35 is for use with either two 100-hp or four 50-hp motors and less. The K-36 is for use with two motors only, each of 60 horse power or less. The controller capacities are based on the standard rating of 500 volts, and for higher voltages they can be correspondingly increased.

The K-34 and K-35 controllers are provided with "bridge" connections by which full current is maintained through all motors during the transition period from series to parallel. A smooth acceleration is thus obtained and the strain on motors and gearing which occurs with a control having a partial or total open circuit position at transition is reduced. The bridge connections are not included in the K-36 controller, as not only are they unessential on small equipments, but they require a larger controller.

The main operating handles are directly connected to the cylinder and no gearing is used. To accommodate the new style of blow-out, the reverse switch is located at the left of the controller (except in the case of the K-36), which therefore differs from the previous K type, in which the reverse handle is at the right of the main handle. The other modifications from existing styles chiefly relate to the construction of the controller cylinder, the location of the reverser fingers and the method of fastening the leads to the controller. Individual blow-out coils and arc chutes are provided, the steel cores of the former being riveted to steel flanges which are fastened to the finger bases. Steel plates are also embedded in the arc deflector partitions, and are thereby electrically insulated from the controller frame. These flanges and plates distribute the magnetic flux through the arc chutes parallel to the shaft, and consequently at right angles to arcs formed between the fingers and cylinder casting whatever position the arc may assume. This insures the extinction of the arc under all operating conditions and reduces burning and consequent repairs to a minimum.

An improved method of fastening the cylinder castings to the shaft is used. Insulation is wrapped around the controller shaft, which is of hexagonal section. The cylinder castings fit over this insulation and are pressed against it by set screws bearing on steel keys. This construction prevents the castings from shifting round the shaft, and at the same time provides for the ready removal and replacement of any casting, if required.

The terminals for the leads entering the controllers are directly attached to the finger bases, thereby obviating the necessity for a separate connection board. The omission of the connection board provides additional space in the controller. In the K-34 and K-35 advantage has been taken of this to lengthen the reversing cylinder, thus allowing all fingers to be located on the outer side, where they are accessible for inspection and repairs.

ORGANIZATION OF THE OPERATING MEN'S ASSOCIATION

Secretary Swenson of the American Street and Interurban Railway Association, has just issued the following notice in regard to the proposed organization of an association of operating managers:

Jan. 14, 1908.

To the General Managers of Member Companies.

Gentlemen: At the Friday (Oct. 18, 1907) session of the Atlantic City convention the American Street and Interurban Railway Association unanimously adopted the following resolution:

"*Whereas,* experience has demonstrated the desirability and usefulness of our existing affiliated organizations, and

"*Whereas,* It has appeared from discussion that another organization of similar character should be created, to which should be committed lines of work pertaining to transportation, traffic and general operation; now, therefore, be it

"*Resolved,* That the executive committee be and hereby is requested to take such steps as it may deem desirable to encourage the formation of such an organization."

The executive committee of the American Association at its meeting held in the city of New York, Saturday, Oct. 19, 1907, voted to proceed with the organization of a fourth affiliated association in accordance with the above resolution, and the undersigned committee on organization was appointed.

The committee has given careful consideration to this entire matter and is of the opinion that the new association should bring together general managers, managers, passenger agents, advertising managers, superintendents and other operating officials, for the consideration of problems of interest to those engaged in the actual operation of street and interurban railway properties. The exact name of the new association will be determined at the organization meeting.

The annual meeting of the executive committee of the American Association will be held on Friday, Jan. 31, and it is the desire of the undersigned to have the organization of the new association completed, so that the action thus taken may be ratified at that meeting, including the adoption of the constitution and by-laws, the election of officers, the appointment of committees and the general outline of the program for the 1908 convention.

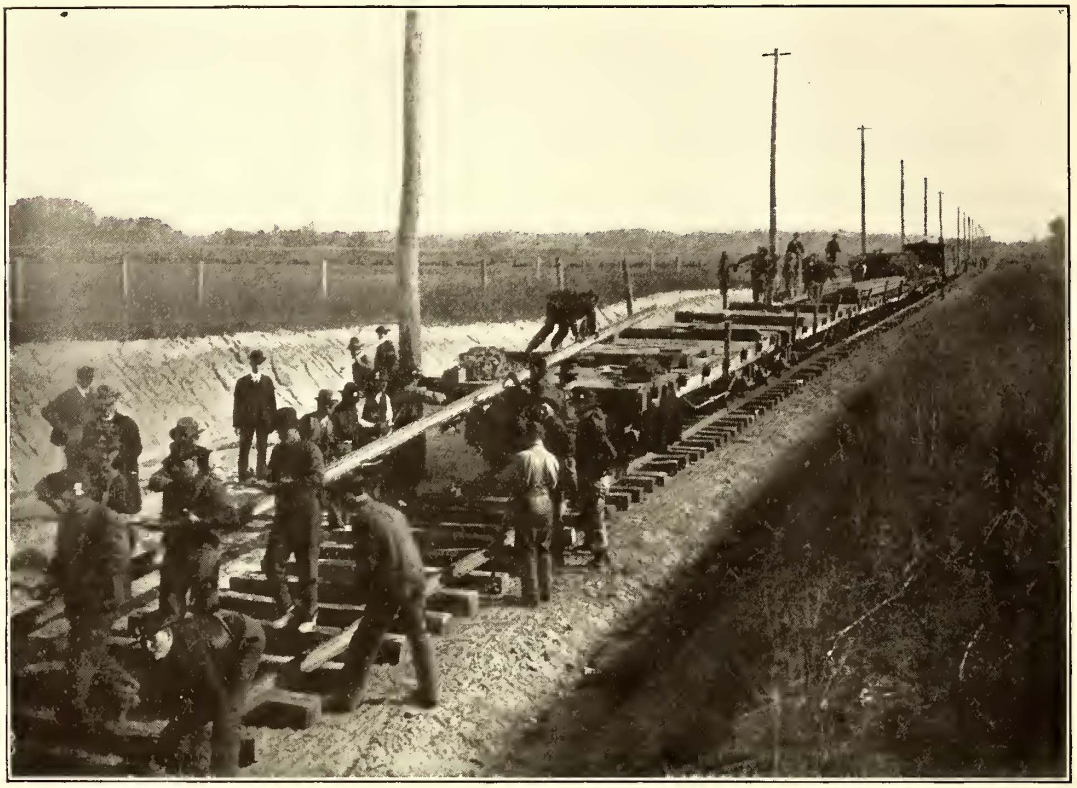
We therefore give notice that a meeting for the purpose of organizing the fourth association to be affiliated with the American Street and Interurban Railway Association will be held at the office of the association, 29 West Thirty-Ninth Street, Engineering Societies' Building, New York City, on Thursday, Jan. 30, 1908, at 10 o'clock in the forenoon. You are respectfully urged to have one or more representatives of your company present at this meeting, fully authorized to participate in the organization of such a fourth affiliated association.

This is a very important meeting and a full attendance of representatives of member companies of the American Association is earnestly requested. Yours very truly,

(Signed) CALVIN G. GOODRICH, Chairman.
W. CARYL ELY.
JAS. F. SHAW.
Committee on Organization.

TRACK LAYING ON THE INDIANAPOLIS & CINCINNATI TRACTION SYSTEM

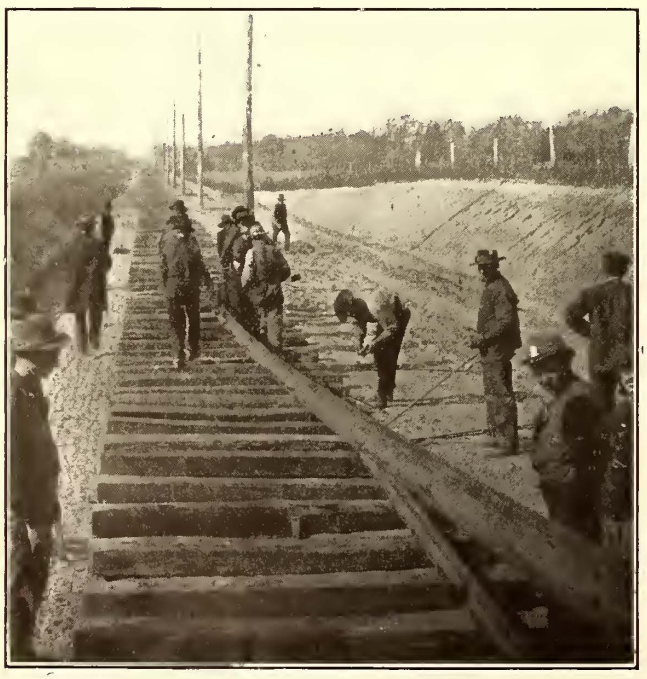
A rather interesting method of laying track is employed by J. W. Moore, chief engineer of the Indianapolis & Cincinnati Traction Company. Most of the work is done along a paralleling steam road, and ties unloaded at stations on the steam road are hauled in wagons and distributed along the right of way a considerable distance ahead of the rail handling gang.



CONSTRUCTION TRAIN

The 60-ft. rails are loaded on ordinary flat cars provided with timbers over the bolsters which support the rails 12 ins. above the floor. At their middle point these timbers are cut away and the recess is fitted with rollers 12 ins. long. A rail train consists of six cars or three loads of rails together with the necessary joints, spikes and bolts.

In unloading the rails they are pushed on the rollers and are then shoved over the cars to the foremost one. The method of taking the rail from this car is well shown in the accompanying illustrations. The rails are bolted up temporarily and are secured to gage by bridles made of bar iron. Each end of the bridle is bent so as to hook over the outside of the flange of each rail. A spike slipped in a hole drilled at the inside edge of the flange holds the rail securely. These bridles are placed at about 15-ft. intervals and a sufficient number is provided for two miles of track. Spikers following the track laying gangs remove them, after which they are carried forward to be used again. The rails are then made permanently fast to the ties. With this method of construction a crew of twenty-four men have been able to lay one and three-quarter miles of track between the hours of 9 a. m. and 4 p. m.



PLACING THE RAILS ON THE TIES.

TIES LAID READY FOR THE RAIL.

The accompanying illustrations show the different steps in the work on the Indianapolis & Cincinnati system.

TROLLEY EXPRESS TRUCK IN NEW HAVEN.

The Connecticut Company, which operates all of the electric lines in Connecticut belonging to the New York, New Haven & Hartford Railroad, also controls the Trolley Express Company, which operates trolley express cars for the handling of express packages, produce and small freight, as well as a large number of horse express wagons. It is naturally the desire of the company to electrify its trucking business as far as possible, for it has an abundance of electric power and realizes the many advantages in both economy and efficiency to be gained by its use. It has consequently recently had designed and built by the James MacNaughton Company, of New York, an electric trolley truck for use in hauling heavy freight to and from its railroad freight depot. This truck has the appearance of an ordinary electric storage battery truck, but is also equipped with a trolley pole, so that when necessary it can take current from an overhead wire.

The vehicle is driven by two automobile motors, specially wound for 250 volts and fitted with the Westinghouse special G. E. 53 controller, which has five speeds forward and

TROLLEY EXPRESS TRUCK OPERATED IN NEW HAVEN

one reverse. Its motive power, when on the highway, is supplied by a Westinghouse battery of the Planté type, having fifty cells of seven plates each and a capacity of forty amperes for one and one-half hours. The battery is charged from the overhead wire while the vehicle is on the track, and can only be charged on one of the forward speeds of the controller. An overload circuit breaker cuts the battery out of circuit when it is fully charged. The tires are five inches wide and have a groove on the periphery three inches wide and one-quarter inch deep at the center. The double flange thus obtained holds the vehicle with sufficient firmness to the rails when desired, yet not so rigidly as to interfere with the ability of the driver to steer the vehicle to one side and thus have the wheels ride up over the rails and off on to the pavement.

The vehicle has a radius of operation when off the tracks of ten miles, calculated on a level hard surface road and with full load. It weighs about 7980 pounds and has a load capacity of five tons. The trolley pole is adjusted so as to have a considerable lateral movement, and is so balanced that when the truck leaves the tracks and the pole is released it automatically drops down on the top of the vehicle after it has reached a certain height or angle.

ANNUAL REPORT OF THE INDIANA COMMISSION

The second annual report of the Indiana Railroad Commission has been filed with the Governor. The Bureau of Inspection inaugurated by the Commission June 1 shows that the work of the Bureau has greatly benefited the community by bringing about more friendly relations between the steam and the interurban railroads and the people at large. The report states that the number of fatal accidents occurring on the steam and interurban railroads during the year ending June 30, 1907, was 413 and the number injured 4637, an increase over the previous year in the number killed of 71, and in the number injured 344. The interurban and steam roads have nearly all been thoroughly inspected, and faulty construction and equipment are being gradually replaced. For electric railways the Bureau of Inspection reports eight defective bridges, fifty defective signals and twenty-five defective roadways. The Bureau inspected about 500 miles of electric railway. About 1100 miles remain to be inspected. While inspecting the electric railways quite a number test stops were made to determine the efficiency of the brakes. It was found that very satisfactory results could be obtained on electric cars equipped with straight air, and that the application of sand very materially assisted in making a stop on a dry rail, and especially on a wet one. It was found also that the sanding arrangement on many cars was not satisfactory. If the sand box is located on the body of the car and the sand pipe lead from the car to the rail the sand would not reach the track on a curve. To overcome this, rubber hose is sometimes fastened to the truck. With the pneumatic sander it was found that when the air was turned on full it would not deliver sand, but blow through and was not at all satisfactory. The report states that both the steam and interurban railways are co-operating cheerfully with the bureau and are affording every facility for making these inspections with a view of making travel safer.

AIR-COCK INTERLOCK ON THE METROPOLITAN WEST SIDE CARS

A number of the cars of the Metropolitan West Side Elevated Railway, in Chicago, have been equipped with an ingenious and simple device by which the train can not be started unless the air-cock valves are in the proper position for working. This is accomplished by connecting a switch in series with one of the control circuits to one of the cocks under each brake valve, the switch being so arranged that the cocks in the operating cab must be open and those in the other cabs closed before power can be transmitted to the motors. It is stated that the device can be installed on cars already operating for less than $5 per car for labor and material, and can be applied to any control system. It was invented by E. T. Munger, master mechanic, and A. H. Daus and H. A. Johnson, engineers, of the company, who have applied for patents covering its main features, and, it is believed will tend greatly to reduce accidents caused by a neglect on the part of trainmen to change the position of the air cocks on their train at terminals.

A NEW RECORDING MILLI-VOLTMETER AND SHUNT AMMETER

Electrical engineers have long felt the need for an accurate and sensitive recording milli-voltmeter, which is adapted to practical everyday service as well as for laboratory tests. There has also been a demand for a recording ammeter of the shunt type which can be connected by leads

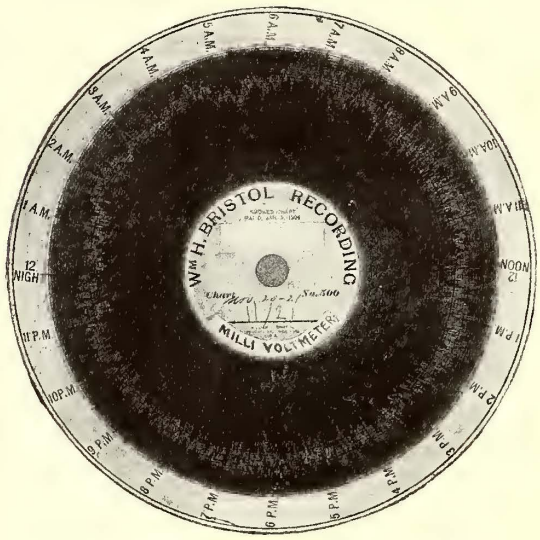


FIG. 1.—REDUCED FACSIMILE OF CHART

to the main bus-bar. The shunt system is especially economical where heavy currents are to be indicated or recorded, as the instruments may be located at a considerable distance from the main current where the instrument is located. The recorders illustrated herewith and made by William H. Bristol, of New York, have been designed to meet these particular demands.

The two most important fundamental features of these recorders are a sensitive electrical movement of special design made by the Weston Electrical Instrument Company, and a new recording system so arranged that there is absolutely no friction between the recording arm and the chart. These instruments are so sensitive that the recording arm will move the whole scale of 5 millivolts or less, making it possible to accurately record one ten-thousandth of one volt. The graduations on the chart are evenly proportioned over the entire range, the same as the Weston ammeter, so that even though there is a small current flowing the readings may be as readily taken as if the current was the maximum that the instrument would record. This feature will be greatly appreciated, as there are many places where it is desired to install instruments for increasing future demands, and it is important that the records be perfectly clear, even though the loads are very light when the outfit is first installed.

The records are made on a novel, semi-transparent, smoked chart, which is periodically brought into momentary contact with the end of the recording arm by means of a special vibrating device. In this way a series of white dots are made on the smoked surface and these form a continuous line, and a record is thus made without causing any friction between the moving arm and the chart. The rate of vibration of the chart is timed to suit the frequency and range of the variation in the current to be recorded. The usual period of vibration of the chart is once in 10 seconds, but to obtain continuous lines where the fluctuations of the current are quite rapid, the vibrating attachment is made to operate twice every second. When the record is completed, the chart is dipped in a simple fixitive solution which makes the record permanent for filing.

Fig. 1 is a reduced photographic facsimile of a chart taken from one of these instruments in connection with electrolytic surveys of underground structures which are being conducted by the Electrical Testing Laboratories, of New York City. The graduations of this chart are arbitrary. It was revolved once in 24 hours and was vibrated once every 10 seconds. The zero position of the recording arm was the middle of the scale, so that the record might be independent of the direction of the current, as in many cases the direction of the current changes from negative to positive during the day. It is expected that by using a number of these instruments, operating simultaneously at different points, stray currents in water and gas mains or in any underground structure may be recorded, making it possible to discover the causes of trouble and how they may be eliminated.

The recording ammeter is shown in Fig. 2 connected to a standard Weston 10,000 amp. shunt, to which is also connected a Weston indicating station ammeter. This illustration shows that the recorder may be readily applied

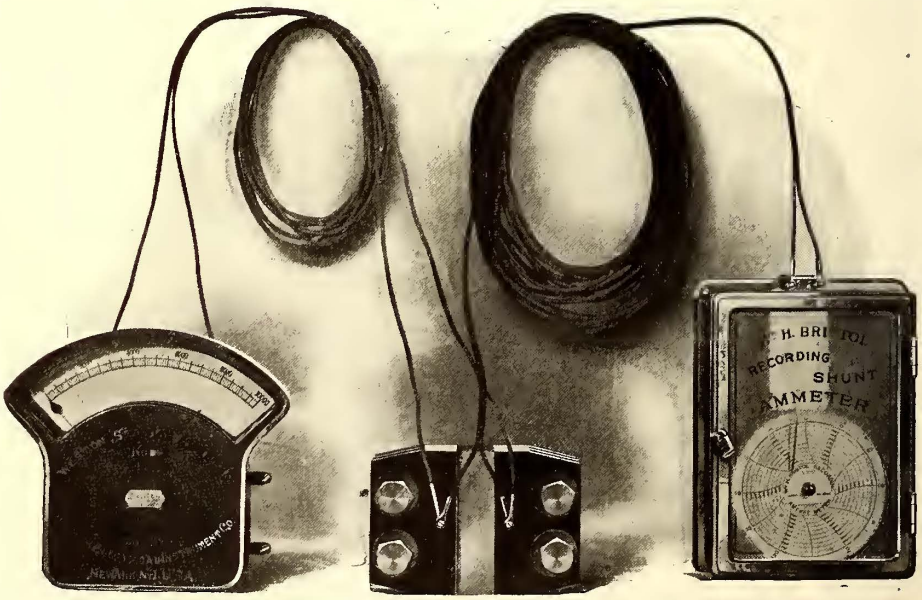


FIG. 2.—RECORDING AMMETER CONNECTED TO SHUNT AND STATION AMMETER

to any standard shunt which is already in service, without disturbing the indicating instrument at the switchboard. As illustrated here, leads of almost any desired length may be used to connect the indicating and recording instruments to the shunt on the main bus-bar. It is even possible to have the recording ammeter located in the superintendent's office at a great distance from the shunt, and the indicating instrument located on the switchboard convenient for the observation of the operator. Such combination outfits

could be furnished as units, with leads of the proper lengths to suit the individual cases.

The recording shunt ammeter has been successfully applied for taking continuous records of the current on a large trolley system, where the fluctuations are very rapid, and varied as much as 4000 amp. several times in a minute. The charts for such work as this are made to revolve once in one hour and the vibrator operates twice in one second. For preliminary tests the recorders are provided with special fast vibrators for the smoked chart and with a clock movement to revolve the chart once in one hour, but for continuous daily records the standard 24-hour charts are recommended.

IMPROVEMENTS IN BRIDGEPORT

The Connecticut Company reports that in 1907 it spent about $600,000 in improving its property in Bridgeport and vicinity. The work thus begun will be continued and finished this year. Most important are the improvements to the power system. In this connection the Sea View Avenue plant has been remodeled and rebuilt. A new 1200-kw unit, new steam piping and new feed water heater have been installed, and a new oiling system finished. In addition the station has been almost entirely rewired. Work going on and contemplated consists of new condensers with a new intake crib, the installation of additional boilers and coal handling machinery, and a 400-kw booster set to feed the company's Bridgeport-New Haven line for next summer's business. The condensers are being installed, the booster is ordered and the other work in various stages of completion. The company found that additional copper was necessary in its feeders, and so has run new lines to Fairfield, Milford and in the city. The company has also spent a large sum for paving. In Bridgeport new track has been laid in East Washington Avenue, Stratford Avenue, and Fairfield Avenue. The charges to maintenance of track and roadway for the Bridgeport lines since April 1 have run considerably over $200,000, while for the five months ending Nov. 30 the company spent $103,000. Another important work is the establishment of storage and operating car houses and shop on Congress Street north of the railroad station. Last winter the Bridgeport lines had twenty-eight double-truck closed cars. This winter there are forty-eight of the same type. During the summer the company increased the number of fifteen-bench open cars by twelve. These additional cars have been furnished at an expense of $195,000. Ten closed cars recently received are equipped with a new type of destination sign, plainly discernible by day or night, which is being tried with a view to its general adoption.

OUTING ON NORTHERN TEXAS TRACTION

The department heads of the Northern Texas Traction Company were entertained recently by General Manager Edgar at a banquet at the Delaware café, the reception being a recognition of the valuable aid given the management of the road in bringing it to its present high state of efficiency. Those present were: A. W. Q. Birtwell, C. H. Boken, G. H. Clifford, H. T. Edgar, W. C. Forbes, G. J. Fry, J. E. Gallagher, T. N. Hartin, L. B. Higgins, W. L. Hunter, J. P. Morton, E. E. Nelson, J. R. Phillips, M. M. Phinney, A. G. Rosser, C. L. Sykes, Theodore Taylor, W. L. Weston, E. L. White and W. H. Woodfin.

THE TRANSFER IN A CAMPAIGN AGAINST DISEASE IN BALTIMORE

The United Railways & Electric Company, of Baltimore, as the result of its desire to co-operate in the crusade now being waged against consumption by the residents of Baltimore and the press, plans to publish on the back of all its transfers, to be issued during the month of February and on Sundays in March, the words of advice here reproduced. The consensus of opinion is that this method will prove

CONSUMPTION IN EARLY STAGES CAN BE CURED **IF TAKEN IN TIME**

DO NOT NEGLECT COLD OR SUCH PREMONITORY SYMPTOMS AS SLIGHT COUGH, FEVER, NIGHT SWEATS, LOSS OF WEIGHT, BUT CONSULT A GOOD PHYSICIAN.

CONSUMPTION IS CONTRACTED THROUGH THE SPIT OF CONSUMPTIVES	FRIENDS OF CONSUMPTION	ENEMIES OF CONSUMPTION
	DAMPNESS — DIRT DARKNESS — DRINK	SUN — CLEANLINESS FRESH AIR—NOURISHING FOOD

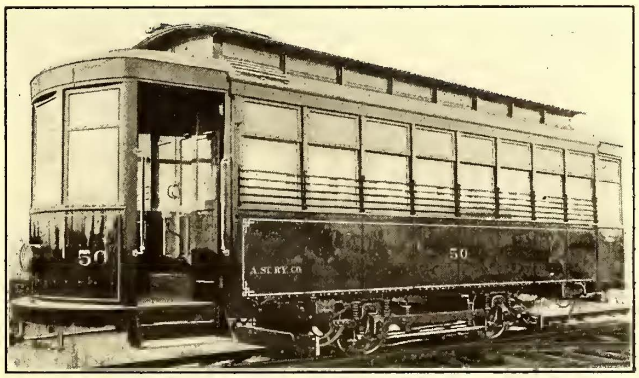
CAUTION AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE—NO MATTER WHETHER YOU HAVE TUBERCULOSIS OR NOT, DO NOT ENDANGER THE HEALTH OF FRIENDS AND FAMILY BY CARELESS SPITTING.

ANNOUNCEMENT TO BE MADE ON BACK OF BALTIMORE TRANSFERS

effective in placing information in the hands of many who would otherwise remain ignorant of the manner in which the dread disease is contracted and relieved. There is a city ordinance which prohibits spitting upon the floors and platforms of cars within the city limits, and the purpose of the company is to secure the passage of such a law by the State Legislature, effective in the counties in which its system operates.

CARS FOR THE AMARILLO STREET RAILWAY

The Danville Car Company has recently turned out for the Amarillo Street Railway Company, of Amarillo, Tex., four new semi-steel, semi-convertible cars, which measure 22 ft. over the car bodies, 32 ft. 7 ins. over all, 8 ft. 2 ins. in overall width. The side sills are of yellow pine with steel plate between, and the subsidiary sills on each side for the truck are reinforced with steel angles. The body framing is of ash. The sides of the car are covered longitudinally with 13/16 tongued and grooved yellow pine, and



SEMI-STEEL, SEMI-CONVERTIBLE CAR FOR AMARILLO.

from the arm rail down are covered with No. 14 sheet steel in panels. The side is of No. 14 sheet steel riveted in one length, thus forming an interior truss. The cars are full vestibuled with folding doors. The interior finish with the exception of the steel panels below the arm rail is of cherry. The seats are of the Hale & Kilburn walkover type. The curtains are of Pantasote. The Danville Car Company's side vestibule sign is used. The bodies are mounted on Brill No. 21 E trucks. The headlights are of the Kirby-Neal type.

FINANCIAL INTELLIGENCE

Wall Street, Jan. 15, 1908.

The Stock and Money Market

Further decided progress in the direction of general improvement in the stock market has been made during the past week, and this too in the face of a number of adverse influences which ordinarily would have served to check any advancing tendencies. Following on the heels of the Seaboard Air Line receivership, comes a similar development in connection with the Chicago Great Western, thus emphasizing the fact that there are at least a few of the smaller railroad systems of the country in need of financial rehabilitation, while a number of railroads reported pronounced decreases in earnings for November. This naturally led to expectations that the statements for December and January, if not for succeeding months, will likewise show up poorly, but strange to say this prospect had no appreciable effect upon the securities of the corporations directly concerned. In addition to these unfavorable factors, considerable disappointment was felt on account of the failure of the Northern Pacific to declare an extra dividend at this time, while not a little uncertainty was created by the important failures in the jewelry trade and by the evidences of business contraction in various parts of the country. There was also some disappointment, as well as surprise, because the Bank of England did not reduce its discount rate, especially in view of the prevailing low rates in the London open market and the strong position of that institution, as disclosed by its usual weekly return. However, the fact that the Bank of France and the Imperial Bank of Germany lowered their discount figures was accepted as practically a foregone conclusion that the Bank of England would be quick to follow suit.

That stocks generally advanced despite the presence of these several disturbing elements is due simply and solely to the vastly improved local monetary position, although the existence of a stubborn short interest made it a comparatively easy task for the professional cliques to work up their respective favorites. However, the enhancement in values was not entirely due to the operations of professionals, as prompted by the renewed ease in money and the prospects of still greater ease in the early future, outsiders were induced to come into the market and pick up stocks in greater or less quantities. The bond market likewise felt the effect of this influx and the demand for railway mortgages was better perhaps than at any time for more than a year past. Not only did call money rule below the legal rate practically throughout the week, but time loans on Stock Exchange collateral could readily be had on the basis of 6 per cent for six months. Borrowers, however, were not at all inclined to pay any such figure and were holding off for a considerably lower rate, with every indication that lenders would sooner or later be compelled to meet their terms. The flow of money from interior points is of course the fundamental reason for this condition of affairs. Through this medium almost entirely our banks have been enabled to once more get on their feet, so to speak, and whereas during the height of the recent panic they had the unprecedented deficit of over $54,000,000, they are now able to report a surplus above legal requirements of over $6,000,000. In due time now the Clearing House certificates outstanding will all be retired and the banks resume the position occupied by them prior to the troubles of last fall. All these things have tended to inspire renewed confidence in the future of the security market and have completely offset the unsettling factors previously referred to. Stocks of all descriptions have participated in the better tone, and even Amalgamated Copper has exhibited strength, notwithstanding expectations that the next dividend is to be reduced. In a few instances, notably the anthracite coal stocks, the advances have been sensational, the gains in the cases cited being accounted for by the exceptional prosperity now being enjoyed by the coal trade as a whole.

Without exception, however, prices have made substantial gains, the local traction group taking a prominent part in the movement, which is quite natural in view of latest developments. The opening of the new tunnel under the East River and its successful operation ever since marks an epoch in the local traction situation, the far reaching importance of which it is hard to determine. Thus far the advantage appears to be largely with the Interborough, as it has brought to that company a considerable traffic hitherto not enjoyed. Eventually, however, the Brooklyn Rapid Transit is bound to benefit greatly by the enlarged population which the new transit facilities will bring to the Borough of Brooklyn, consequently sentiment regarding all the local traction securities at present is decidedly bullish.

Philadelphia

Although the dealings in the local traction shares assumed only moderate proportions during the past week, still they shared to a great extent in the improvement which has been witnessed in the general securities market. Philadelphia Rapid Transit, which was the active feature of the trading, advanced to 18⅜, and held most of the gain. Philadelphia Traction, after an early decline to 84½, advanced sharply to 87 and closed at the highest. Union Traction moved up nearly a point to 51⅞, and substantial gains were recorded in Philadelphia Company's stocks, the common selling at 37⅛ and the preferred at 38½. Frankfort & Southwark Passenger sold at 280 @ 282, and Fairmount Park Transportation brought 84. American Railways was steady at 43 and Consolidated Traction of New Jersey advanced to 654.

Baltimore

Pronounced strength characterized the dealings in the Baltimore traction issues, United Railway issues scoring sharp advances. The 4 per cent bonds, after selling at 82½, rose to 85, while the incomes rose nearly 5 points to 49½. The funding 5s advanced about 2 points to 71¼, and the stock sold at 11½. In the other issues trading was light, but prices throughout the entire list held firm. Lexington Street Railway 5s sold at 96; Baltimore City Passenger 5s at 101 and Baltimore Traction 5s at 107.

Other Traction Securities

In the Boston market more interest was manifested in the tractions than for some time past, and prices generally reached a higher level. Boston Elevated led the list, selling as high as 130¼, but the Massachusetts Electric issues also improved materially, the common selling at 12 and the preferred at 49½. Boston & Suburban sold at 10 @ 9¾ and Boston & Worcester preferred rose a point to 60. West End brought 80 and the preferred 96¼ @ 96. The Chicago market was quiet but firm. Metropolitan Elevated common changed hands at 17, while the preferred moved up to 46½. South Side Elevated advanced to 71 and Chicago & Oak Park at 2.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Jan. 8.	Jan. 15.
American Railways	43	43
Boston Elevated	129	129½
Brooklyn Rapid Transit	40	44¾
Chicago City	a150	a150
Cleveland Electric	41¾	—
Consolidated Traction of New Jersey	61	64½
Detroit United	37½	38½
Interborough-Metropolitan	6½	7⅜
Interborough-Metropolitan (preferred)	18¼	20
International Traction (common)	—	30
International Traction (preferred) 4s	—	61¼
Manhattan Railway	118	123
Massachusetts Elec. Cos. (common)	10½	11½
Massachusetts Elec. Cos. (preferred)	—	49
Metropolitan Elevated, Chicago (common)	16½	a17½
Metropolitan Elevated, Chicago (preferred)	41	45½
Metropolitan Street	—	20
North American	50⅞	53¼
Philadelphia Company (common)	36	36½
Philadelphia Rapid Transit	18¼	18
Philadelphia Traction	—	85½
Public Service Corporation certificates	54	54
Public Service Corporation, 5 per cent notes	85	85
South Side Elevated (Chicago)	64	68
Twin City, Minneapolis (common)	85½	86½
Union Traction (Philadelphia)	50¼	51¼

a Asked.

Metals

The "Iron Age" says the improvement in the financial situation is reflected by a better feeling in the iron trade, but as yet there has been little increased buying except in pig-iron. The cast-iron pipe manufacturers, East and West, have been fairly large buyers. The steel rail business is very light, and contractors for structural material are still holding back.

The copper metal market remains unchanged at 13¾ to 14 for lake, 15⅝ to 15⅞ for electrolytic, and 15⅜ to 15⅝ for eastings.

STREET CARS ACCIDENTS IN CHICAGO IN 1907

During the year ended Dec. 31, 1907, there were 3430 street car accidents of various kinds reported to the police department, as against 3154 in 1906, and 2035 in 1903. The number of accidents to persons reported by the elevated roads also increased from fifty-two in 1906 to eighty-one in 1907. The following table shows the causes of accidents reported:

	1907.	1906.
Alighting from cars	866	843
Cars striking vehicles	836	687
Persons struck by cars	824	768
Sudden stops or starts	179	82
Thrown from car by conductor	25	13
Miscellaneous	700	761

IMPORTANT INTERURBAN BILL INTRODUCED IN MASSACHUSETTS

There has been filed with the Secretary of State a petition for legislation to allow interurban electric railroad companies to construct, operate and maintain an elevated or subway structure longitudinally in any public street or way. With the petition is a bill, which provides: Section 1. An electric railroad company heretofore or hereafter organized under the laws of this commonwealth may construct, operate and maintain an elevated or subway structure logitudinally in a public way or place of a city or town with the approval of the aldermen of a city or the selectmen of a town and the approval of the board of railroad commissioners.

Section 2. An electric railroad company shall not begin the construction of its elevated or subway structure longitudinally in the public ways or places of a city or town until it has filed in the office of the city or town engineer a plan showing the exact location thereof and the general form and method of construction. After thirty days from the filing thereof the railroad company shall apply to the board of railroad commissioners, which, after such notice and hearing as it may deem proper, shall approve said plan, or alter the same in such manner as it may deem neeessary.

Section 3. In respect to the equipment, use and operation of an electric railroad over said elevated, and in said subway structure, the company shall have all the rights, privileges and immunities set forth in the general law, now in force, or in laws hereafter enacted applicable thereto.

Section 4. An electric railroad company whose petition to the board of aldermen of a city or the selectmen of a town, for an elevated structure or a subway, has been refused, or has neither been granted or refused, within three months after the filing thereof, may apply to the board of railroad commissioners, who, after such notiee and hearing as it deems proper, if they deem public necessity so requires, may enter a decree granting the location of such structure.

Section 5. This act shall take effect on its passage.

THE BOSTON ELEVATED RAILWAY COMPANY

An abstraet of the report of the Boston Elevated Railway Company for the fiscal year ended Sept. 30 last was published last week, but the leading position of the road in New England makes some comments and further facts of interest. The records of the company reflect to some extent the abnormally unpropitious and unusual trolley weather that was experienced during the winter of 1906-07. The lateness of the spring of 1907 also, coupled with the severity of the winter previous, so retarded riding that it was well into the middle of June last before the company was able to record anywhere near normal increases in its gross receipts, as compared with the same period of the previous year. The gross earnings of the company for the late fiscal period represented the smallest actual inerease, as well as per cent of increase, ever shown in the history of the company—$425,781, or 3.1 per cent—with the exception of 1905, when the expansion in that item was $298,323, or 2.4 per cent.

During the last fiscal year the company added 5.807 miles to its surface lines, and leased as well a short piece of track heretofore controlled by the Boston & Northern Street Railway Company, at Orient Heights, East Boston, making its total length of surface tracks 445.897 miles which, in conjunetion with its 16.015 miles of elevated road, make the total mileage 461.912. Of this total mileage, approximately 50 miles are sidings and tracks in car houses and yards. In reducing the income account for the last fiscal year to a per mile basis, therefore, only the amount of first and second track should be taken into consideration. This is approximately 410 miles, as compared with about 405 miles in the year previous. The following table is the per mile showing of the company in the last fiscal year, as compared with 1906:

	1907.	1906.	Changes.	P. C. Chge
Gross earnings	$34,032	$33,400	Inc. $632	1.89
Operating expenses	23,531	22,980	Inc. 551	2.40
Net earnings	$10,501	$10,420	Inc. $81	0.77
Other income	142	265	Dec. 123	46.41
Total increase	$10,643	$10,685	Dec. $42	0.39
All charges	*8,616	8,582	Inc. 34	0.39
Balance	$2,027	$2,103	Dec. $76	3.61
Dividends	1,946	1,970	Dec. 24	1.21
Surplus	$81	$133	Dec. $52	39.09

*Includes $244 per mile charged for depreciation.

An interesting feature of the last pamphlet report is a summary of the stockholders of record on Oct. 1, 1907, which shows that the total number was 3438, holding 133,000 shares of stock. Of this number 3009, holding 114,347 shares, reside in the State of Massachusetts. It is, therefore, apparent that about 86 per cent of the stock is held in the home state.

The Boston Elevated Railway Company was incorporated in 1897, since which time rapid strides have been made as regards earnings. For instance, the gross earnings since 1898 have expanded some $9,000,000, or approximately 52 per cent, while at the same time the gain in net has been in the neighborhood of $2,700,000, or about 62½ per cent. The average yearly gain in gross earnings from Sept. 30, 1898, to Sept. 30, 1906, was 5.9 per cent, or 47 per cent for the eight years. It will, therefore, be noted that had the average yearly expansion been maintained in the late fiscal period, the gross receipts would have been considerably in excess of $14,000,000.

Since the company was organized material improvement has been made in its percentage of operating expenses to gross earnings, a reduction in the last fiscal year of 2.5 per eent, as compared with 1898, having been effected. The following table shows the percentage of operating expenses to gross earnings each year from 1898 to 1907, both years inclusive:

Year.	Per eent operating expenses to gross.	Year.	Per eent operating expenses to gross
1907	69.1	1902	69.4
1906	68.7	1901	67.9
1905	68.0	1900	67.3
1904	69.6	1899	70.5
1903	69.0	1898	71.6

During the last fiscal year the number of passengers carried by the company was 271,084,815, and the total revenue received therefrom was $13,546,779, while receipts from the carriage of United States mails amounted to $38,898, making a total revenue from these two sources of $13,585,677. The average receipts per revenue passenger amounted to 4.997 cents. The profit and loss surplus on Sept. 30 last, as shown in the balance sheet, was $668,603.

THE CLEVELAND SITUATION

One of the important features of the meeting at Cleveland last Friday was the proposition of Mayor Johnson to ascertain the cost of securing the consents of property owners all over the city, and allowing this to stand in lieu of the value of pavement construction. The valuation committee reported a difference of $258,122 in their figures on pavements. For the Cleveland Electric the value was placed at $1,520,888, while the city's representative placed it at $1,282,766. The committee was set to work to reconcile the differences in some way, and reported that the difference, with the exception of $52,000, was due to different methods of arriving at depreciation estimates. A request was then made for instructions as to whether to estimate on the straight line year or 4 per cent curve. Mayor Johnson proposed to compromise on the remaining $206,000. Mr. Goff said that the estimate should be on a 3 per cent, instead of a 4 per cent curve, and that the difference, as proposed by the Mayor, would then be about $150,000. The Mayor accepted this and ordered it added to the estimate made by his member of the committee, which would make the total valuation of pavements about $1,412,766, depending upon how the $52,000 still unsettled is adjusted. Since the larger item has been arranged there is not much danger but that this one will be adjusted in some way without much further trouble.

A number of items in schedule B 2 were discussed on Friday, including such things as expenses of grade crossing elimination, pavement outside the tracks, cost of land for making curves at street corners, frontage maps and other things of the kind. The mediators do not agree upon all the items as belonging to any schedule, the Mayor holding that some of them do not belong to cost, but to expenses of operation. Mr. Goff replied that if they do not belong to the cost of the property, then they should be included in the lost capital account, and considered under a head of this kind or added to the sum the Mayor is willing to concede for good will. In discussing the cost of frontage maps, Mr. Goff declared that the company should be credited with what it would cost to secure the franchise rights and the charter for a company to reproduce the properties of the company. The Mayor did not want to allow this.

At a meeting Monday forenoon, Messrs. Baker and Tolles, committee to decide upon the dates of the expiration of the various franchises, submitted a report which shows them to be far apart in some instances in their opinion. While their idea of the expiration of franchises on various lines within the city varied quite a little, the greatest difference was in those to which grants to extend tracks had been made. Mr. Tolles held that the grants operated to extend the franchise of the entire line in several instances, while Mr. Baker held to what is known as the Tayler opinion, that such a grant applied only to the portion of the line included in the extension and that the franchise for the extension expired with that of the original line, no matter how many years it was given for.

Some of the franchises in the suburbs, Mr. Tolles held, expired on dates varying from 1917 to 1931, while Mr. Baker held that the franchises in these places expire with those within the city. Mayor Johnson stated that the differences in the expiration of the franchises would easily make a difference of between $1,000,000 and $2,000,000.

F. H. Goff, in the absence of Mr. Tolles, took up the discussion of the subject and stated at the outset that he felt that Mr. Tolles was correct in his contentions. He discussed the so-called Tayler rule which has been followed by Mr. Baker and said that the Supreme Court had given an opinion to the effect that a City Council has full power to grant an extension for as long a time as it sees fit, so it does not exceed the twenty-five years set by the statutes.

City Solicitor Baker said that he and Mr. Tolles tried to make their decisions by letting all court decisions stand, whether they believed them right or not. He further stated that Mr. Tolles had urged that all contracts made with the villages be carried out. Baker said he believed in observing contracts when the bodies that made them do not go beyond their authority. In the case of the Gelville arrangement he believed that the Village Council had exceeded its authority in giving the company a franchise extending beyond the life of the franchise of the original line. He said he did not believe it wrong or immoral to repudiate a contract that has been made under such circumstances. Law makes a difference when it comes to things of this kind, he said, and he felt that it is right and moral to hold to the tenets of the law, even if this result in the repudiation of contracts.

Mayor Johnson stated that he would go as far as any one in recognizing contracts made by the suburban towns. He discussed the ordinance made by the village of Glenville to the St. Clair Street line, and said it was about the most severe ordinance that the company had ever accepted, because it was drawn by F. H. Goff while he was Mayor of the village. Mayor Johnson, however, tried to turn this fact to advantage in saying that the company is now trying to make this ordinance the basis of a claim of $500,000 addition to the franchise values. He also argued along the same lines that Mr. Baker did, to the effect that the ordinance is of no account after the franchise on the line within the city expires.

The Mayor is formulating plans to get at the proportion of the business the parts of the system lying outside of the city do, and stated that he would place men at the city limits to secure the number of passengers on each car for a certain length of time. He stated that this would aid in ascertaining the franchise value on the various lines.

A question as to how to arrive at the value of franchises was brought up, and the Mayor said he knew of but two ways of getting at this. One was to value the franchises on the different lines in fragments, as the roads were given grants, and the other is to secure an average date of expiration and then apply the car-miles or number of passengers carried or some other rule of this kind. The fixing of a rule will be one of the difficult matters to arrive at.

The Tayler rule, which was discussed at the meeting Monday, applies mostly to the grants lying outside of the city, which were made as extensions, rather than original grants. The Chapman decision was also discussed in all its phases. This was a decision by Judge Chapman to the effect that a franchise ordinance giving rights on tracks on which a car line is already in operation cannot be made to extend beyond the life of the original grant. In addition to the dates fixed by the franchise committee, as individuals, the expiration of franchises has been agreed upon as follows: Payne Avenue, Jan. 26, 1910; Wade Park Avenue, July 13, 1913; Cedar Avenue, July 13, 1913; most of the Broadway line, July 1, 1914. The difference on a portion of the St. Clair Street line is twenty-one days, but the most important disagreement is the Woodland Avenue line and West Side system, which includes one-fourth the trackage of a goodly portion of the system.

In their discussion Tuesday both F. H. Goff and Mayor Johnson stated that they would not depend strictly upon legal rights in the settlement of the franchise question. This is considered an important step in the matter, although Mr. Goff said he did not know that it would please the officers of the Cleveland Electric to have him depart from the rights which the company hold in the least. He feels that this is a case where there must be some concessions on both sides if an agreement is to be reached. The company, Mr. Goff said, had not regarded the ordinances as mistakes, and have spent the money for improvements and repairs under the impression that the franchises all expired at a later date than is claimed by the city. City Solicitor Baker said that he had not changed his mind regarding the Tayler rule. The Supreme Court, he said, had reversed itself several times on the points included in it and any lawyer is liable to make a mistake in his ideas of it. He thinks Mr. Tolles has made a mistake.

The Mayor said he did not believe the Chapman decision is correct, although it is in favor of him and the city. He asked that Mr. Goff select something to balance his idea on this, so that they will be even in their concessions. The Mayor also said that, if Judge Sanders, one of the Cleveland Electric attorneys, said in a case four or five years ago that these franchises expire in 1908, his words should not be used against the company now. He probably did not intend to state definite dates in his address, and besides, he has a right to change his mind and give the company his latest opinion.

Messrs. Andrews and DuPont reported on the store schedule a value of $305,882.30, a decrease of $26,278.09 from the value made under former negotiations.

City Solicitor Baker, who is acting with S. H. Tolles in ascertaining the dates of the expiration of franchises on certain lines of the Cleveland Electric, claims that the company admitted that its rights on Woodland Avenue and Kinsman Street expire in February, 1908, before the United States Superior Court in April 1904, when suit was brought to enjoin the Hopkins and Cope ordinances; and also before the Chamber of

Commerce in 1901, when the existing franchises were being investigated by a special committee. When the case mentioned was tried, it is claimed that Judge Augustus J. Ricks decided that these franchises expire Feb. 10, 1908. The Cleveland Electric says that ordinances passed in 1893 operate to extend the franchises of a number of West Side lines two years, and that they still have this length of time after the date given to use the lines. If this can be shown, the values of the franchises will be much more than they will be under the claim of the city.

AFFAIRS IN NEW YORK

The regular monthly accident report for December, as compiled by the Public Service Commission, shows the following figures for the railroads and street railways:

Killed	51
Fractured skulls	14
Amputated limbs	5
Broken limbs	36
Other serious injuries	94
Total	200

There were 216 car collisions in December, and 947 persons were struck by cars and injured. In getting on cars 438 persons were injured, and 435 were injured in alighting. Employees injured numbered 363, and the minor accidents totaled 1,594, bringing the total of accidents for the month up to 3,993.

Within the last few days the finishing touches have been given to the completed four tubes of the first section of the Pennsylvania Railroad Company's tunnel system now building under the East River between Long Island City and Manhattan. Within a few weeks it is predicted that the four under-river tubes of the system will be joined about midstream under the East River, and thus the second section will be moving toward completion.

It is the hope of the Public Service Commission that it can persuade the trunk line railroad companies, which are now engaged in the electrification of their system, to become bidders for the operation of city subways, presumably to be run in connection with their suburban service. A letter from the commission to the Board of Estimate regarding the changes that have been made in the plans for the bridge loop subway intimates such a hope. The letter is in part as follows:

During the preparations of the contracts for the Fourth Avenue Subway in Brooklyn, the Public Service Commission has considered it advisable to make certain modifications, so as to reduce the grades and increase the headway. The object of these changes is to promote the more rapid, safe and economical operation of trains, and to make it possible for cars now being used in the local suburban traffic of steam railroads to be operated through the subway. By so doing this would also facilitate the making of more advantageous contracts by the city for the subsequent rental and operation of the road. In the opinion of the commission it would be a great mistake to build any future subway of such dimensions that an existing railroad might be debarred from being a competitive bidder, or through which it would be impossible to run railroad cars.

The trains through the Fourth Avenue Subway will continue over the Manhattan Bridge and be run through the subway loop now under construction in Canal and Centre Streets. If the Fourth Avenue Subway is enlarged it would be advisable to enlarge the subway loop, otherwise the larger cars used by steam roads could only run as far as the Manhattan terminal of the Manhattan Bridge; the subway loop only allowing for a headroom of 13 feet 6 inches above top of rail, whereas 14 feet 6 inches are necessary for the cars used in suburban traffic.

The subway loop, connecting as it does, the Williamsburg Bridge with the other two bridges, is so planned that the cars from any future subway extending into Brooklyn or Queens from the Brooklyn terminus of the Williamsburg Bridge can be run to the subway loop. If the present headroom of 13 feet 6 inches is not enlarged, it will be impossible to allow for any railroad connection with such future subways, and will make it impossible for any present railroads in Queens to reach Manhattan via the Williamsburg Bridge and subway loop.

Our chief engineer, Mr. Seaman, after careful study of the problem, has found that it is possible to modify the plans for the subway loop so as to increase the height of the tunnel. To make these changes it will be necessary to change two of the stations, and in order to make proper connection with the crosstown line in Canal Street, it is proposed to unite the two stations at Leonard-Franklin Street and at Howard-Grand Street into one station at Canal Street. It is also proposed to operate the loop as two double-track railroads, instead of one four-track road, but with cross-overs to be used in case of accident, or when needed for the shunting of trains. Eventually this might lead to the connection of the Williamsburg Bridge with the Brooklyn Bridge, which would naturally serve the purposes of the elevated roads in Brooklyn which connect with these two bridges. The other set of tracks would be operated in connection with the Manhattan Bridge, through the proposed terminal at Chambers Street and thence down William or Nassau, crossing the East River by a tunnel and connecting with some future subway in Brooklyn. This loop would naturally serve the Fourth Avenue Subway, and could be operated there in conjunction with or entirely independent of the loop previously described.

This modification simplifies a very complicated plan; eliminates two double-deck stations, making all tracks on a level, and would increase very materially the safety of operation. It is estimated that the operating capacity would be increased fully 25 per cent, and also that the time of construction would be materially decreased.

The Supreme Court, on Jan. 13, denied the application of Joseph Konrad and Daniel Gallagher and Frowan S. Reisenberg for writs of mandamus to compel Judge Lacombe of the United States Circuit Court for the Southern Division of New York to vacate his orders appointing Adrian H. Joline and Douglas Robinson receivers for the New York City and the Metropolitan Street Railway Company of New York, and to relinquish to the State courts jurisdiction of the matter.

The fire at Nineteenth Street and Fourth Avenue last Friday night necessitated the shutting down of the subway temporarily while cribbing could be laid so as to protect the tunnel in case the walls of the burned buildings in the vicinity should fall. The work was all finished within a few hours and service then resumed. The effect of the fire on the surface lines was much more serious, of course.

On Friday the Public Service Commission will hold a public hearing on the proposal to change the Rapid Transit act, which includes the Elsberg law, but does not include the Public Service Commission act. The commission held a similar hearing in November, but it was not well attended. One of the features that has to be considered is the exempting from the debt limit provision of the Constitution of rapid transit bonds. Another and very important one is the time for which a franchise may be granted. A third is whether private enterprise shall be allowed to build transit lines. At the end of its statement of the law or laws as now on the statute books, the commission states that the following questions arise:

1. Whether the city should be confined to municipal construction only.
2. Whether the city should also allow main rapid transit lines to be constructed by private corporations at their own expense.
3. Whether franchises for main lines, like that granted for the McAdoo tunnel under Sixth Avenue, would be safe.
4. Whether the twenty-year term of operation of a municipally constructed rapid transit road should be increased.
5. Whether the city should be allowed to make contracts for operation of extensions of existing subways for as long a time as the original contract upon terms.
6. Whether the city should allow extensions of elevated railroads and other existing rapid transit lines holding franchises in perpetuity to construct extensions at their own expense subject to proper terms and readjustment each twenty-five years.

It is expected that immediately after the hearing the commission will have introduced in Albany such amendments to the law as it thinks are necessary.

THE PENNSYLVANIA STREET RAILWAY ASSOCIATION

The executive committee of the Pennsylvania Street Railway Association has recently issued a circular letter to the street railway companies in Pennsylvania, calling attention to the many problems now facing the electric railway industry in that State and urging the companies to join the association. Under the new by-laws the initiation fee is $5, and the annual dues are $25.

CENTRAL ASSOCIATION CHANGES MEETING PLACE

The meeting and banquet of the Central Electric Railway Association, arranged to be held at Dayton, Ohio, Thursday, Jan. 23, as announced previously in the STREET RAILWAY JOURNAL, will be held at the Phillips Hotel, Dayton, and not the Algonquin as had been arranged. The programme of the meeting was given in the issue of this paper for Jan. 11. A meeting has been called of the traffic officials of the companies for the previous day, with the idea in mind of forming an organization to be a branch of the Central Association.

PENNSYLVANIA RAILROAD COMMISSION NAMED

Governor Stuart, of Pennsylvania, appointed on Jan. 13 the following members of the State Railroad Commission, created by the last Legislature, and which became operative one week ago: Nathaniel Ewing, of Uniontown, judge of the United States District Court of Western Pennsylvania, Pittsburg, chairman, to serve for five years; Charles N. Mann, of Philadelphia, deputy prothonotary of the courts of Philadelphia County, to serve for four years; John Y. Boyd, of Harrisburg, retired, a member of the firms which formerly acted as general sales agents for the anthracite coal companies controlled by the Pennsylvania Railroad, to serve for three years. The commission is composed of three members at a salary of $8,000 a year each, and is authorized to appoint an attorney at a salary of $4,000 a year, a secretary at $4,000 and a marshall at $2,500. It is also authorized to appoint an acountant, an inspector of railroads and an inspector of electric railways. The principal office of the commission will be at Harrisburg.

Judge Nathaniel Ewing was born in Uniontown in 1848 and was admitted to the bar in 1871. He was appointed to the Fayette County bench in 1887, and was elected for a term of ten years in November of the same year. He was defeated for re-election by Judge Umbel. His appointment to the Federal bench came in 1906, when he succeeded Judge Buffington, who was appointed to the Circuit Court. Judge Ewing was president of the Pennsylvania Bar Association in 1893-94. He has been president of the National Bank of Fayette County and a director of the Finance Company of Pennsylvania, the Pittsburg Life & Trust Company and the Maryland, West Virginia & Pennsylvania Telephone & Telegraph Company. He is a member of the American Bar Association, and was delegate to the Universal Congress of Lawyers and Jurists at St. Louis in 1904.

Charles N. Mann was born in Philadelphia Feb. 14, 1840, educated in that city and in the private academy of his grandfather, the Rev. William Mann, at Mount Holly, N. J. He studied law under Charles E. Lex and in the Law School of the University of Pennsylvania, which he entered in 1860. Before his connection with the prothonotary's office in the early nineties Mr. Mann enjoyed a lucrative practice. He is a member of the Union League, Lawyers' Club, Young Republicans and many other social organizations.

John Y. Boyd was born in Danville, Aug. 19, 1862, and has resided in Harrisburg since 1874. He graduated at Princeton in 1884. Since then he has been identified with municipal affairs of Harrisburg. He was formerly a member of the firms of James Boyd & Company and Boyd, Stickney & Company, wholesale coal dealers, who were agents for the anthracite companies controlled by the Pennsylvania Railroad. This agency was surrendered several years ago and the firms are now occupied with coal and iron interests in the South. He is a member of the board of managers of the Harrisburg Hospital, Harrisburg Country Club, and the Harrisburg Municipal League Executive Committee. He is also a member of the University Club, of New York; the University Club, of Philadelphia; the Ivy Club, of Princeton; the American Forestry Association, the National Geographical Society, the American Academy of Political and Social Science, the American Institute of Mining Engineers, the Engineers' Club of Central Pennsylvania, and the Harrisburg Board of Trade.

CHANGES IN BOSTON "L" ENGINEERING DEPARTMENT

With new power stations coming into use and a general increase of work in the department of motive power and machinery, the Boston Elevated Railway Company has since the beginning of the year been operating with two new departments in place of the one mentioned. One is the department of power stations, the other the department of rolling stock and shops. James D. Andrew is the new superintendent of power stations. He has charge of the maintenance and operation of all the company's power stations and sub-stations; is responsible for the delivery and distribution of electricity to meet the demands of the service; controls the coal wharves, with the receipt, discharge, and care of coal, and reports to the vice-president through the chief engineer of motive power and rolling stock. John Lindall is the new superintendent of rolling stock and shops. He has direct charge of the Albany Street and Bartlett Street shops; shop tools and shop machinery; all repairs to cars and car equipment, and of the distribution and collection of coal and supplies by car. Division superintendents still have immediate care of the surface cars in the car houses of their respective divisions, and the shops and rolling stock of the elevated service are in the immediate charge of the superintendent of the elevated division, but the superintendent of rolling stock and shops will have general supervision of shop work and car house methods, in conjunction with the division superintendents, to the end of securing the greatest efficiency and economy.

THE GOVERNOR OF NEW JERSEY ON THE RAILROADS

The final message of Governor Stokes, of New Jersey, went to the Legislature Tuesday, Jan. 14. At the beginning of his message the Governor speaks of the great industrial progress made by New Jersey since 1870 and of the increased transportation facilities in the way of steam and electric railways. He says these conditions are invited by the conservative character of the state institutions and the unimpeachable integrity of the courts. He refers to President Roosevelt's speeh at Indianapolis in May last, in which the President, referring to the need of increased railway facilities, said: "The want can be met only by private capital, and the vast expenditure necessary for such purposes will not be incurred unless private capital is afforded reasonable incentive and protection. It is, therefore, a prime necessity to allow investments in railway properties to earn a liberal return, a return sufficiently liberal to cover all risks."

According to the Governor, the laws for the taxation of public utility franchises result in a revenue of over $626,000 per annum. He believes that publicity should be given the reports of corporations and banks, and points out that suspicion is allayed and confidence inspired by giving the proper amount of publicity to statements of the financial condition of these institutions. Another suggestion is that a permanent body be created for the investigation and examination of the various state departments and institutions. In conclusion, the Governor urges the Legislature to reconsider the bill for the regulation of public utilities. This bill was passed by the lower house last year, but was defeated in the upper house. It provided for the regulation and control of public utilities corporations. He regrets that the bill did not become a law.

BILLS INTRODUCED IN OHIO

At the instance of Mayor Tom L. Johnson, of Cleveland, three bills have been introduced in the Ohio Legislature that are intended to aid him in carrying out his plans in Cleveland. Representative Metzger has presented the old bill that caused considerable discussion two years ago. It does away with the necessity of securing the consents of abutting property owners on a street where a street railway is proposed, and provides that all questions of franchise shall be submitted to a vote of the people, thus taking away all rights of those most affected and giving authority to the people in general to say whether or not streets shall be used. The bill does away with the necessity for bids or applications to City Councils, and the routes and terms are to be included in the franchise without any preliminaries of any kind.

Another bill, fathered by Representative Stockwell, amends the municipal code in such a way that cities will have a right to own and operate street railways. In addition, they may purchase and appropriate systems and grant security franchises. Under this head public utilities may be taken over by a city, if the people desire, and so-called public utility bonds issued to secure money to pay for them. Mr. Stockwell introduced another measure that will allow cities to build and own street railway tracks, but not operate them. This is intended to make the building of the loops now under construction in Cleveland, paid for with the money the Cleveland Electric gave the city in return for the use of Central Avenue and Quincy Street after the franchise had expired. Under the bill rents may be collected for the use of these loops and the bridge tracks.

Under the guidance of Representative Schmidt a bill has been introduced that will aid Mayor Johnson and his low-fare companies in the event of a settlement not being reached with the Cleveland Electric within a reasonable time. Under it the two sections of the statutes relating to petitions and consents will be repealed, and where a grant is made for the construction of a street railway, either as a new route or an extension of an existing route over a street or part of a street, in which a

line has previously been in operation, it will not be necessary for property owners to sign a petition to that effect or for the company to secure their consent to the operation of the line. If this bill passes, the new companies will not have to secure consents on the streets where the franchises of the Cleveland Electric have expired. The Mayor has thus undertaken to do by legislation what the fight in Cleveland has prevented him from doing with the aid of the city administration.

Representative Shuler has introduced a bill, modeled after the Wisconsin law, which will put the control of all public utilities in the hands of a commission. Public service corporations and municipally owned plants alike will be under the control of the board.

The fact that there is a strong sentiment on the part of some of the members in favor of a measure of this kind may operate against the other bills mentioned.

THE STRIKE ON THE INDIANA UNION TRACTION COMPANY'S LINES

The general situation in Muncie, Anderson and other cities in Indiana as a result of the strike of the employes of the Indiana Union Traction Company is greatly improved. The members of the Amalgamated Association of Street and Electric Railway Employes realize how foolish the position was which they took in opposition to the order of interurban trainmen, with which the company had an agreement, and so the strike may be said gradually to have petered out.

Governor Hanly issued a proclamation and special instructions to Major-General McKee removing martial rule from Muncie Jan. 13, and Major-General McKee immediately prepared his proclamation giving notice of the suspension of military authority and turned the government and control of Muncia and its environs over to the legally constituted civil authorities. Major-General McKee, with four companies of troops, will remain in the city for the purpose of aiding the civil authorities in cases of emergency until the final order is received from the Governor. It is likely that these troops will remain until after the first of next week. After martial law was abolished the saloon men's organization held a mass meeting and invited the civil authorities to attend for the purpose of allowing the resumption of the liquor traffic, which was stopped by Mayor Guthrie thirteen days ago. For an hour the saloon men awaited action on the part of the authorities, and during the interim several speeches were made, in which the leaders of the liquor men's association advocated strict discipline in the operation of the saloons. The directors reported that they would permit saloons to open under certain regulations. Each saloon keeper was sworn in as a deputy sheriff. They were instructed to arrest any person who made any sign of trouble in their saloons and to do all in their power to suppress any unruly spirit that might manifest itself.

THE T-RAIL RECOMMENDED FOR DETROIT

The committee of the Council of Detroit which has been considering the question of the use in Detroit by the Detroit United Railway for a part of its system of the T-rail has as a result of its study of conditions in Grand Rapids, Milwaukee, St. Paul and Minneapolis submitted a report to the Council, advising that the company be permitted to use the T-rail. The committee says:

"In Grand Rapids the company operating the street railway system uses a 91-lb. T-rail, laid on a gravel foundation, using a special grooved granite block, which takes the place of the iron groove in the rail used by the local company. In this instance the granite block is not laid under the head of the rail, but a cement mortar is placed against the web of the rail to take up the space under the head or top of the rail, and the granite grooved block is then laid next to the mortar, which is done for the purpose of not disturbing the pavement should there occur a depression of the track.

"In Milwaukee the company operating the railway system uses a 97-lb. T-rail, laid on a 6-in. concrete foundation. As to the pavement between the track the company uses an arched or circular section which gives a crown in the pavement nearly equal to the head or top of rail, which construction in the judgment of your committee is undesirable.

"In St. Paul and Minneapolis the street railway systems are operated by one company, called the Twin City Rapid Transit Company. They use a 91-lb. T-rail with a 6-in. base, 7 ins. in depth, same as other cities visited. A gravel foundation is used throughout the entire systems, except in the central portions of each city, where a concrete foundation is used. Granite block is used almost entirely in both of said cities, but the same, while grooved, is laid against the web and under the head of rail instead of being laid away from rail as is done in Grand Rapids, using a flat section across tracks, so that the groove of the granite block takes the place of the steel groove of the rail used in our city.

"The sum and substance of the conditions in all cities are these: The companies use a 60-ft. 7-in. T-rail, weighing from 91 lbs. to 97 lbs. per yard. In Grand Rapids, Milwaukee, St. Paul and Minneapolis the companies use the cast-welded joint, while in Grand Rapids they also use what is called a continuous joint.

"The cast-welded joint is exceptionally well thought of in those cities, because of the smooth riding and continuity of the track, and also because the pavements have seldom, if ever, to be disturbed to bond the rails with copper wire for the conveyance of the electrical current, and it is stated that less than 1 per cent of these joints require any further attention. The continuous joint is also held in high regard, but your committee is of the opinion that, while both of the methods employed have given good results, neither one or the other should be specified. Inasmuch as the company has taken the initiative in this matter, we believe that they will use whichever joint is best adapted to local conditions, and we therefore recommend that the commissioner of public works grant said company permission to reconstruct the tracks on Jefferson Avenue, from Woodward to Beaufait Avenues, on the express condition that the company use a 60-ft. 7-in. T-rail, weighing from 91 lbs. to 97 lbs., using granite block between tracks and 18 ins. outside."

MEETING OF THE EXECUTIVE COMMITTEE, SOUTHWESTERN ELECTRICAL & GAS ASSOCIATION

A meeting of the executive committee of the Southwestern Electrical and Gas Association was held last month at Dallas, Tex. Reports of all committees were received and ordered filed. A. E. Judge, treasurer, submitted a report showing the financial condition of the association on Dec. 1 for the years 1904, 1905, 1906, and 1907. This report showed that the finances of the association were in better condition than ever before.

A communication was received from W. W. Freeman, secretary of the National Electric Light Association, New York City, suggesting closer co-operation between the various local organizations, which would tend to benefit all concerned.

The president, H. T. Edgar, the secretary, R. B. Stichter, and J. A. Myler, Jr., manager of the Dallas Gas Company, were appointed a committee of three to arrange for all papers to be read at the next meeting, which will be held in El Paso in May, 1908. The question of exhibits for the El Paso meeting was brought up, and it was the understanding of the executive committee, and so expressed, that this matter was in the hands of a committee of supply men, appointed at the San Antonio convention, and that the president take the matter up with that committee.

The secretary was instructed to gather such information as directed by the president of the association, regarding taxes, both ad valorem and special; cost of street improvements; donations, etc., as would be of benefit to the association, and the executive committee requested that all members of the association give the secretary every aid possible in the procuring of this information. This information is to be filed in the office of the secretary for the use of the members of the association.

LIMITED SERVICE ON OHIO ELECTRIC RAILWAY

Effective Jan. 19, the limited service put on between Columbus and Dayton, Ohio, by the Ohio Electric Railway, will be extended to Richmond, making a through run from Columbus to Richmond, a distance of 112 miles. Stops will be made only at the more important towns. The run will be made in three hours and 55 minutes. Reports show that the through business between Columbus and Dayton has increased about 300 per cent since the limited service was put on between those towns last month. If the Richmond service proves as successful, the through service will be extended to Indianapolis. The new Richmond service will comprise four limited cars each way a day.

A NEW FIRM OF CONSULTING ENGINEERS

The firm of Manning, Hanchett & Young, consulting, mechanical, civil and electrical engineers, has just been organized with offices at 237 Fulton Street, New York, and 824 Equitable Building, Baltimore. The firm will also have a laboratory in New York. Its members are well known in the fields of civil, mechanical and electrical engineering. W. T. Manning, from 1894 to 1899, was chief engineer of the Baltimore Belt Railroad, and has since been conducting a consulting business in Baltimore. He has also held the positions of assistant chief engineer of the Baltimore & Ohio Railroad, engineer maintenance of way of the Pittsburg Division of the same company, and chief engineer of the Staten Island Rapid Transit Railway. Mr. Hanchett has conducted a business as consulting engineer in New York for the last ten years, previous to which time he was associated with several manufacturers of electrical apparatus. He is the author of a book on the subject of electric motors, and has given a great deal of attention to electric railway engineering.

Mr. Young was for eleven years electrical engineer of the Baltimore & Ohio Railroad, and has written several papers on the subject of the equipment of the belt line tunnel, for engineering societies and the technical press. Before becoming associated with the Baltimore & Ohio Railroad, which was in the year 1895, he was on the engineering staff of the General Electric Company.

DECORATIONS FOR TECHNICAL JOURNALISTS

At a dinner given Jan. 15 at the Aldine Club, New York, by the American Museum of Safety Devices, the decoration of Officier de l'Instruction Publique, given by the French republic, was presented to T. Commerford Martin, editor of the "Electrical World"; Chas. Kirchhoff, editor of the "Iron Age," and Rev. P. S. Grant. This decoration is one of the important French orders, was instituted early in the last century by Napoleon, and is awarded by the Minister of Public Instruction and Fine Arts for scientific and literary attainments. The insignia consists of two sprays of laurel and bay crossed pendant on a purple ribbon.

Albert H. Gary, chairman of the United States Steel Corporation, presided at the dinner, and acted as toastmaster. M. LeFarge represented the French government, for whom he spoke in the absence of the French Consul. Frank J. Sprague presented Mr. Martin for the decoration. He referred to the fact that Mr. Martin had been engaged continuously in electrical journalism since 1883, and expressed the great debt of the electrical industry to Mr. Martin and the "Electrical World" for what they had accomplished during the past twenty-five years. He also spoke of the assistance which Mr. Martin had been to the industry in connection with his work as electrical expert of the United States Census, as an active member and past president of the American Institute of Electrical Engineers, for his services in connection with the erection of the United Engineering Societies Building, in New York, and in many other ways. Mr. Kirchhoff was presented in like manner by Mr. Dickson, who is second vice-president of the United States Steel Corporation, and who referred to him and the "Iron Age" as authorities in all matters relating to iron and steel and metallurgy. Bishop Potter, of New York City, presented Rev. Mr. Grant. Dr. Strong, president of the American Institute of Social Service, of whose committee of direction Mr. Kirchhoff is chairman, and Mr. Martin, vice-chairman, also spoke and described the purposes of the museum in the field of industrial welfare.

A number of letters of congratulation to Messrs. Martin and Kirchhoff were received from this country and Europe. Among those who wrote was Andrew Carnegie, who said that "the country is fortunate in having such men as Mr. Martin and Mr. Kirchhoff; their lives should be an inspiration to the members of kindred societies." Prof. W. Ayrton, of London, testified to the satisfaction which the electrical engineers of Great Britain would feel at hearing of the honor to Mr. Martin, and looked upon it as a recognition of the entire industry on both sides of the water. Prof. Blondel, of the Ecole Nationale des Ponts et Chaussées, spoke in a similar way of the French engineers. W. von Siemens, of Siemens & Shuckert, referred particularly to Mr. Martin's work on the "Electrical World," whose influence, he said, extended to all civilized parts of the globe. Other letters referring to Messrs. Martin or Kirchhoff were received from Gen. Horace Porter, Sir Hugh Bell, Robt. A. Hadfield, of Sheffield, and others.

STREET RAILWAY PATENTS

UNITED STATES PATENTS, ISSUED DEC. 31, 1907.

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

874,979. Trolley Harp; William J. Murphy, Bridgeport, Conn. App. filed Oct. 31, 1907. The trolley wheel has an integral axle and is pivoted between jaw members of the harp which are resiliently pressed together, whereby the bearing will automatically take up wear.

875,028. Train Stop for Electric Railways; Ernst Woltmann, New York, N. Y. App. filed Feb. 23, 1907. Relates to railway installations in which the power is supplied through a third-rail constructed in insulated sections for train stop and other purposes. Provides connecting bonds for the separate sections whereby the third-rail acts as a current-carrying conductor for the transmission of the power to the system. In this way separate copper cables are made unnecessary or greatly economized.

875,057. Railway Tie; Eli T. Forrester, Washington, D. C. App. filed June 29, 1907. A railway tie having a depressed portion constituting a yoke, said tie including a cushioning means extending throughout the length thereof and in the walls and bottom of the yoke.

875,061. Ventilation of Electric Railway Motors; George Gibbs, New York, N. Y. App. filed July 24, 1907. A pneumatic piping system extending co-axially through the pivots of the bogie trucks.

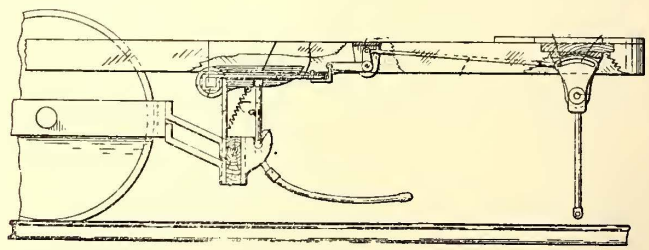
875,063. Safety Car Signaling Device; George W. Goddard, Philadelphia, Pa. App. filed Jan. 15, 1907. Provides means for preventing the conductor from ringing the signal bell whenever anyone is standing on the car step in the act of boarding the car or alighting therefrom.

875,120. Automatic Electric Block-Signal; William A. D. Short, Lexington, Ky. App. filed Nov. 25, 1905. Adapted for systems of that type known as a spindle-operated electric motor signal in which the controlling mechanism is located directly in line with the spindle on top of the signal post.

875,198. Electric Bond for Rails; Frank M. Marcy, Worcester, Mass. App. filed March 3, 1906. The bond is compressed transversely into two conical blocks by the forcing of the blocks into the rails.

875,215. Trolley Pole; Frederick M. Ross, Newport, Ky. App. filed March 4, 1907. Details of a retrieving device having latches which are tripped by a sudden movement of the pole.

875,229. Rail-Joint; James O. Wrench, Beloit, Kan. App. filed March 23, 1907. Relates to the construction of the base-plate or chair.



PATENT NO. 875,373

875,249. Brake-Shoe; Charles J. Egler, New York, N. Y. App. filed May 13, 1907. The brake-shoe is provided at its top with a hook adapted to engage a socket in the brake block, and a reception socket formed in the brake-shoe adapted to receive a diagonally mounted bolt carried by the brake block.

875,313. Block Signal Apparatus; Alexander Bevan, Providence, R. I. App. filed April 8, 1907. The signals are automatically operated by a passing car to indicate the presence or absence of a car in the block, as well as the direction in which it may be moving.

875,373. Car Fender; George A. Parmenter, Cambridge, Mass. App. filed July 20, 1907. Details of construction.

875,454. Air Brake; Edmund B. Powers, New York, N. Y. App. filed Feb. 26, 1907. Provides means whereby the engineer

may test the entire length of train pipe for obstructions, and result being indicated by a signal in the cab.

875,536. Electric Controller; Joseph Ledwinka, Philadelphia, Pa. App. filed Aug. 3, 1907. Permits the contemporaneous charging of the storage battery and operation of the vehicle motors by connection with a railway supply system when the current on said system is of such voltage as not to be directly applicable to charge said storage battery.

875,541. Street-Car Fender; Matthew Lund, Grand Rapids, Mich. App. filed March 28, 1907. Relates to means for tripping an auxiliary fender from the main fender.

875,543. Automatic Brake; James Lynch, Van Buren, Ark. App. filed June 29, 1907. Relates to pneumatic control and provides a brake which is held unapplied by the air pressure in the service pipe, but which is applied by spring pressure when the pressure in the service pipe is sufficiently reduced.

875,581. System of Electric-Motor Control; Henry D. James, Pittsburg, Pa. App. filed May 6, 1907. A system for the control of direct-current motors which are supplied with energy from multi-voltage sources. Means whereby a large range of speeds can be secured.

875,582. Multi-Voltage System of Electric-Motor Control; Henry D. James, Pittsburg, Pa. App. filed May 6. 1907. Relates to modifications of the above.

875,583. Method of Control of Electric Motors; Henry D. James, Pittsburg, Pa. App. filed May 6, 1907. Additional modifications.

875,584. Multiple-Voltage System of Control; Henry D. James, Pittsburg, Pa. App. filed May 6, 1907. Further modifications.

875,596. Trolley Pole Retriever; Luther M. Perkins, Tacoma, Wash. App. filed May 6, 1907. A retrieving device automatically operated and having a valve which opens to admit air to the retrieving cylinder in case the trolley wheel leaves the wire.

875,631. Track Sander; Joseph M. Smith, Worcester, Mass. App. filed March 23, 1907. Provides a rotating worm device capable of efficiently delivering wet sand and having means whereby the sand in a dry state is prevented from being discharged from the casing when the worm is not turning.

875,663. System of Control; Henry D. James, Pittsburg, Pa. App. filed May 6, 1907. Arrangement of the circuits of the motor control system by which the proper voltages may be applied to the operating or controlling magnet windings of the separately actuated switches of the control system.

PERSONAL MENTION

MR. C. E. PALMER has resigned as general superintendent of the Cincinnati Northern Traction Company, of Hamilton, Ohio, and will be succeeded by Mr. A. J. Brown, superintendent of the Dayton & Western Traction Company.

MR. ALEX. L. CRAWFORD, formerly a director of the Second & Third Street Railroad, of Philadelphia, in the management of which he was prominent, is dead, aged eighty-five years.

MR. ALFRED B. SCOTT, of Scott & Bowne, of New York, formerly of that city, but recently of London, is dead. Mr. Scott was largely interested in foreign tramway interests, being one of the owners, with Mr. Theodore N. Vail, of the La Capital Tramways Company, of Buenos Ayres, Argentina.

MR. JOHN H. KELLEY, for two years inspector on the Central District of the Ohio Electric Railway, has been appointed ticket agent in charge of the company's Dayton office, succeeding Mr. A. Watson. Mr. Kelley was formerly inspector on the Central Market lines at Columbus, Ohio.

MR. THOMAS FINIGAN, formerly connected with the North Jersey Street Railway Company of New Jersey (now the Public Service Corporation), and who has been assistant purchasing agent of the United Railroads of San Francisco for the past three years, has been appointed purchasing agent of that company, vice Mr. C. D. Baldwin, resigned.

MR. R. M. HOWARD, of Clinton, Iowa, has been appointed general manager and superintendent of the Green Bay Gas & Electric Company and Green Bay Traction Company, to succeed Mr. Geo. W. Knox, of Chicago, because it was deemed advisable to have a resident manager in charge of the property in Green Bay.

MR. R. R. HAYES has resigned as trainmaster of the Western Ohio Railway Company to accept the position of superintendent of the Northern Indiana Traction system, with lines between Michigan City and Goshen, with headquarters at Elkhart. Mr. Hayes began his electric railway career as a dispatcher six years ago.

MR. A. L. NEEREAMER, who for several years has been general superintendent of the Columbus, Delaware & Marion Railroad, with headquarters at Delaware, retired from the service of the company Jan. 15. The company abolished the office of general superintendent and the duties have been distributed among several other officials.

MR. C. A. GOODNOW has resigned as general manager of the Chicago & Alton Railroad and will become president of the South Side Street Railway Company in Chicago. Mr. Goodnow has been with the Chicago & Alton since Nov. 3, 1903. He entered railroad service in 1868 as telegraph operator for the Vermont & Massachusetts Railroad, when he was fifteen years old.

MR. JOHN LAHRMER has resigned from the Columbus & Springfield line of the Ohio Electric Railway. Mr. Lahrmer entered the service of the old Cleveland, Lorain & Sandusky, now a part of the Central Division of the Ohio Electric Railway Company, in November, 1902, as a conductor. He was appointed dispatcher a few weeks later and has held that position ever since, except for a short period during which he occupied the position of assistant superintendent of the Cleveland, Painesville & Ashtabula Railway.

MR. JOSEPH H. HANDLON has been appointed claim agent of the United Railroads of San Francisco, vice A. K. Stevens, resigned. Mr. Handlon has been connected with the United Railroads as chief clerk to the late general manager, G. F. Chapman, for about five years. Previous to this time he held various positions with the North Jersey Street Railway Company, of New Jersey, both in the claims department and with the general superintendent; the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., and the Metropolitan Street Railway Company, of New York City.

MR. GEORGE W. WHYSALL, general manager of the Columbus, Delaware & Marion Railway Company, announces a number of changes in the personnel of the Columbus, Delaware & Marion Railway Company. Among other offices abolished was that of soliciting freight agent, the resignation of Mr. L. W. Harrington, who occupied that position, having been accepted. It is said that the office of general superintendent will also be abolished. Mr. C. F. Turner, who has been chief engineer, has been appointed superintendent of motive power, a position that has recently been created.

MR. GEORGE WESTON has been appointed by the Mayor of Chicago as a member of the Board of Supervising Engineers of the Chicago traction lines. He succeeds his brother, Mr. Charles V. Weston, who resigned to accept the presidency of the South Side Elevated, as noted in this column last week. Mr. George Weston was born in Kalamazoo, Mich., in 1861, and his first engineering work was as a rodman on the Missouri, Kansas & Texas in 1880. He was engaged in steam railway work in the Southwest until 1887, when he entered the employ of Mr. C. T. Yerkes in Chicago. The construction of Clybourne Avenue, Milwaukee Avenue, Blue Island Avenue and Halsted Street cable lines was carried out under his charge, and later he built 75 miles of electric street railways for the West Chicago Street Railway. In 1896 he resigned this position to go with Naugle, Holcomb & Company, constructing engineers. He was in charge of the construction of the Suburban Railroad of Chicago until 1898, when he was made general manager of the company. Until 1901 he was engaged in the construction of the Tennessee Central, on the completion of which he resigned to engage in consulting engineering practice with his brother under the firm name of Weston Brothers. In April of this year he was appointed assistant chief engineer of the Traction Board, and has since had charge of much of the engineering work carried out under the direction of that body.

NEWS OF THE WEEK

CONSTRUCTION NOTES

Items in this department are classified geographically by States, with an alphabetical arrangement of cities under each State heading.

For the convenience of readers seeking information on particular subjects, the character of the individual item is indicated as follows:

* Proposed roads not previously reported.
o Additional information regarding new roads.
† Extensions and new equipment for operating roads.

Numerals preceding these signs indicate items referring to:

1. Track and roadway.
2. Cars, trucks and rolling stock equipment.
3. Power stations and sub-stations.
4. Car houses and repair shops.
5. Parks and amusement attractions.

†BIRMINGHAM, ALA.—President Ford, of the Birmingham Railway, Light & Power Company, has petitioned the City Council for an extension of time on a half dozen or more franchises which have been granted by the Board of Aldermen.

1†BERKELEY, CAL.—The San Francisco, Oakland & San Jose Railway Company, operating the Key Route system, has applied for a fifty-year franchise for the new line projected along Sacramento Street, from the Oakland line all the way to the north end of Berkelev and branching through the hill country to the north to the section donated for the proposed site of the State capital.

oLOS ANGELES, CAL.—It is reported that Col. J. W. Eddy has lost his franchise to build an inclined railway to the top of Harpers' Peak, in Griffith Park, the time limit having expired. The failure to begin work is due to the delay of the Huntington interests in building a street car line to the park.

1†NAPA, CAL.—The San Francisco, Vallejo & Napa Valley Electric Road has formally opened for traffic its extension from Napa to St. Helena.

oPUEBLO, COL.—We are officially advised that the Pueblo & Arkansas Valley Electric Railway Company will begin construction work next April. The company proposes to construct a standard-gage railway, 53 miles long, which will connect Pueblo, Avondale, Fowler, Monzanola and Rocky Ford, Col. Both steam and electricity will be used in operating the road, the latter being rented from the Pueblo Traction Company. It is also the intention to operate an amusement park in the vicinity of Pueblo. The company has an authorized capital stock of $300,000, and its offices are located in the Bryant Building, Kansas City, Mo. The officers are as follows: N. Douthitt, Kansas City, Mo., president and general manager; M. G. Saunders, Pueblo, vice-president; F. R. Stoller, Kansas City, Mo., secretary; F. B. Chappege, Kansas City, Mo., treasurer, and N. C. Van Natta, Pueblo, chief engineer.

1†NEW HAVEN, CONN.—It is believed that President Mellen, of the Connecticut Company, is about to order the building of the proposed electric railway connection between Willimantic and South Coventry. It is said the company is to discharge an obligation existing as the result of the purchase by the Consolidated Railway Company of the electric railway between Willimantic and Baltic by the Willimantic Traction Company at an early date as evidenced by the rumor that quotations have been asked on a certain number of thousand railroad ties to be used in the construction of the proposed extension from Willimantic to South Coventry. It is construed from the communication that the company intends to build at an early date, and from the specifications it is assumed that the extension, which will be six miles in length, is to be of heavy construction on an excellent roadbed, so that there can be trolley freight and express as well as passenger service.

oWILMINGTON, DEL.—The West Chester & Wilmington Electric Railway Company, which is arranging to build an electric railway from Wilmington to West Chester, Pa., has opened offices in Wilmington. Thomas E. O'Connell, who started the project and is president of the company, is in charge of the office.

1†WILMINGTON, DEL.—Arrangements have been completed by the Wilmington City Railway Company for opening the new Lobdell division in South Wilmington this week.

1†ST. AUGUSTINE, FLA.—The St. Johns Light & Power Company has received the maps and necessary papers from the war department granting this company a right of way through the fort reservation to connect the tracks of the electric railway from Bay Street to San Marco Avenue.

oAUGUSTA, GA.—The Atlanta & Carolina Construction Company, which proposes to construct an electric railway between Augusta and Atlanta, has petitioned the City Council for rights and privileges to lay tracks into and through the city of Augusta, and erect terminal stations. The matter was referred to the railroad and streets and drains committee, to take up with the officials of the company, and report back. The survey of the line has been finished some time, all the way from Atlanta to Augusta, and the contract was awarded some months ago to a construction firm in Montgomery, Ala. Matthew Mason is vice-president and general manager of the company.

†SPRINGFIELD, ILL.—The Illinois Traction system has officially accepted the 50-year franchise granted by the City Coucil of Streator about a week ago for the Chicago, Peoria & Ottawa Railway, which is to be part of the system's line to Chicago. The acceptance of the Streator franchise has assured the immediate construction of the Ottawa-Streator line. According to the agreement now existing between the city councils of Ottawa and Streator work on the construction of the line must be commenced not later than March 1, 1908. The expenditure of at least $100,000 by the interurban company during the year is also required. Orders for rails and other material necessary for the track construction have been placed. An agreement, contingent upon the acceptance of the Streator franchise already exists between the Ottawa Council and the interurban interests, whereby a combination bridge is to be erected by the company, Ottawa agreeing to pay $35,000 toward the erection of this structure.

†FORT WAYNE, IND.—The Town Council of Roanoke has passed an ordinance giving the Fort Wayne & Wabash Valley Traction Company a franchise to do an electric lighting business there for a term of 99 years.

oSOUTH BEND, IND.—Good progress is being made on the construction of the Chicago, Lake Shore & South Bend Railway Company. About forty-eight miles of track have already been laid, and it is said that thirteen miles more will be completed within a short time, the grading having been almost completed for that much. This will make sixty-one of the seventy-one miles of track to be built. The turbines for the power house have been delivered and will be erected as soon as possible. It is estimated that the road will be in operation by July or August. J. B. Hanna, of South Bend, is president of the company.

oWARSAW, IND.—Work on the projected line of the Winona Interurban Railway Company's line, between Valparaiso and Fort Wayne, will begin at once. The line has been under consideration for two years and the surveys have been completed. The road will parallel the Pennsylvania road the greater part of the distance.

1-3-5†ISHPEMING, MICH.—The Marquette County Gas & Electric Company has just completed a new boiler house and installed the following apparatus in its power station: One 500-kw vertical Curtis turbine, one 200-kw Buffalo Forge engine direct-connected to a 110-kw, direct-current, 550-volt street railway generator; also a new storage battery. The company has in view the construction of about two and a half miles of new track and a dancing pavilion. At present the company is in the market for a double truck closed car about 42 ft. over all.

1†FARMINGTON, MO.—The St. Francois County Electric Railway Company expects to begin construction work this week on the following extensions: 2600 ft. spur with siding from main line on the De Lassus division and a 2600 ft. extension to the power station of the State Hospital, No. 4. Manager Zwart states that all the material necessary for this construction work is already on hand.

3†NEVADA, MO.—The Missouri Water, Light & Traction Company will place contracts during the next few weeks for the installation of the following apparatus: Two 225-hp water tube boilers, 600-hp exhaust steam heater, 600-hp live steam water purifier and the necessary piping. Hiram Phillips has succeeded M. P. Murray as receiver for the company.

2†BINGHAMTON, N. Y.—The Binghamton Railway Company is equipping five of its large cross seat cars with Franklin hot water heaters.

1-5†KINGSTON, N. Y.—The Kingston Consolidated Railroad Company is reconstructing its lines with 90-lb. T-rails. The company expects to purchase a penny arcade, to be installed in Kingston Point Park.

1-3†LIMA, N. Y.—The Lima-Honeoye Electric Light & Railroad Company expects to place contracts during the next three months for the construction of about thirty-six miles of new standard track. The company also proposes to purchase gas engines and considerable other equipment for a new power station, which will use natural gas for fuel.

oMINEOLA, N. Y.—The New York & North Shore Traction Company made an application to the Nassau Supervisors last week for a franchise to build an electric railway from Mineola to Westbury, permission being sought to build on Maple Avenue and to cross Post Avenue, both county highways.

oNEW YORK, N. Y.—The failure of the New York & Port Chester Railroad to make an annual report to the up-State Public Service Commission, as required by the public utilities law, necessitated a hearing last week, which was given to the representatives of the company by the commission. William C. Trull appeared as attorney for the Port Chester Railroad, and Allen Wardwell for the New York, New Haven & Hartford and allied interests in the consolidation. The commission desired